FINAL WORK PLANS LIMITED RCRA FACILITY INVESTIGATION OF SOLID WASTE MANAGEMENT UNITS 45, 54 AND 55 NAS FORT WORTH TX

9/1/2000

HYDROGEOLOGIC

NAVAL AIR STATION
FORT WORTH JRB
CARSWELL FIELD
TEXAS

ADMINISTRATIVE RECORD
COVER SHEET

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HYDRO GeoLogic INC.

FINAL WORK PLANS LIMITED RCRA FACILITY INVESTIGATION OF SWMUs 45, 54, AND 55 AT NAS FORT WORTH JRB, TEXAS

SD-15
SD-20
SD-9

AF CENTER FOR ENVIRONMENTAL EXCELLENCE

Prepared for

U.S. Air Force Center for Environmental Excellence
Brooks AFB, Texas

Contract Number F41624-95-D-8005

September 2000

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Response To Comments
Draft Work Plan
Limited RCRA Facility Investigation of SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas
July 2000

General Comments:

Instead of installing permanent groundwater monitor wells using a hollow-stem auger rig, it is recommended that collection of proposed groundwater samples be accomplished using a direct push technology (DPT) rig such as a geoprobe or hydropunch. Also, it is recommended that the document be reviewed for spelling, grammar, and clarity.

General Response:

The technical approach outlined in the Draft Work Plan is intended to reflect a "limited" RCRA Facility Investigation (RFI) effort. This limited effort includes conducting the investigation in a phased approach, so that if no evidence of a release of hazardous waste is identified in soil, investigation of groundwater will not be necessary. In the event soil contamination is identified, groundwater must be investigated to definitively determine the nature of impact to groundwater, if any, that has occurred. If a groundwater investigation is deemed necessary, definitive rather than screening-level data will be necessary to support the findings. Therefore, permanent groundwater monitoring wells are necessary in order to collect legally defensible, definitive data. No changes to the technical approach are proposed.

Specific Comments:

Work Plan

ITEM	PAGE	SECTION	COMMENT	RESPONSE
1	1-9	1.5	This section does not state whether Notice of Intent to proceed under the Texas Risk Reduction Standards (RRS) contained in 30 TAC §335 was submitted to the TNRCC. This Notice of Intent to grandfather under the Texas RRS is necessary since the Texas Risk Reduction Program (TRRP) rules contained in 30 TAC §350 became effective September 23, 1999. In order to grandfather under the Texas RRS, the TRRP rules require that a Notice of Intent should have been provided to the TNRCC by May 1, 2000. Please indicate in the document whether a Notice of Intent was submitted by May 1,	The following text will be added to Section 1.5: Although new regulations for conducting environmental investigations including RFIs have been promulgated in Texas, this investigation will be conducted under the RRS Program. AFCEE has requested that all RFIs be conducted under the RRS Program as the RFI process at this installation is already underway under the RRS

Response To Comments
Draft Work Plan
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ITEM	PAGE	SECTION	COMMENT	RESPONSE
			2000 and if not, why not.	Program. The TNRCC has agreed to this approach and indicated to AFCEE that a formal Notice of Intent to stay under the RRS Program was not necessary.
2	Figure 2.11	Figure 2.11	Please orient the north arrow correctly on this figure.	This change will be made.
3	3-8	3.5.1.2	Paragraph 2, line 2: It is recommended that consideration be given to collecting a groundwater sample using a direct push technology (DPT) rig instead of installing a permanent groundwater monitor well.	See response to the General Comment.
4	3-9	3.5.2.2	Bullet 3: See comment 3.	See response to the General Comment.
5	3-10	3.5.2.2	Paragraph 5, line 2: See comment 3	See response to the General Comment.
6	3-12	3.5.3.2	Paragraph 2, line 3: It is recommend that the number of proposed soil borings be revised from a minimum of four to a maximum of four.	Based on the outcome of the August 10, 2000 Remedial Project Manager's meeting, an additional boring located along the underground piping between SWMU 54 and 55 will be advanced. Therefore, the text will be changed to "a maximum of five borings".
7	3-13	3 5.3.2	Paragraph 1, line 2: See comment 3.	See response to the General Comment.
8	4-1	4.1	Paragraph 1, line 7: Please correct "Chapter 33" to read "Chapter 330".	This change will be made.

Response To Comments
Draft Work Plan
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NAS Fort Worth JRB, Texas
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ITEM	PAGE	SECTION	COMMENT	RESPONSE
9	Table 5.2	Table 5.2	It is recommended that permeable reactive barriers (PRBs) and phytoremediaton be added to this table as additional technology options considered for the treatment of groundwater.	Based on discussions with the AFCEE Team Chief, Sections 4 and 5 will be removed from the work plan due to the limited nature of this RFI.
10	1-6	1.3.2	On Interceptor 001, is there a description (size) available of the line connecting the Outfall 001 to Outfall 003?	We do not currently have this information, but will include it in the RFI report.
11	1-7	1.3.2	Revise the last sentence of Outfall 001 to read: "Stormwater collected in interceptor 04 is conveyed to the wet well and pumped from this unit through a 10-inch force main from the vault to the nearby OWS (SWMU 55)."	This change will be made.
12	1-7	1.3.2	Change all reference to 10-inch pipe to read 10-inch force main.	This change will be made.
13	1-8	1.3.3	Same as comment 12.	This change will be made.
14	Table 4.1	FSP	Correct Michael Dodyk's phone number as (817) 782-7167.	This change will be made.
15	Table 13.1	H&SP	Same as comment 14.	This number is presented in the Draft FSP. No change is necessary.

FINAL
WORK PLAN
LIMITED RCRA FACILITY INVESTIGATION OF SWMUS 45, 54, AND 55 AT NAS FORT WORTH JRB, TEXAS

Prepared for

U.S. Air Force Center for Environmental Excellence
Brooks AFB, Texas

Contract Number F41624-95-D-8005

Prepared by

HydroGeoLogic, Inc.
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September 2000

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REPORT DOCUMENTATION PAGE

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13 ABSTRACT *(Maximum 200 words)*

This document presents the Final Work Plan for the Limited RCRA Facility Investigation of SWMUs 45, 54, and 55 at NAS Fort Worth JRB, Texas. The Work Plan presents detailed procedures for the investigation required to evaluate the potential threat to human health and the environment posed by wastes handled at the subject sites

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15 NUMBER OF PAGES

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18 SECURITY CLASSIFICATION OF THIS PAGE

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20 LIMITATION OF ABSTRACT

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PREFACE

HydroGeoLogic, Inc. (HydroGeoLogic) was contracted to perform Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs) at three Solid Waste Management Units (SWMUs) that require further investigation under the Installation Restoration Program (IRP) at the Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), Fort Worth, Texas. Work will be conducted under Contract Number F41624-95-D-8005, Delivery Order Number 0033. SWMUs requiring RFIs as part of this project include the following:

- SWMU 45 (Building 1027 Waste Oil Tank Vault)
- SWMU 54 (Storm Water Interceptors)
- SWMU 55 (East Gate Oil/Water Separator)

Responsible key HydroGeoLogic personnel are as follows:

Jim Costello, P.G.	Program Manager
Miquette Rochford, P.G.	Project Manager

This contract will be administered by the Defense Contracts Management Command, 10500 Battleview Pkwy, Suite 200, Manassas, Virginia, 22110. The Contracting Officer will be Mr. David Miller. The Contracting Officer's Representative (COR) will be Mr. Don Ficklen (210/536-5290), located at the U.S. Air Force Center for Environmental Excellence (AFCEE)/Environmental Restoration Division (ERD), 3207 North Road, Brooks Air Force Base (AFB), Texas 78235-5363.

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LIST OF ACRONYMS AND ABBREVIATIONS

1,1,1-TCA	1,1,1-trichloroethane
ACC	Air Combat Command
AFB	Air Force Base
AFBCA	U.S. Air Force Base Conversion Agency
AFCEE	U.S. Air Force Center for Environmental Excellence
AFP 4	Air Force Plant 4
AGE	aerospace ground equipment
AOC	area of concern
ARARs	Applicable or Relevant and Appropriate Requirements
BLRA	baseline risk assessment
RAC	Base Realignment and Closure Act
BSS	Base Service Station
CFR	Code of Federal Regulation
cm/sec	centimeters per second
CMI	corrective measures implementation
CMS	corrective measures study
COPC	chemicals of potential concern
COR	Contracting Officer's Representative
DoD	Department of Defense
DPT	direct push technology
DRMO	Defense Reutilization and Marketing Office
EM	electromagnetic induction
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
ERD	Environmental Restoration Division
ESE	Environmental Science and Engineering Incorporated
°F	degrees Fahrenheit
FSP	Field Sampling Plan
ft/d	feet per day
GC	gas chromatograph
gpd/ft^2	gallons per day per square foot
HSA	hollow stem auger
HSP	Health and Safety Plan

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

HydroGeoLogic	HydroGeoLogic, Inc.
ILS	Instrument Landing System
IRP	Installation Restoration Program
IS	internal standard
IT	International Technology Corporation
JP-4	jet propulsion grade 4 fuel
JRB	Joint Reserve Base
LAW	Law Environmental Inc.
LCS	laboratory control sample
MEK	methyl ethyl ketone
mg/kg	milligrams per kilogram
MQL	method quantitation limit
MS	matrix spike
MSCs	medium-specific concentrations
MSD	matrix spike duplicate
NAS	Naval Air Station
NFA	no further action
NGVD	National Geodetic Vertical Datum
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
OWS	oil/water separator
PCBs	polychlorinated biphenyls
PR	Preliminary review
QA	quality assurance
QC	quality control
QAPP	Quality Assurance Project Plan
Radian	Radian Corporation
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RF	response factor
RFI	RCRA facility investigation
RI/FS	remedial investigation/feasibility study

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

RPM	Remedial Project Manager
RRS	risk reduction standards
RSD	relative standard deviation
SAC	Strategic Air Command
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAC	Texas Administrative Code
TCE	trichloroethene
TPH	total petroleum hydrocarbons
TNRCC	Texas Natural Resource Conservation Commission
TWC	Texas Water Commission
USACE	United States Army Corps of Engineers
USAF	United States Air Force
UST	underground storage tank
UTL	upper tolerance limit
VOC	volatile organic compound
VSI	visual site inspection
WP	Work Plan

TAB

Work Plan

TAB

Section 1

FINAL
WORK PLAN
LIMITED RCRA FACILITY INVESTIGATION OF
SWMUs 45, 54, AND 55 AT
NAS FORT WORTH JRB, TEXAS

1.0 INTRODUCTION

The following sections briefly describe the objective of the United States Air Force (USAF) Installation Restoration Program (IRP) and the rationale for implementing this work plan (WP).

1.1 BACKGROUND

Carswell Air Force Base (AFB) was officially closed on September 30, 1993. A parcel of the former base, now known as Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), has been transferred from USAF to U.S. Navy management. Before complete property transfer can be accomplished, required environmental investigations of potential contamination related to USAF activities occurring prior to September 30, 1993 at the NAS Fort Worth JRB property are to be complete, and contaminated sites are to be remediated.

On February 7, 1991, the former Carswell AFB (NAS Fort Worth JRB), was issued a Resource Conservation and Recovery Act (RCRA) hazardous waste permit (HW-50289) by the Texas Natural Resource Conservation Commission (TNRCC). This permit requires a RCRA Facility Investigation (RFI) of all solid waste management units (SWMUs) and areas of concern (AOCs) listed in Permit Provision VIII, as well as those SWMUs and AOCs subsequently added to the list, in order to determine whether any of the hazardous constituents listed in 40 Code of Federal Regulation (CFR) Part 264, Appendix IX, have been released into the environment.

SWMUs 45, 54, and 55 are the subject of this limited RFI. All three of these units were listed in a TNRCC letter dated March 2, 1995 to the U.S. Air Force Base Conversion Agency (AFBCA), for inclusion into the permit requirement for Corrective Action. The TNRCC letter and the RCRA permit are included as Appendix A.

This investigation will be managed by the USAF under the Environmental Restoration Account Other portions of the former Carswell AFB that are not being transferred to the Navy remain under Base Realignment and Closure Act (BRAC) funding and management.

The primary regulatory programs that govern the RFI, and potential closure of these sites are RCRA and the TNRCC Risk Reduction Standards (RRS) Program. The TNRCC is the lead regulatory agency for activities to be conducted at the subject sites.

This limited RFI has been designed to meet the requirements of Permit Provision VIII of the NAS Fort Worth JRB HW-50289 permit. This WP has been prepared using guidance documents from the IRP, U.S Environmental Protection Agency (EPA), TNRCC RRS Program, and RCRA. The WP for this project consists of the following documents:

- The WP, which describes the work to be performed, explains project objectives and presents the rationale for conducting specific project activities. The WP describes the site history and setting and provides a summary of environmental investigations that have been completed at the base. A description of each SWMU is presented, along with data needs and the proposed sampling program for each site. Technical reports and presentation formats are also discussed in the WP

- The Field Sampling Plan (FSP), which describes the planned field sampling procedures. Each method to be used is described in detail, including mobilization activities, environmental sampling procedures, and a field quality control program.

- The Health and Safety Plan (HSP), which provides guidance and procedures to satisfy health and safety regulations and procedures. The HSP describes required monitoring procedures, personal protection, and site safety protocols. Medical surveillance procedures, site control, and emergency response procedures are also described. In addition, potential health and safety risks for the investigation are identified.

1.2 HISTORY OF PAST IRP WORK AT THE INSTALLATION

This section describes the location, physical setting, operational history, and previous environmental investigations at the NAS Fort Worth JRB.

1.2.1 Installation Description

NAS Fort Worth JRB is located on 2,555 acres of land in Tarrant County, Texas, 8 miles west of downtown Fort Worth (Figure 1.1). The main base comprises 2,264 acres and is bordered by Lake Worth to the north; the West Fork Trinity River, the city of River Oaks, and the city of Westworth Village to the east; other urban areas of Fort Worth to the northeast and southeast; the city of White Settlement to the west and southwest; and Air Force Plant 4 (AFP 4) to the west. The area surrounding NAS Fort Worth JRB that is not used for Department of Defense (DoD) operations is mostly suburban. Land use in the immediate vicinity of the base is industrial, commercial, residential, and recreational (A.T. Kearney, 1989).

1.2.2 Installation History and Present Mission

Prior to the initial base construction in 1941, the area that is now occupied by the NAS Fort Worth JRB consisted of woods and pasture in an area called White Settlement. The NAS Fort Worth JRB started as a modest dirt runway built to service the aircraft manufacturing plant formerly located at AFP 4's current location. Figure 1.2 presents the geographic relationship between AFP 4 and the NAS Fort Worth JRB. In August 1942, the base was opened as

Tarrant Field Airdrome and was used to train pilots to fly B-24 bombers under the jurisdiction of the Gulf Coast Army Air Field Training Command. In May 1943, the field was re-designated as Fort Worth Army Air Field with continued use as a training facility for pilots. The Strategic Air Command (SAC) assumed control of the installation in 1946, and the base served as the headquarters for the 8th Air Force. It was renamed Carswell AFB in 1948, and the 7th Bomber Wing became the base host unit. The Headquarters 19th Air Division was relocated to Carswell AFB in 1951, where it remained until September 1988 (A.T. Kearney, 1989).

The SAC mission remained at Carswell AFB until 1992, when the Air Combat Command (ACC) assumed control of the base upon disestablishment of SAC. In October 1994, the U.S. Navy assumed responsibility for much of the facility, and its name was changed from Carswell AFB to NAS Fort Worth JRB. The NAS Dallas and elements of Glenview and Memphis NASs were combined and joined to NAS Fort Worth JRB to streamline naval operations into one central area. The principal activities on the base have been maintaining and servicing bombers, fuel tankers, and fighter jet aircraft (A.T. Kearney, 1989).

1.2.3 Site Operational History

A summary of past and current industrial activities and waste disposal operations conducted at the NAS Fort Worth JRB is presented in the following sections.

1.2.3.1 Industrial Activities

Major industrial operations that have been performed at the NAS Fort Worth JRB include the following: maintenance of jet engines, aerospace ground equipment (AGE), fuel systems, weapons systems, pneudraulic systems, and general and special purpose vehicles; aircraft corrosion control; and non-destructive inspection activities. Most of the liquid wastes that have been generated by industrial operations can be characterized as waste oils, recoverable fuels, spent solvents, and spent cleaners (CH2M HILL, 1984).

Waste oils generally refer to lubricating fluids/oils and, to a lesser extent, hydraulic fluids. Recoverable fuels refer to fuels drained from aircraft tanks and other base vehicles, such as jet propulsion grade 4 fuel (JP-4) and unleaded gasoline. Spent solvents and cleaners refer to stripping liquids used for degreasing and cleaning of the following: aircraft, aircraft systems and parts, electronic components, and vehicles. Spent solvents and cleaners include PD-680 (petroleum naphtha) and various chlorinated organic compounds. Specific types of degreasing solvents used by the USAF have changed over the years. Carbon tetrachloride was commonly used in the 1950s until it was replaced by trichloroethene (TCE) around 1960. Since then, TCE and 1,1,1-trichloroethane (1,1,1-TCA) have been used, although TCE usage has decreased in favor of 1,1,1-TCA. Today, PD-680 (Type II), 1,1,1-TCA, and to a limited extent, TCE are used. Waste paint solvents and strippers are also generated on-site from corrosion control activities. Typical paint solvents include the following compounds. isobutyl acetate, toluene, methyl ethyl ketone (MEK), isopropanol, naphtha, and xylene. Paint strippers generally contain such compounds as methylene chloride, toluene, ammonium hydroxide, and phenolics. Servicing and maintaining the engines and equipment of the B-52 and KC-135 aircraft generated the majority of waste liquids at NAS Forth Worth JRB (CH2M HILL, 1984).

1.2.3.2 Waste Disposal Operations

Wastes have been generated and disposed of at the NAS Fort Worth JRB since the beginning of industrial operations in 1942. Historical waste management practices at the NAS Fort Worth JRB were presented in the Phase I Initial Assessment Report (CH2M HILL, 1984), the Phase I Remedial Investigation Report (Radian Corporation [Radian], 1989), and the Site Characterization Summary Informal Technical Information Report (CH2M HILL, 1996a), and are summarized in the following paragraphs:

1942-1970: The majority of waste oils, recovered fuels, spent solvents, and cleaners were burned at the fire department training areas during practice exercises. Some waste oils and spent solvents were disposed of through contractor removal, while some waste paints (contaminated with thinners and solvents), waste oils, and PD-680 are suspected of having been disposed of in the base landfills. Some waste oils, recovered fuels, spent solvents, and cleaners were also discharged to sanitary and storm sewers. These discharges occurred primarily at the washracks. In 1955, an oil/water separator (OWS) (Facility 1190) was installed to recover waste materials discharged from the washracks. Non-aqueous materials from OWSs were pumped out and disposed of through contractor removal. Aqueous discharge from OWSs was, and still is, pumped into the sanitary sewers.

1971-1975: During this period, most waste oils, spent solvents, and cleaners were disposed of by contractor removal. A private contractor would pump the materials from OWSs, 55-gallon drums, and bowsers. Recovered JP-4 continued to be stored at the fire training areas and burned in practice exercises. Recovered JP-4 was also reused in AGE operations. Some waste paints (contaminated with thinners and solvents), waste oils, and PD-680 are suspected of having been disposed of in the base landfills. Some waste oils, solvents, and cleaners were discharged into sanitary sewer drains, primarily at the washracks that discharge to the Facility 1190 OWS. This OWS was routinely pumped out by a private contractor, and the recovered materials were removed from the base by the contractor.

1976-1982: The majority of waste oils, spent solvents, and cleaners were disposed of through services contracted either directly or through the Defense Reutilization and Marketing Office (DRMO). Recovered JP-4 was stored at the fire department training areas and burned during practice exercises. Recovered JP-4 was also used in AGE operations. PD-680 used at the washracks was discharged to the Facility 1190 OWS, which discharged to the sanitary sewers.

1983-Present. Waste oils, solvents, and cleaners are collected in 55-gallon drums and temporarily (less than 90 days) stored at 12 hazardous waste accumulation points located throughout the base. They are subsequently disposed of by contractor removal through DRMO. Recovered JP-4 and other fuels (mogas and unleaded gasoline) are stored at the fire department training area for subsequent burning in practice exercises or reuse in AGE operations. Waste paint solvents or thinners and strippers such as toluene, isobutyl acetate, MEK, isopropanol, naphtha, and xylene are also temporarily stored prior to removal. Removal of waste oils and PD-680 (Type II) from OWSs is also handled by off-base contractors through DRMO.

1.3 SITE IDENTIFICATION AND DESCRIPTION

The areas of interest for this RFI are three SWMUs. These areas are identified as follows:

- SWMU 45 (Building 1027 Waste Oil Tank Vault)
- SWMU 54 (Storm Water Interceptors)
- SWMU 55 (East Gate Oil/Water Separator)

The locations of these SWMUs on the base are presented on Figure 1.3. Table 1.1 provides a summary description of each area and lists the current status of each site.

1.3.1 Description of SWMU 45

SWMU 45, the Building 1027 waste oil tank vault, is located just outside the south end of Building 1027, approximately 30 feet from an associated 1,500-gallon industrial waste OWS. Building 1027 is the Aircraft Washing Hangar, and is located in the southeastern portion of the flight line area. A wastewater lift station is located just south of the site.

SWMU 45 consists of an 8-foot long by 8-foot wide by 8-foot deep concrete vault that reportedly holds a carbon steel underground storage tank (UST) for collection of waste oils and solvents channeled from the OWS (A.T. Kearney, 1989). The vault was reported to consist of an interior steel containment liner along the concrete walls. The system was reported to have been installed in 1987 and is apparently no longer in service. The tank stored a mixture of flammable liquid wastes including aircraft wash rinsate, PD-680 (an industrial solvent), engine oils, and other hydrocarbon products used in operations conducted at Building 1027. Aqueous discharges from the OWS are directed to the storm water sewer system. However, during periods when influx into the OWS exceeds the conduit capacity to the sewer system, excess wastewater was directed into the UST along with the hydrocarbon wastes.

Current photographs of SWMU 45 area are presented as Figure 1.4. Although there are no previous photographs of SWMU 45 that show the construction of subsurface components, the current photographs presented in Figure 1.4 represent the general area in which the tank vault is believed to exist.

1.3.2 Description of SWMU 54

SWMU 54 consists of five separate storm water interceptors as shown on Figure 1.3. Each of these five concrete vault units was designed to collect volumes of effluent from storm water pathways and redirect that flow through an OWS before it discharges into surface waters. The arrangement is designed to operate as a slow-flow system. Under normal non-rainfall and average rainfall conditions, influx into each interceptor is periodically shunted into conduits leading ultimately to the East Gate OWS (SWMU 55, discussed in Section 1.3.3 below). During heavy rainfall events, influx that exceeds the diversion conduit capacity at each interceptor will, by design, overflow into nearby surface waters. The intent of that configuration is based on the rationale that under normal slow-flow conditions, drainage runoff processed through the OWS is likely to contain a much higher concentration of hydrocarbon constituents per unit volume than runoff collected during heavy rainfall events. Thus, the heavy rain overflow effluent would impart a minimal contaminant impact upon surface waters. The system is arranged so that all flow from Interceptors 001, 003, 005, and 006 is, under normal conditions, directed to Interceptor 004 before being channeled into the OWS. Each unit is numbered according to the corresponding storm water outfall in which the interceptor is located. Outfall 002 does not contain an interceptor unit. The storm water interceptors are identified on Figure 1 3. The location and general description of the five interceptor units is as follows:

- Interceptor 001 is located along Lake Worth, at the north end of the installation, approximately 90 feet east of Building 3356. The unit consists of a 7- by 10.5-foot enclosed concrete vault constructed within a cross-sectional cutout of an existing 4- by 6-foot concrete box culvert that carries storm water from the northeast flightline area to an outlet at Lake Worth. The vault is 8.5 feet deep. Although this unit is located a far distance from the other interceptors, it apparently ties to the interconnected storm water network through a series of lines that carry flow east from the unit, then south into the outfall basin at Interceptor 003.

- Interceptor 003 is located approximately 375 feet north of the intersection of Military Parkway and Doolittle Drive. The unit is a 10 feet by 30 feet concrete vault located within the center of a 75-foot long open outfall basin that cascades down a hill east of new Building 1803. Storm water flow into this basin comes primarily from the administrative and training areas between Military Parkway and Burke Avenue. A 12-inch pipe carries effluent by gravity from the south end of the vault unit to Interceptor 004.

- Interceptor 004, the primary interceptor, is located southeast of the intersection of Military Parkway and Davison Drive, near the East Gate. This unit is shown in detail on Figure 3.3. The unit consists of a 20- by 45-foot diversion vault within the center of a 45- by 70-foot open outfall basin. Storm water effluent into this unit is carried through twin 54-inch culverts from the Post Office, police, and base service station areas into the northwest end of the basin, and through twin 30-inch lines from the Post Exchange and Davison Drive areas into the southwest corner of the basin. The 12-inch pipe from Interceptor 003 enters the vault from the north end, and a 12-inch pipe from Interceptors 005 and 006 connects to the south end of the vault. Stormwater collected in Interceptor 004 is conveyed to the wet well and pumped from this unit through a 10-inch force main from the vault to the nearby OWS (SWMU 55).

- Interceptor 005 is located approximately 75 feet north of Building 1330. The unit consists of a 32- by 12-foot open concrete vault with a metal grate cover. Storm water effluent into this unit comes from a culvert on Depot Avenue that collects inflow primarily from the "warehouse" areas. Effluent from Interceptor 006 is pumped into this unit from a 10-inch pipe that connects to the southwest corner of the interceptor. A 12-inch storm sewer outlet to Interceptor 004 is located on the north side of the unit. The vault is 8 feet deep at the ends, with the floor sloping to 10 feet at the center of the unit.

- Interceptor 006 is located south of Nimitz Drive, near the intersection with Pumphrey Drive, 330 feet southwest of Building 1302. The unit consists of a 32- by 10-foot open concrete vault with a metal grate cover. The vault is 16 feet deep on the ends, with the floor sloping to 19 feet at the center of the unit. A pumping station, control panel, and wet well are located along the west side of the vault. Storm water effluent into this unit comes from much of the south flightline and southeast taxiway areas, and the south industrial areas. The intercepted flow from the unit is pumped through a 10-inch pipe to Interceptor 005.

The interceptor system was designed in 1976 (U.S. Army Corps of Engineers [USACE]) and was apparently constructed and activated within a year of that date. An aerial photograph from July 11, 1977 clearly shows the existence of the OWS unit comprising SWMU 55 (Metropolitan Aerial Surveys). The individual interceptors were fabricated within pre-existing storm water outfall spillways varying in age; the spillway containing Interceptor 003 is shown on a December 3,1958 aerial photograph (National Archives).

When operating normally, the SWMU 54 units received storm water discharge from all areas of the installation, including runoff from the flightline and hangar areas, and the POL tank farm. Storm water runoff from these areas may include traces of fuels, oils, pesticides, soaps, and solvents used on base (A.T. Kearney, 1989).

Because normal flow through the interceptor units is relatively low for long periods of time, the wet pumps have developed service problems in recent years, and the system is currently not operating as designed. Gravity flow continues to carry storm water from Interceptors 001, 003 and 005 into the basin at Interceptor 004, but effluent is not pumped to the OWS (SWMU 55) at present. Thus all wastewater entering Interceptor 004 currently flows down the overflow spillway into a conduit to the West Fork Trinity River.

1.3.3 Description of SWMU 55

SWMU 55, the East Gate OWS, located approximately 300 feet west of the West Fork Trinity River. The unit consists of two adjoining 64- by 16-foot concrete-lined basins, each with a 3- by 16-foot oil containment compartment at the east end and a saw-tooth weir at the west end of the structure. A ramp is located at the side of each basin for periodic removal of sediment. Wastewater is pumped into the system through the 10-inch pipe that directs storm water from the basin at Interceptor 004 (described in Section 1.3 2), then is split at a tee into two valved 8-inch lines to divide the flow evenly before spilling into each of the OWS basins. The valved lines allow one cell to operate independently while the other cell can remain inactive. Following separation and removal of the oil phase, wastewater from each basin flows into a common separator drain that is evacuated through a 12-inch pipe terminating at a discharge point downstream from the Interceptor 004 overflow flume. That flow is then discharged into the West Fork Trinity River (USACE, 1976).

The exact date of construction is unknown, but the system was designed in the mid 1970s and is clearly visible in aerial photographs taken in 1977. The facility is technically able to operate, but is apparently not functioning at present since the required pumping device at Interceptor 004 is currently out of service. When in operation, the facility receives wastewater from various points within the installation, including water that may be contaminated with aviation fuels, engine oil, PD-680, antifreeze, and hydraulic fluids as discussed earlier in Section 1.2.3 2, Waste Disposal Operations.

The area immediately surrounding the OWS facility is covered with a paved asphalt pad that is connected to Military Parkway by a short service drive. The footprint of the entire OWS unit occupies an area approximately 79- by 53 feet, and the asphalt area extends about 10 feet outside the unit on each of the four sides. The outer edge of the asphalt lot is surrounded by a chain-link fence that contains a secure gate at the driveway entrance from Military Parkway. Currently, the vicinity of SWMU 55 outside the fence is covered by a grass lawn and by the right-of-ways of adjacent Davison Drive and Military Parkway. Current photographs of SWMU 55 are presented in Figure 1.5.

1.4 REGULATORY BACKGROUND INFORMATION

This RFI is being conducted at the NAS Fort Worth JRB to satisfy RCRA requirements for federal facilities and also to comply with Provision VIII of Permit HW-50289 (Appendix A). This permit was issued by the TNRCC on February 7, 1991. SWMUs 45, 54, and 55 were listed in the permit modification letter of March 2, 1995 for inclusion into the permit requirement for Corrective Action.

1.5 DESCRIPTION OF CURRENT STUDY

A limited RFI will be conducted at SWMUs 45, 54, and 55 at NAS Fort Worth JRB in an effort to characterize and identify the possible presence of hazardous constituents related to past and present site operations. This RFI is considered to be limited in scope due to the low probability that contamination resulting from SWMUs 45, 54, and 55 has occurred. Requirements for closure under RRS 3, that is a BLRA and CMS, are not included within this WP. The results of this limited RFI may support a determination for no further action (NFA), or provide the required information to support the selection of appropriate corrective measures under the TNRCC RRS Program. The results of previous investigations, and the results of the investigation outlined in this WP will be used to determine which RRS is appropriate for closure at each of the subject SWMUs. If the RRS 2 medium-specific concentrations (MSCs) are exceeded during this investigation, then (1) interim corrective measures to achieve RRS 2 levels may be performed, or (2) closure under RRS 3, including initiation of a Baseline Risk Assessment (BLRA), Corrective Measures Study (CMS), and corrective actions, will be performed as necessary.

Although new regulations for conducting environmental investigations including RFIs have been promulgated in Texas, this investigation will be conducted under the RRS Program. AFCEE has requested that all RFIs be conducted under the RRS Program as the RFI process at this installation is already underway under the RRS Program. The TNRCC has agreed to this approach and indicated to AFCEE that a formal Notice of Intent to stay under the RRS Program was not necessary.

An initial assessment will be conducted at each SWMU, focusing on characterizing any potential contaminant sources and providing a preliminary evaluation of the nature and extent of any contamination detected. For the purpose of determining if site closure can occur under RRS 1, investigative sample results for inorganic compounds will be compared to established basewide background values, and investigative sample results for organic compounds will be compared to analytical method quantitation limits (MQLs). The results of the investigations proposed in the WP may not provide a complete delineation of the nature and extent of the contamination present at each of the subject sites. If further delineation of contamination is required at any of the SWMUs in this study, additional monitoring wells and/or soil borings will be installed to complete characterization of the contaminants. When delineation of the contamination is complete at each of the sites, the data will be compiled and presented in an RFI Report with a discussion of the RRS standard that is appropriate for closure at each SWMU.

1.6 PROJECT OBJECTIVES

The overall objective of this project is to confirm the presence or absence of contamination at the subject SWMUs under the TNRCC RRS program. In addition, the SWMUs at NAS Fort Worth JRB are subject to the specific requirements of the TNRCC HW Permit number HW-50289 and subsequent permit modification documents. Specific permit requirements are discussed in greater detail in Section 3.2 of the WP.

In order to characterize site conditions at the subject SWMUs, each location of concern will be evaluated during this investigation in order to determine if hazardous constituents have been released into the environment. The primary objectives for this project are as follows:

- Determine if SWMU 45 exists
- Determine if a release from any of the three SWMUs has occurred.
- If contamination is detected, characterize the nature and extent of the contamination.
- Determine the appropriate RRS to be used for closure of each site.

These primary objectives are discussed in greater detail in Section 3.4 of the WP.

FIGURES

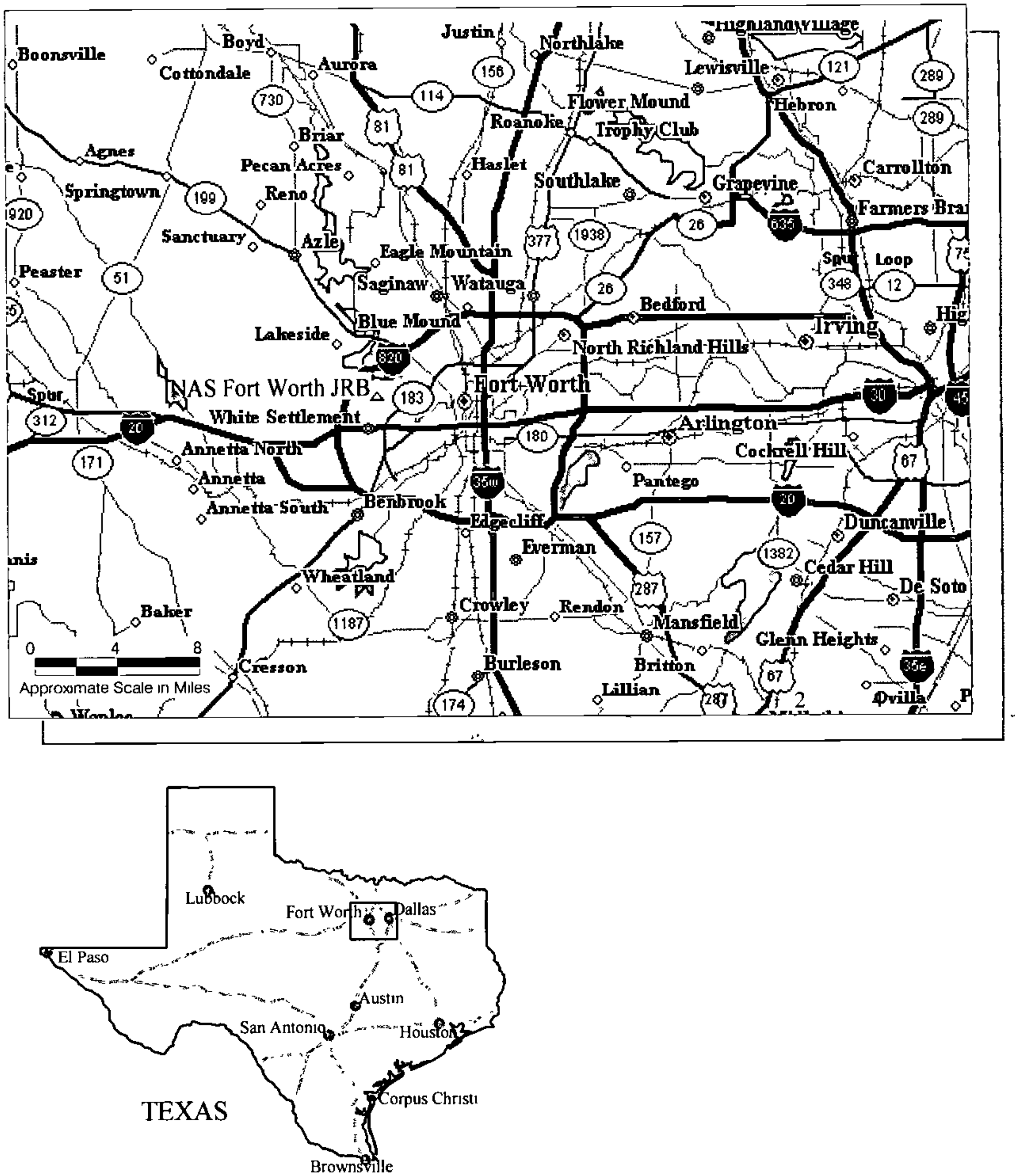

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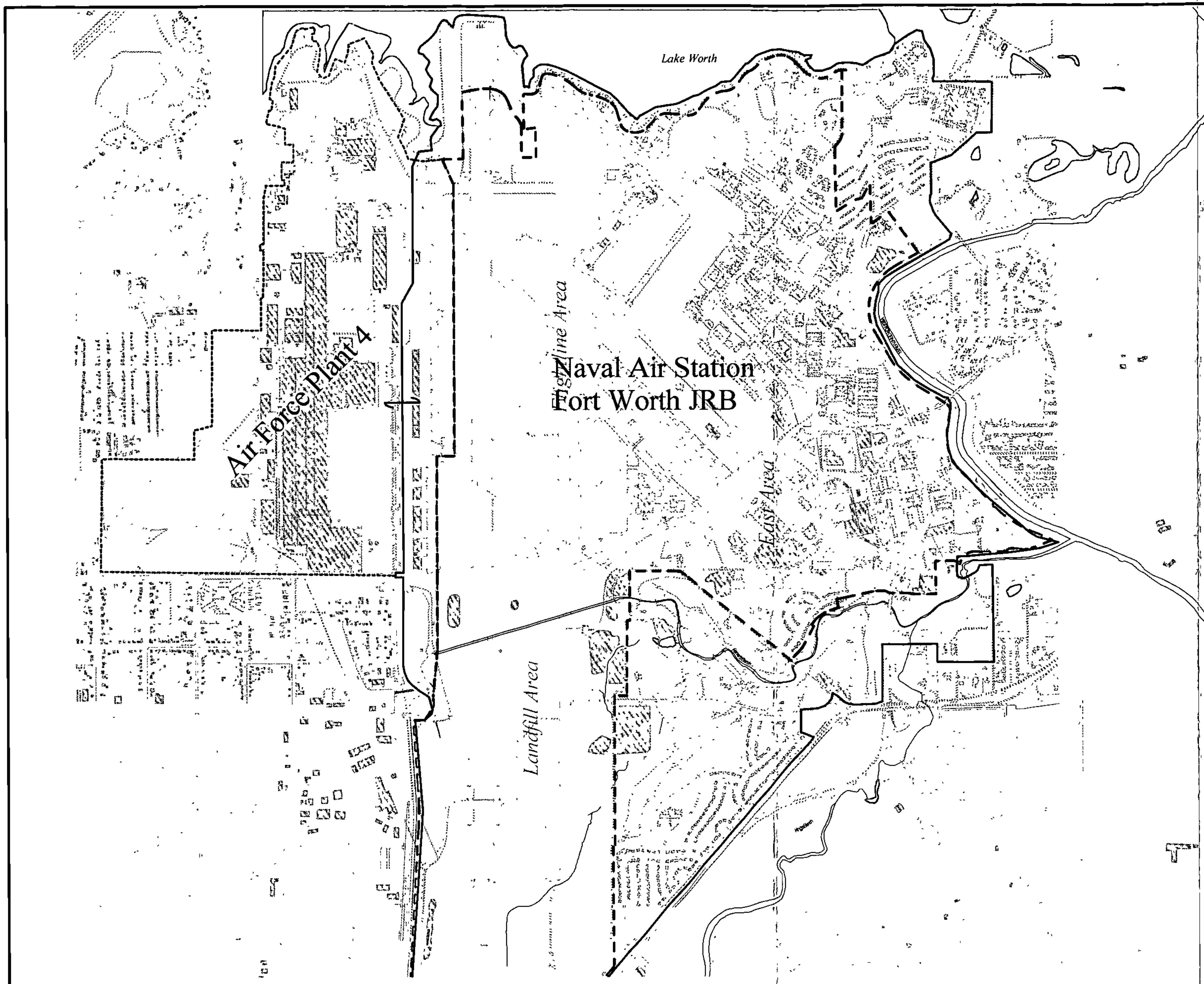
Figure 1.1

Site Location Map
NAS Fort Worth JRB, Texas



HydroGeoLogic, Inc
Limited RFI Work Plan, SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

Figure 1.2

Base Boundaries
NAS Fort Worth JRB, Texas

U.S. Air Force Center For
Environmental Excellence

Legend

Boundary of NAS Fort Worth JRB

Former Property Boundary of Carswell Air Force Base

Property Boundary of Air Force Plant 4

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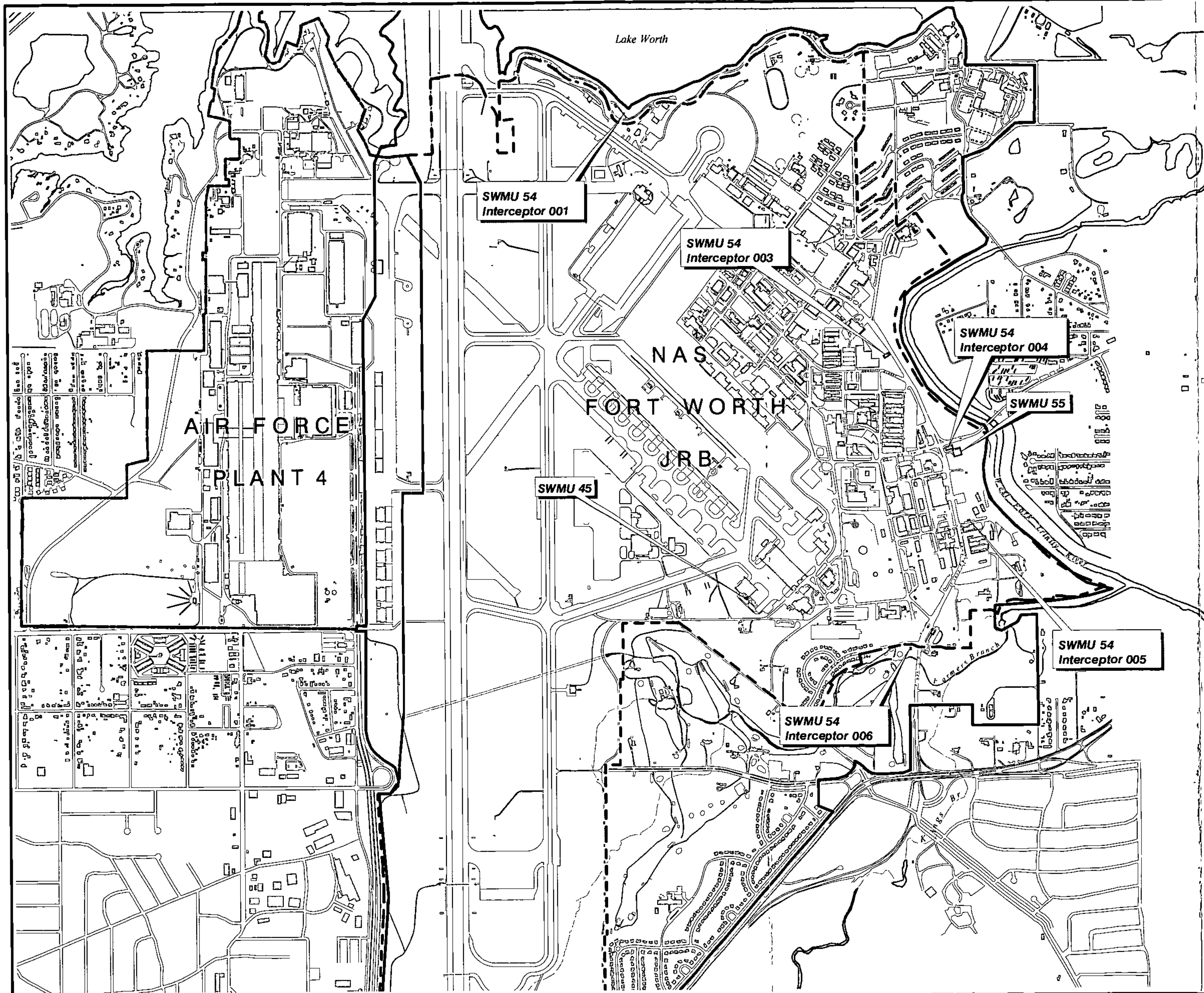
Project AFC001-33BAA
Created 04/23/98 nzehms
Revised 06/06/00 jb
Map Source HydroGeoLogic Inc Arcview Database
Base Boundary from Air Force Base Conversion
Agency Fort Worth, Texas, 1998

HYDRO GeoLogic INC



HydroGeoLogic, Inc
Limited RFI Work Plan, SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

Figure 1.3

SWMU Location Map
NAS Fort Worth JRB, Texas

U.S. Air Force Center for Environmental Excellence

Legend

- NAS Fort Worth JRB (Carswell Field)
- Former Carswell Air Force Base Boundary
- Air Force Plant 4 Bounday
- Solid Waste Management Unit (SWMU)

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Project AFC001-33BAB
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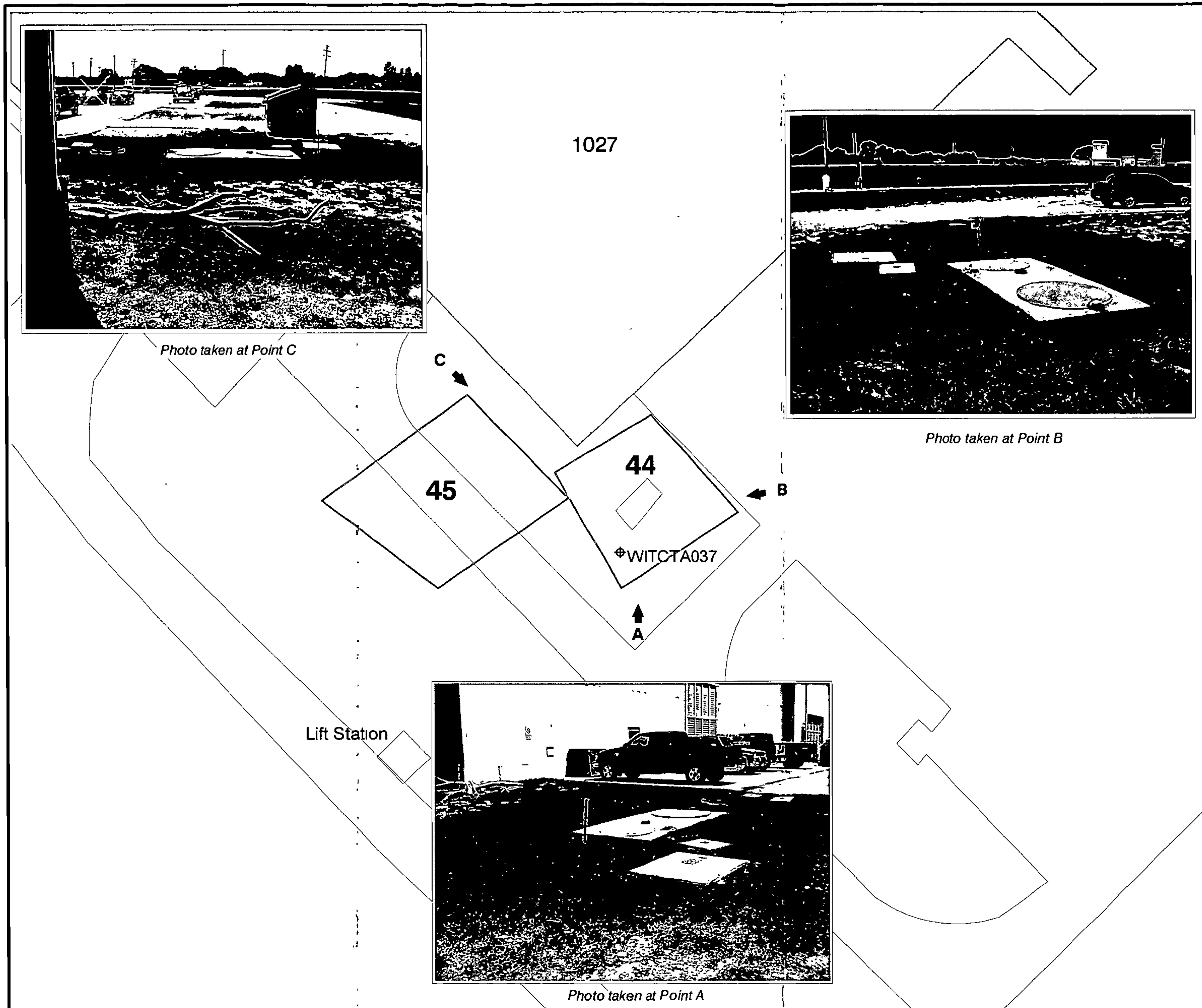
Revised
Source HydroGeoLogic, Inc GIS Database, 2000
USAF Storm Drainage System, May 1986
USACE Site Plan & Vicinity Map, November 1976

HYDRO GeoLogic INC

HydroGeoLogic, Inc
Limited RFI Work Plan, SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

Figure 1.4
Photograph and Location Map
SWMU 45
Building 1027
Waste Oil Tank Vault

U.S. Air Force Center for Environmental Excellence



Legend

- Monitoring Well
- Solid Waste Management Unit (SWMU)
- Building

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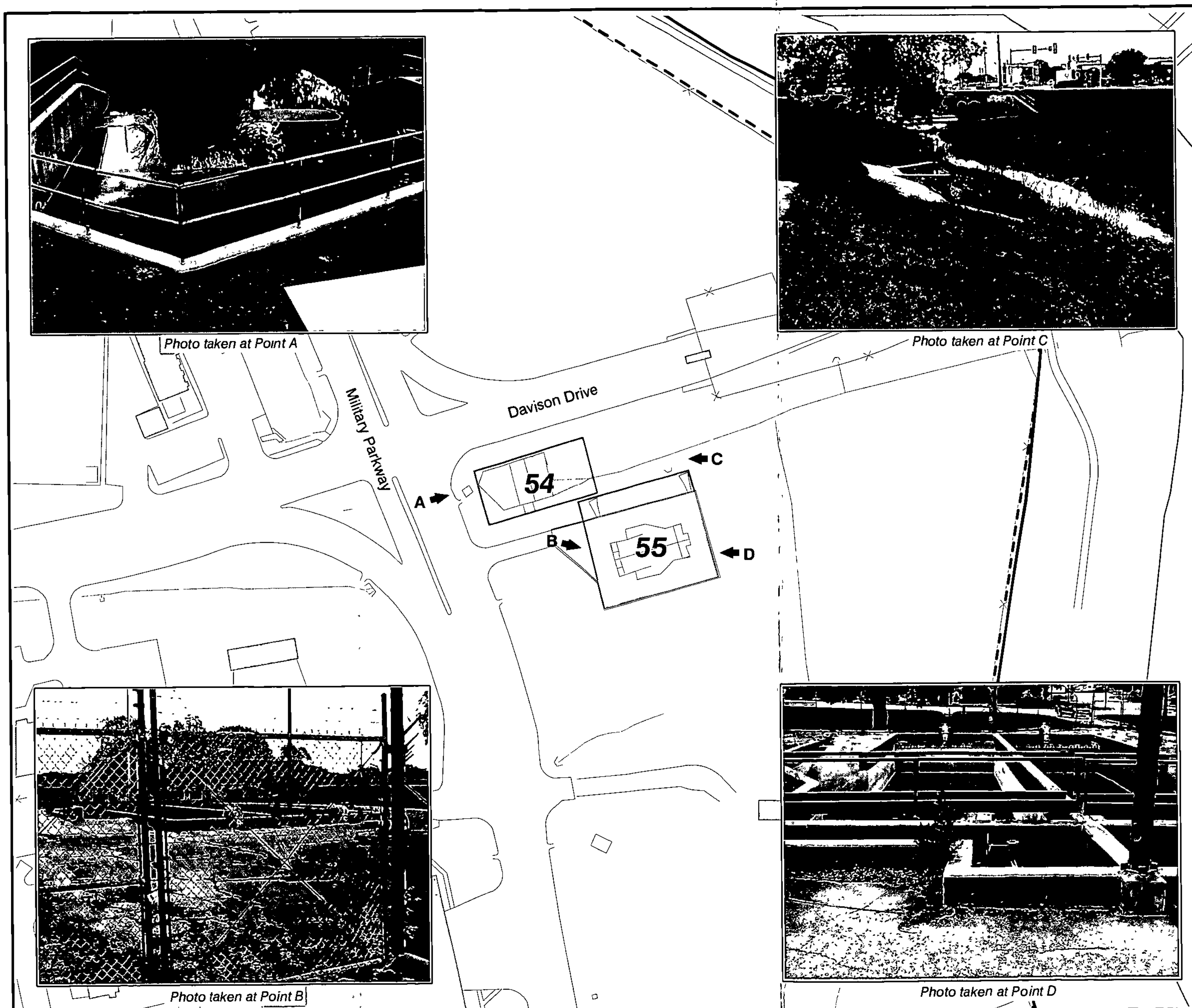
GIS Database 2000

HYDROGEOLOGIC INC.



HydroGeoLogic, Inc
Limited RFI Work Plan, SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

Figure 1.5
Photograph and Location Map
SWMUs 54 and 55
Storm Water Interceptor 004 and
East Gate Oil/Water Separator

U.S. Air Force Center for Environmental Excellence

Legend

- NAS Fort Worth JRB (Carswell Field)
- Former Carswell Air Force Base
- Solid Waste Management Unit (SWMU)
- Building

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Source HydroGeoLogic, Inc
GIS Database 2000

HYDRO GeoLogic INC

TABLES

Table 1.1
SWMU Summary Information
NAS Fort Worth JRB, Texas

SWMU	Description	Waste Managed	Operational Period	Status
45	Building 1027 Waste Oil Tank Vault	Waste oils, recovered fuels, spent solvents and cleaners	1987 to present	Inactive site - condition of vault and tank unverified
54	Storm Water Interceptors	Storm water from large portions of installation, including traces of waste fuels, solvents, and flightline runoff	Late 1970s - present	Intact, but currently inactive
55	East Gate Oil/Water Separator	Base wide storm water, including traces of waste fuels, solvents, and flightline runoff	Late 1970s - present	Intact, but currently inactive

*Note The actual waste handled at these sites is unknown The wastes reported are based on the general disposal practices of the former Carswell AFB during the time the site was in operation.

Sources A T Kearney 1989

TAB

Section 2

2.0 ENVIRONMENTAL SETTING

The climate, physiography, geology, hydrology, biology, and demographics of the NAS Fort Worth JRB area are described in the following sections. This data has been primarily derived from the Summary of Remediation Projects at AFP 4 Carswell AFB (Environmental Science and Engineering, Inc. [ESE], 1994) and the Remedial Investigation/Feasibility Study (RI/FS) reports (Radian, 1989a, 1991).

2.1 INSTALLATION ENVIRONMENTAL SETTING

2.1.1 Physiographic Province

NAS Fort Worth JRB is located along the border zone between two physiographic provinces. The southeastern part of the base is situated within the Grand Prairie section of the Central Lowlands Physiographic Province. Most of NAS Fort Worth JRB is located within this province. This region is characterized by broad, eastward-sloping terrace surfaces that are interrupted by westward-facing escarpments. The land surface is typically grass covered and treeless except for isolated stands of upland timber. The northwestern part of the NAS Fort Worth JRB area is situated within the Western Cross Timbers Physiographic Province. This area is characterized by rolling topography and a heavy growth of post and blackjack oaks (Radian, 1989) Surface elevations for this region range from about 850 feet above National Geodetic Vertical Datum (NGVD) west of the base to approximately 550 feet above NGVD along the eastern side of the base. Figure 2.1 is a section of the Lake Worth, Texas, U.S. Geological Survey topographic map showing the relief of the NAS Fort Worth JRB/AFP 4 region.

2.1.2 Regional Geology

The geologic units of interest for the region, from youngest to oldest, are as follows: (1) the Quaternary Alluvium (including fill material and terrace deposits), (2) the Cretaceous Goodland Limestone, (3) the Cretaceous Walnut Formation, (4) the Cretaceous Paluxy Formation, (5) the Cretaceous Glen Rose Formation, and (6) the Cretaceous Twin Mountains Formation. A generalized cross section of the geology beneath NAS Fort Worth JRB is presented in Figure 2.2 (Radian, 1989). The areal limits of surface exposure of these units at NAS Fort Worth JRB are shown in Figure 2.3. Cross section locations and individual cross sections at NAS Fort Worth JRB are presented in Figures 2.4 through 2.7 (CH2M HILL, 1996b). The regional dip of the stratigraphic units beneath NAS Fort Worth JRB is between 35 and 40 feet per mile in an easterly to southeasterly direction. NAS Fort Worth JRB is located on the relatively stable Texas Craton, west of the faults that lie along the Ouachita Structural Belt. No major faults or fracture zones have been mapped near the base.

2.1.3 Groundwater

The water-bearing geologic formations located in the NAS Fort Worth JRB area may be divided into the following five hydrogeologic units, listed from the shallowest to the deepest: (1) an upper perched-water zone occurring in the alluvial terrace deposits associated with the Trinity River, (2) an aquitard of predominantly dry limestone of the Goodland and Walnut Formations, (3) an aquifer in the Paluxy Sand, (4) an aquitard of relatively impermeable limestone in the Glen Rose Formation, and (5) a major aquifer in the sandstone of the Twin Mountains Formation. Each of these units is examined more explicitly in the following paragraphs. The relationship between these hydrogeologic units and geologic units is illustrated in Figure 2.8 (Radian, 1989a).

2.1.3.1 Alluvial Terrace Deposits

The uppermost groundwater in the area occurs within the pore space of the grains of coarse sand and gravels deposited by the Trinity River. In some parts of Tarrant County, primarily in those areas adjacent to the Trinity River, groundwater from the terrace deposits is used for irrigation and residential use. Groundwater from the terrace deposits is rarely used as a source of potable water due to its limited distribution and susceptibility to surface/storm water pollution (CH2M HILL, 1984).

Recharge to the water-bearing deposits occurs through infiltration from precipitation and from surface water bodies. Extensive on-site pavement and construction restricts this recharge. Additional recharge, however, comes from leakage in water supply lines, sewer systems, storm drains, and cooling water systems. In 1991, this leakage was calculated to be in excess of approximately 115.5 million gallons for NAS Fort Worth JRB and AFP 4 (General Dynamics Facility Management, 1992). This inflow of water to the shallow aquifer effects local groundwater flow patterns and contamination transport, along with increasing hydraulic head, which acts as the force to potentially drive water into lower aquifer systems. The estimated hydraulic conductivity of the alluvial aquifer is 4.57 gallons per day per square foot (gpd/ft^2) (Radian, 1989).

This flow between aquifers is restricted by the Goodland/Walnut Formations; therefore, the alluvial terrace groundwater is not hydraulically connected to the underlying aquifers at NAS Fort Worth JRB. The primary water flow in the terrace deposits is generally eastward toward the West Fork Trinity River, although localized variations exist across the entire site. The hydraulic gradient across the base is variable, reflecting variations in the flow direction and localized recharge. Discharge from the aquifer occurs into surface water on-site, specifically Farmers Branch Creek.

Potentiometric maps of NAS Fort Worth JRB and AFP 4 alluvial terrace groundwater are presented as Figure 2.9 and Figure 2.10. Both the January 1999 and July 1999 groundwater elevation data show an easterly trend in groundwater flow over the area of NAS Fort Worth JRB toward the West Fork Trinity River (HydroGeoLogic, 1999a,c).

2.1.3.2 Goodland/Walnut Aquitard

The groundwater within the terrace deposits is isolated from groundwater within the lower aquifers by the low permeability of the Goodland Limestone and Walnut Formations. The primary inhibitors to vertical groundwater movement within these units are the fine-grained clay and shale layers that are interbedded with layers of limestone. Some groundwater movement does occur between the individual bedding planes of both of these units, but the vertical hydraulic conductivity has been calculated to range between 1.2E-09 centimeters per second (cm/sec) to 7.3E-11 cm/sec for the NAS Fort Worth JRB and AFP 4 area. This corresponds to a vertical flow rate that ranges between 1.16E-03 feet per day (ft/d) to 5.22E-03 ft/d (ESE, 1994).

At the AFP 4 "window area," the Goodland/Walnut aquitard is breached, and the alluvial terrace groundwater is in direct contact with the groundwater in the Paluxy aquifer. Several wells and borings have been advanced at NAS Fort Worth JRB to the Goodland/Walnut aquitard. There is no evidence that a similar window exists on the base property. All five monitoring wells that fully penetrate the Paluxy aquifer on NAS Fort Worth JRB property are represented in cross sections (Figures 2.5 through 2.7). These wells are USGS01P, USGS05P, USGS06P, USGS07P, and Paluxy 1 (P1).

2.1.3.3 Paluxy Aquifer

The Paluxy aquifer is an important source of potable groundwater for the Fort Worth area. Many of the surrounding communities, particularly White Settlement, obtain their municipal water supplies from the Paluxy aquifer Groundwater from the Paluxy is also used in some of the surrounding farms and ranches for agricultural purposes. Due to the extensive use of the Paluxy aquifer, water levels have declined significantly over the years. Water levels in the NAS Fort Worth JRB vicinity have not decreased as much as in the Fort Worth area due to its proximity to the Lake Worth recharge area and the fact that the base does not obtain water from the Paluxy aquifer. Drinking water at the base is supplied by the city of Fort Worth, which uses Lake Worth as its water source. The groundwater of the Paluxy aquifer is contained within the openings created by gaps between bedding planes, cracks, and fissures in the sandstones of the Paluxy Formation. Just as the Paluxy Formation is divided into upper and lower sand members, the aquifer is likewise divided into upper and lower aquifers. The upper sand is finer grained and contains a higher percentage of shale than the lower sand. In 1989, Radian estimated the hydraulic conductivity and transmissivity to be 130 to 140 gpd/ft2 and 1,263 to 13,808 gpd/ft^2, respectively.

2.1.3.4 Glen Rose Aquitard

Below the Paluxy aquifer are the fine-grained limestone, shale, marl, and sandstone beds of the Glen Rose Formation. The thickness of the formation ranges from 250 to 450 feet. Although the sands in the Glen Rose Formation yield small quantities of groundwater in the area, the relatively impermeable limestone acts as an aquitard, restricting water movement between the Paluxy aquifer above and the Twin Mountains aquifer below.

2.1.3.5 Twin Mountains Aquifer

The Twin Mountains Formation is the oldest and deepest water supply source used in the NAS Fort Worth JRB area. The Twin Mountains Formation occurs approximately 600 feet below NAS Fort Worth JRB, with a thickness of between 250 to 430 feet. Recharge to the Twin Mountains aquifer occurs west of NAS Fort Worth JRB, where the formation out crops. Groundwater movement is eastward in the downdip direction. The Twin Mountains groundwater occurs under unconfined conditions in the recharge area and becomes confined as it moves downdip. Transmissivities in the Twin Mountains aquifer range from 1,950 to 29,700 gpd/ft^2 and average 8,450 gpd/ft^2 in Tarrant County. Permeabilities range from 8 to 165 gpd/ft^2 and average 68 gpd/ft^2 in Tarrant County (CH2M HILL, 1984).

2.1.3.6 Water Well Survey Results

An inventory of water supply wells within a one-half-mile radius of the NAS Fort Worth JRB boundary was conducted by HydroGeoLogic in 1997. Figure 2.11 illustrates the locations of 59 wells that were identified from Texas Water Commission (TWC) records. All of these wells were installed and completed in the Paluxy aquifer or the Twin Mountains aquifer. No active water wells are located on NAS Fort Worth JRB property. Water is supplied to the base by the city of Fort Worth, which obtains water from Lake Worth.

2.1.4 Surface Water

The topography of NAS Fort Worth JRB is fairly flat except for the lower lying areas along the tributaries of the Trinity River. The land surface slopes gently northeastward toward Lake Worth and eastward toward the West Fork Trinity River. Surface elevations range from about 690 feet above NGVD at the southwest corner of the base to approximately 550 feet above NGVD, along the eastern side of the base. Figure 2.1 is a section of the Lake Worth, Texas, U.S. Geological Survey topographic map showing the relief of the NAS Fort Worth JRB area.

NAS Fort Worth JRB is located within the Trinity River Basin, adjacent to Lake Worth. The lake is a man-made reservoir created by damming the Trinity River at a point just northeast of the base. The surface area of the lake is approximately 2,500 acres. Lake Worth receives a limited amount of storm water runoff from NAS Fort Worth JRB during and immediately after rainfall events. Elevation of the water surface is fairly consistent at approximately 594 feet above NGVD, the fixed elevation of the dam spillway. Part of the eastern boundary of NAS Fort Worth JRB is defined by the West Fork Trinity River. River flow is towards the southeast into the Gulf of Mexico. Because the Trinity River has been dammed, the 100- and 500-year flood plains do not extend more than 400 feet from the center of the river or any of its tributaries.

Surface drainage is mainly east towards the West Fork Trinity River. The base is partly drained by Farmers Branch Creek, a tributary of the West Fork Trinity River. Farmers Branch Creek begins within the community of White Settlement and flows eastward. Just south of AFP 4, Farmers Branch flows under the runway within two large culverts identified as an aqueduct. Most of the base drainage is intercepted by a series of storm drains and culverts, directed to OWSs, and discharged to the West Fork Trinity River downstream of Lake Worth. A small portion of the north end of the base drains directly into Lake Worth

NAS Fort Worth JRB currently has three storm water discharge points that are subject to National Pollution Discharge Elimination System (NPDES) requirements. Each discharge point is monitored weekly for chemical oxygen demand, oil and grease, and pH. The permit has been violated on numerous occasions. In 1979, these violations prompted the EPA to formally demand a corrective action (CH2M HILL, 1984). Several additional sampling points were established to determine the flow of pollutants onto and off of the base. Samples were collected for a variety of parameters (spills, fish kills, odors, and oil sheen) as circumstances dictated (Radian, 1989a,b).

2.1.5 Air

The climate in the Fort Worth area is classified as humid subtropical with hot summers and dry winters. Tropical maritime air masses control the weather during much of the year, but the passage of polar cold fronts and continental air masses can create large variations in winter temperatures. The average annual temperature in the area is 66 degrees Fahrenheit (°F), and monthly mean temperatures vary from 45°F in January to 86°F in July. The average daily minimum temperature in January is 35°F, and the lowest recorded temperature is 2°F. The average daily maximum temperature in July and August is 95°F, and the highest temperature ever recorded at the base was 111°F. Freezing temperatures occur at NAS Fort Worth JRB an average of 33 days per year (TNRCC, 1996c).

Mean annual precipitation recorded at the base is approximately 32 inches. The wettest months are April and May, with a secondary maximum in September. The period from November to March is generally dry, with a secondary minimum in August. Snowfall accounts for a small percentage of the total precipitation between November and March. Thunderstorm activity occurs at the base an average of 45 days per year, with the majority of the activity between April and June. Hail may fall 2 to 3 days per year. The maximum precipitation ever recorded in a 24-hour period is 5.9 inches. On the average, measurable snowfall occurs 2 days per year (TNRCC, 1996c).

Lake evaporation near NAS Fort Worth JRB is estimated to be approximately 57 inches per year. Evapotranspiration over land areas may be greater or less than lake evaporation depending on vegetative cover type and moisture availability. Average net precipitation is expected to be equal to the difference between average total precipitation and average lake evaporation, or approximately minus 25 inches per year. Mean cloud cover averages 50 percent at NAS Fort Worth JRB, with clear weather occurring frequently during the year. Some fog is present an average of 83 days per year. Wind speed averages 7 knots; however, a maximum of 80 knots has been recorded. Predominant wind direction is from the south-southwest throughout the year (TNRCC, 1996c).

Air quality in the Dallas-Fort Worth area meets EPA National Ambient Air Quality Standards for carbon monoxide, nitrogen dioxide, sulfur dioxide, and respirable particulate matter. However, ozone levels exceed national standards, and the ozone pollution level in the area has a Federal classification of moderate. During 1996, ozone measurements showed an arithmetic mean concentration of 0.033 parts per million in North Tarrant County. Actual exceedances of the national standards for ozone concentrations was calculated to be 2 days for the measurement station in North Tarrant County. Additional control measures are being implemented as a result of 1990 Federal Clean Air Act mandates to bring the area into compliance with the national standard (TNRCC, 1996c).

2.1.6 Biology

Approximately 374 acres, or 14 percent, of NAS Fort Worth JRB is considered unimproved, indicating the presence of seminatural to natural biological/ecological conditions. The base lies in the Cross Timbers and Prairies Regions of Texas, where native vegetation is characterized by alternating bands of prairies and woodlands. The higher elevations on the base are covered by native and cultivated grasses such as little bluestem, Indian grass, big bluestem, side oats, grama, and buffalo grass. Forested areas occur primarily on the lower land and along the banks of streams. Common wood species include oak, elm, pecan, hackberry, and sumac. Several non-native species such as catalpa and chinaberry are common (Radian, 1989).

Typical wildlife on the base includes black-tailed jackrabbits in grassy areas along the runway. In addition, there are cotton-tail rabbits, gray squirrels, and opossums in the wooded areas. Common birds include morning doves, meadowlarks, grackles, and starlings. Hunting and trapping are not allowed on the base, but in the nearby rural areas they are a very popular form of recreation (Radian, 1989).

Reported game fish include black bass, sunfish, and catfish, all of which can be found in Lake Worth, Farmers Branch Creek, and one small pond located on base near the golf course equipment shed. According to the Texas Department of Parks and Wildlife and the U.S. Fish and Wildlife Service, there are no threatened or endangered species known to occur on NAS Fort Worth JRB. None of the federally listed endangered plant species for Texas are known to occur within 100 miles of Tarrant County. Of the federally listed endangered animals species, only the peregrine falcon and the whooping crane are known to occasionally inhabit the area; however, none of these is suspected to reside in the vicinity of NAS Fort Worth JRB (Radian, 1989).

2.1.7 Demographics

The following sections describe the regional and site-specific demographics as they relate to the Fort Worth, Texas, area and NAS Fort Worth JRB.

2.1.7.1 Regional Demographics

Approximately 1,278,606 people reside within Tarrant County, Texas (U.S. Department of Commerce, 1996). Of this population, 485,650 reside within the city limits of Fort Worth. Several smaller cities and villages make up the remainder of the population. The communities of White Settlement, Lake Worth, Westworth Village, River Oaks, and Sansom Park lie within a 3- mile radius of NAS Fort Worth JRB. The following populations that reside in the cities and villages are based on 1994 census data. White Settlement (city) 16,502; Lake Worth (city) 4,694; Westworth Village (town) 2,502; River Oaks (city) 6,747; and Sansom Park (city) 4,136 (U.S. Department of Commerce, 1994). Six schools exist within a 2-mile radius of NAS Fort Worth JRB; the closest is 0.5 miles south (RUST, 1995).

The area surrounding NAS Fort Worth JRB is highly urbanized due to its proximity to the city of Fort Worth. The area comprises a combination of residential, commercial, and light industrial properties that employ the majority of local residents (RUST, 1995).

2.1.7.2 Site-Specific Demographics

The current full-time population at NAS Fort Worth JRB is approximately 3,600 people, comprising 400 officers, 1,400 civilians, and 1,800 active reservists. Part-time military reservists will increase this population to over 6,000 military personnel (CH2M HILL, 1997).

Approximately 86 percent of NAS Fort Worth JRB has been developed by way of buildings, roads, parking lots, runways, and housing and recreational areas. On-site activities include various maintenance, inspection, and support activities for fuel systems, weapons, jet engines, AGE, and specialized ground equipment (HydroGeoLogic, 1997). The SWMU 45 site is located within a maintenance and service facility at Building 1027, but the components of SWMUs 54 and 55 are located generally away from housing and industrial area, mostly within areas surrounded by mowed lawns or drainage structures.

2.2 SITE-SPECIFIC ENVIRONMENTAL SETTING

The following sections describe the site-specific environmental setting of NAS Fort Worth JRB. Site-specific information at SWMUs 45, 54, and 55 is very limited because no previous investigations have been performed.

2.2.1 Site-Specific Soils

The U.S. Soil Conservation Service has identified four major soil associations in the area of NAS Fort Worth JRB. The first association is the surficial soils of the nearly level to gently sloping clayey soils of the Sanger-Purves-Slidell Association. Second is the Aledo-Bolar-Sanger Association, which is located within the southwestern portion of the Sanger-Purves-Slidell Association and is characterized as an increasingly loamy clayey soil of gentle to moderate slope. The third association, the Bastsil-Silawa Association separates the Sanger-Purves-Slidell Association from the Frio-Trinity Association The Bastsil-Silawa Association is characterized as a sandy clay loam of nearly level slope (ESE, 1994). The clayey soils of the Frio-Trinity Association make up the fourth soil association and are located along the flood plain of the West Fork Trinity River.

The SWMU 45 site is located wholly within the Sanger-Purves-Slidell Association. For SWMU 54, Interceptor 001 is located within the Bastsil-Silawa Association, Interceptors 003, 004, and 005 are located within the Frio-Trinity Association, and Interceptor 006 is located within the Sanger-Purves-Slidell Association. The SWMU 55 site is located within the Frio-Trinity Association. The areal limits of each of these soil associations at NAS Fort Worth JRB are shown in Figure 2.12.

2.2.2 Site-Specific Geology

The majority of NAS Fort Worth JRB is covered by alluvium deposited by the Trinity River during flood stages. The Quaternary Period alluvium (Holocene Epoch) occurs downstream from the Lake Worth Dam in the current flood plain of the West Fork Trinity River, on the east side of the facility. Older alluvial deposits and terrace deposits (Pleistocene Epoch) also occur on-site. The alluvium is composed of gravel, sand, silt, and clay of varying thicknesses and lateral extent The thickness of these materials ranges from 0 to 60 feet. Fill material is also included within these deposits where landfills, waste pits, excavation sites, and other construction activities have altered the original land surface. This fill material is made up of clay, silt, sand, and gravel mixtures, but may also contain debris and other waste (Radian, 1989).

Below the alluvial terrace deposits are the Cretaceous-age Goodland and Walnut Formations, which form the bedrock surface beneath NAS Fort Worth JRB. Both formations consist of interbedded, fossiliferous, hard limestone and calcareous shale. The upper formation, the Goodland Limestone, is exposed on the southern portion of the base, south of White Settlement Road. The Goodland is a chalky-white, fossiliferous limestone and marl. The thickness of the Goodland Limestone ranges from 20 to 25 feet. Below the Goodland Formation is the Walnut Formation (or Walnut Clay). The Walnut Formation is exposed in a small area along the shores of Lake Worth and Meandering Road Creek. This formation is a shell agglomerate limestone with varying amounts of clay and shale. It ranges in thickness from 25 to 35 feet throughout the site except where erosion has produced a few thinner areas. Subsurface investigations have located troughs and paleochannels that are eroded into the top of the bedrock at NAS Fort Worth JRB. These paleochannels are typical of an erosional surface modified by fluvial processes and are filled with sand and gravel deposits ranging in thickness from 15 to 35 feet (CH2M HILL, 1996b).

Below the Walnut Formation is the Paluxy Formation (or Paluxy Sand). The Paluxy Formation underlies all of NAS Fort Worth JRB The formation consists of several thick sandstone layers that are separated by thin, discontinuous shale and claystone layers. Sandstones in the formation are primarily a fine- to coarse-grained sand with minor amounts of clay, sandy clay, pyrite, lignite, and shale. The lower section of the Paluxy is generally coarser-grained than the upper section (CH2M HILL, 1996b). Total formation thickness ranges from 130 to 175 feet, with variable thickness and occurrence of individual layers across the site. Only one unit in this formation, a shale/silty shale, can be extensively mapped across the base.

The older Glen Rose and Twin Mountains Formations are not exposed at NAS Fort Worth JRB. The Glen Rose Formation consists primarily of calcareous sedimentary rock and some sands, clays, and anhydrite. The Glen Rose caps the Twin Mountain Formation, which is the oldest Cretaceous Formation in the NAS Fort Worth JRB area. The Twin Mountain Formation consists of a basal conglomerate of chert and quartz, grading upward into coarse- to fine-grained sand interspersed with varicolored shale.

All parcels of SWMUs 45, 54, and 55 are located on deposits of Quaternary alluvium, generally composed of stream sediments. The alluvial deposits are underlain by the Goodland and Walnut Formations, but man-made structures at these sites do not extend deep enough below the ground surface to encounter the bedrock units.

646 49

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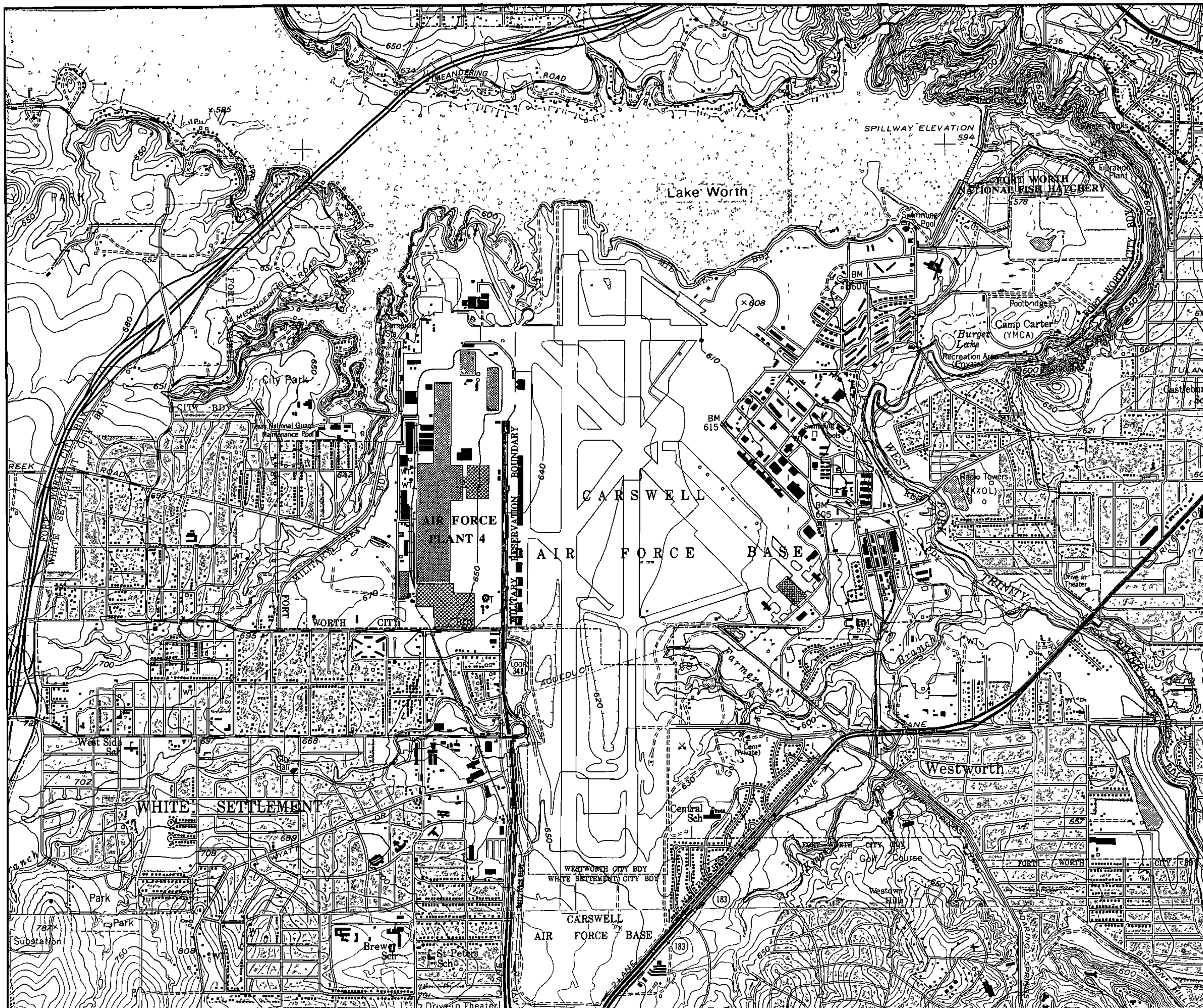
FIGURES



HydroGeoLogic, Inc
Limited RFI Work Plan SWMUs 22, 23, 24, and 25
NAS Fort Worth JRB, Texas

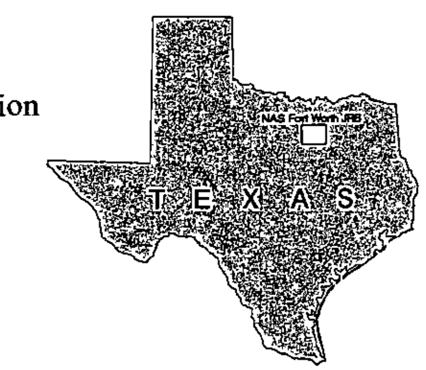
Figure 2.1

NAS Fort Worth JRB Regional Topographic Map

U.S. Air Force Center for Environmental Excellence

Legend

Site Location



N

0 5 1
SCALE IN MILES
Scale 1:24,000

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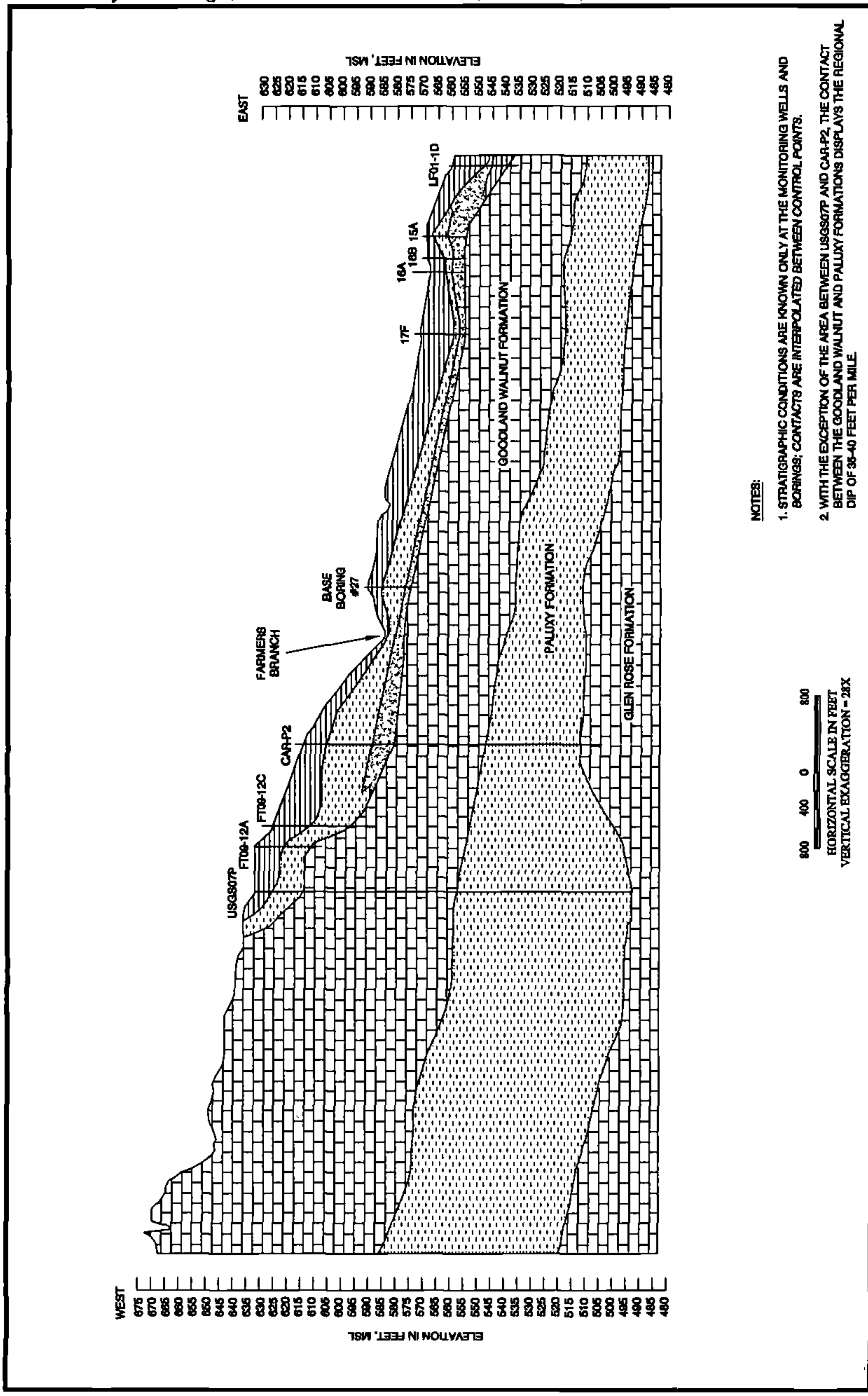
Project AFC001-19CD
Created by cfarmer 05/27/99
Revised 08/31/00 cf
Map Source USGS
Maps Lake Worth and Benbrook, TX
Dates Photorevised 1981, 1982

HYDROGEOLOGIC INC



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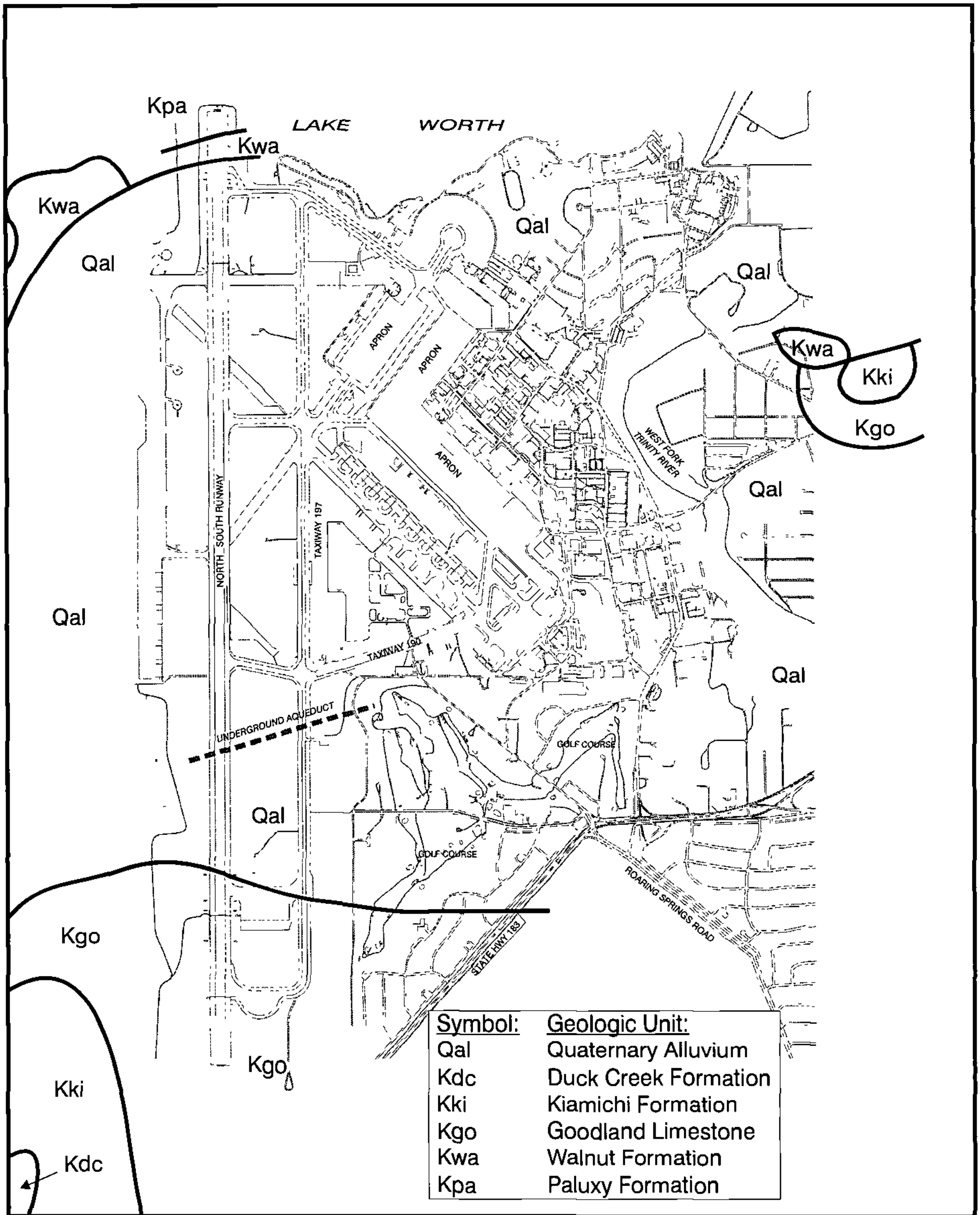
Created 06/02/99 jbelcher
Revised 06/07/00 jb
Project: AFC001-33BAA
Source: Radian, 1986; HGL, 1999

HydroGeoLogic

Figure 2.2
Generalized Geologic Cross Section of NAS Fort Worth JRB, Texas



Filename X \AFC001\33BAA\Report \Aerial_Distr cdr
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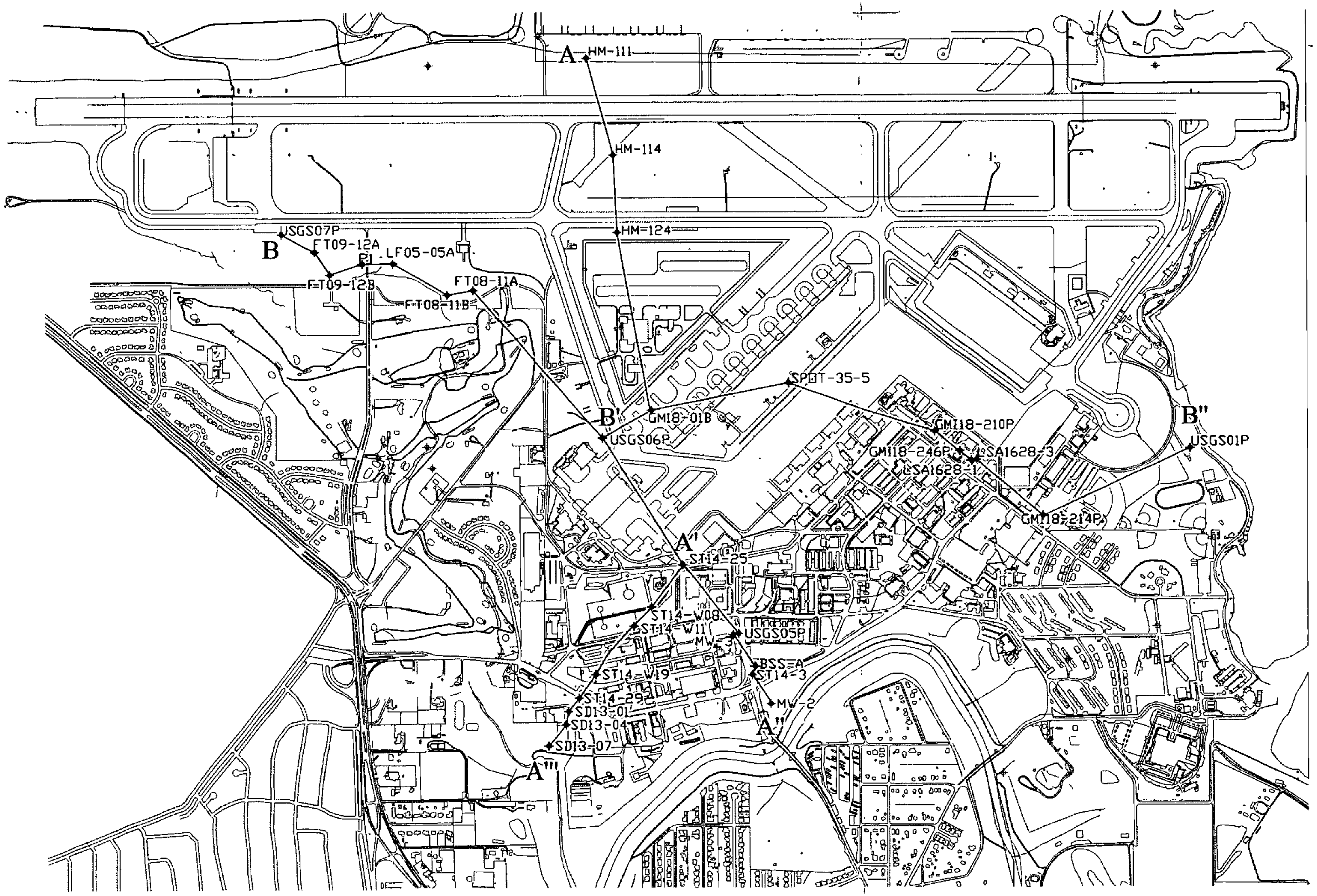
Revised 06/08/00 cf
Map Source Radian, 1989

HYDRO GeoLogic INC

Figure 2.3
Areal Distribution of Geologic Units of NAS Fort Worth JRB, Texas



HydroGeoLogic, Inc.
Limited RFI Work Plan, SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

Figure 2.4

Cross Section Location Map

U. S. Air Force Center For Environmental Excellence

Legend

USGS01P Boring Location

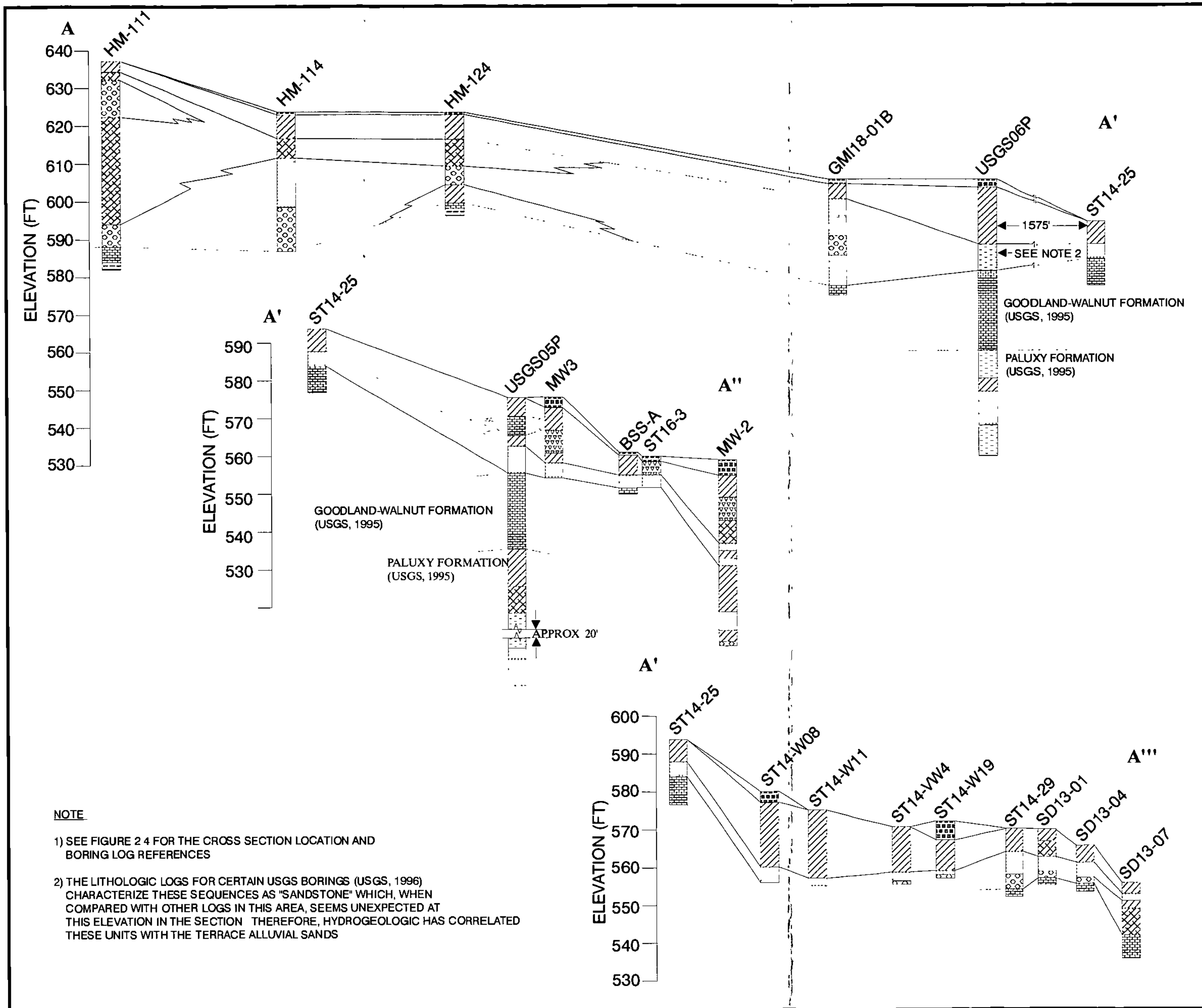
A___A' Cross Section Line

N

0 625 1250 2500
SCALE IN FEET

Filename X:\AFC001\33baa\Report\x-sect-loc dwg
Project AFC001-33BAA
Created by: jbelcher 06/09/99
Revised 06/06/00 jb
Map Source JACOBS, 1996

HYDRO GeoLogic INC



NOTE

1) SEE FIGURE 2 4 FOR THE CROSS SECTION LOCATION AND BORING LOG REFERENCES

2) THE LITHOLOGIC LOGS FOR CERTAIN USGS BORINGS (USGS, 1996) CHARACTERIZE THESE SEQUENCES AS "SANDSTONE" WHICH, WHEN COMPARED WITH OTHER LOGS IN THIS AREA, SEEMS UNEXPECTED AT THIS ELEVATION IN THE SECTION THEREFORE, HYDROGEOLOGIC HAS CORRELATED THESE UNITS WITH THE TERRACE ALLUVIAL SANDS

HydroGeoLogic, Inc —Limited RFI Work Plan, SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

Figure 2.5

Cross Sections A-A', A'-A'', and A'-A'''

U.S. Air Force Center for Environmental Excellence

Legend

- Stratigraphic Contact
- Inferred Stratigraphic Contact
- Fine- to Coarse-Grained Sand, Clayey Sand, Silty Sand, Gravelly Sand
- Clay, Silty Clay, Sandy Clay
- Silt, Clayey Silt, Sandy Silt
- Gravelly Clay or Clay w/Limestone
- Fill, Soil, Gravel, Rock
- Coarse Gravel, Silty Gravel, Sandy Gravel
- Limestone
- Claystone/Mudstone/Shale
- Sandstone

0 600 1200
HORIZONTAL SCALE IN FEET

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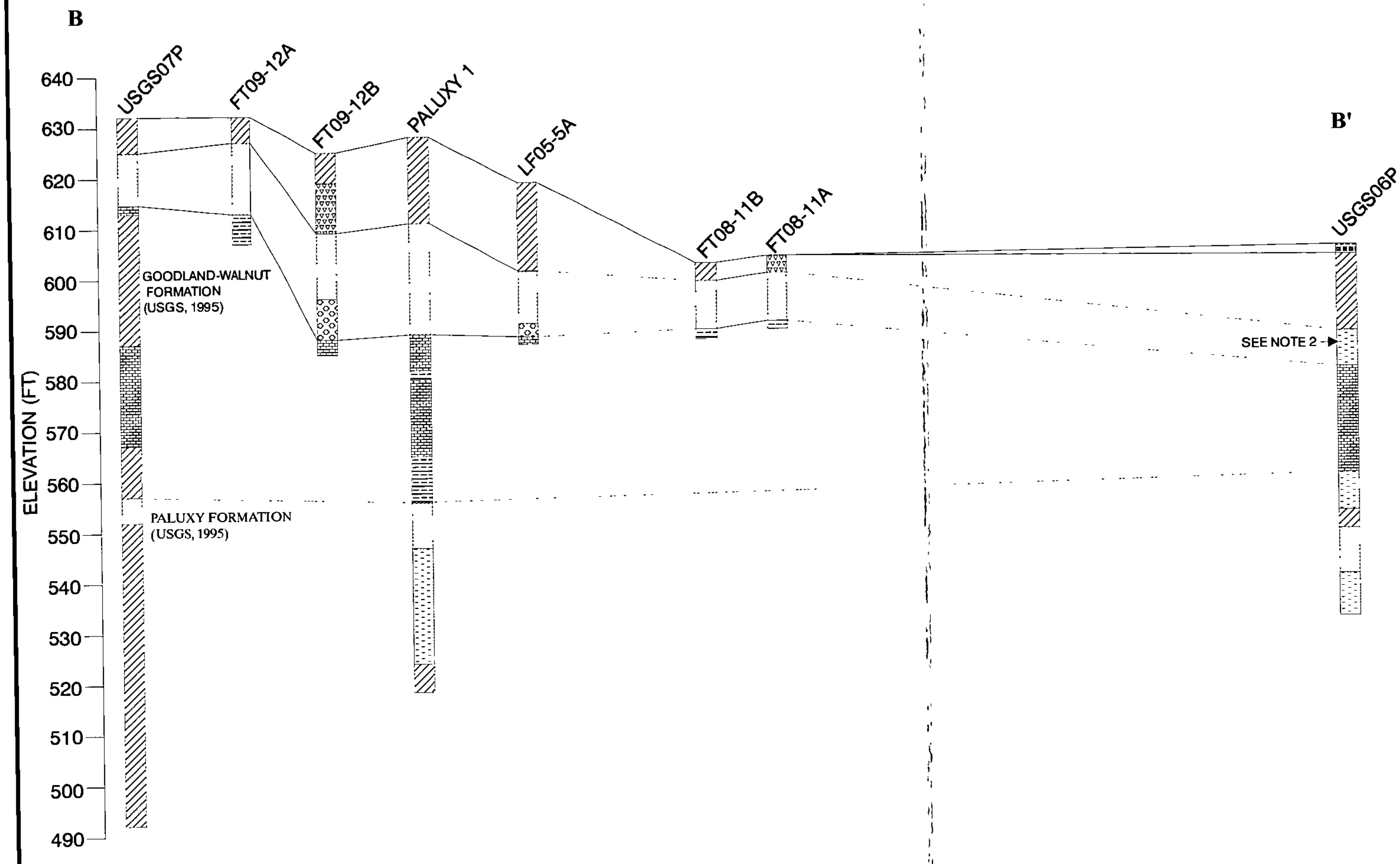
Project AFC001-33BAA
Revised 06/08/00 cf
Source CH2M HILL, 1996 b



NOTE

1) SEE FIGURE 2 4 FOR THE CROSS SECTION LOCATION AND BORING LOG REFERENCES

2) THE LITHOLOGIC LOGS FOR CERTAIN USGS BORINGS (USGS, 1996) CHARACTERIZE THESE SEQUENCES AS "SANDSTONE" WHICH, WHEN COMPARED WITH OTHER LOGS IN THIS AREA, SEEMS UNEXPECTED AT THIS ELEVATION IN THE SECTION THEREFORE, HYDROGEOLOGIC HAS CORRELATED THESE UNITS WITH THE TERRACE ALLUVIAL SANDS

HydroGeoLogic, Inc —Limited RFI Work Plan, SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

Figure 2.6

Cross Section B-B'

U.S. Air Force Center for Environmental Excellence

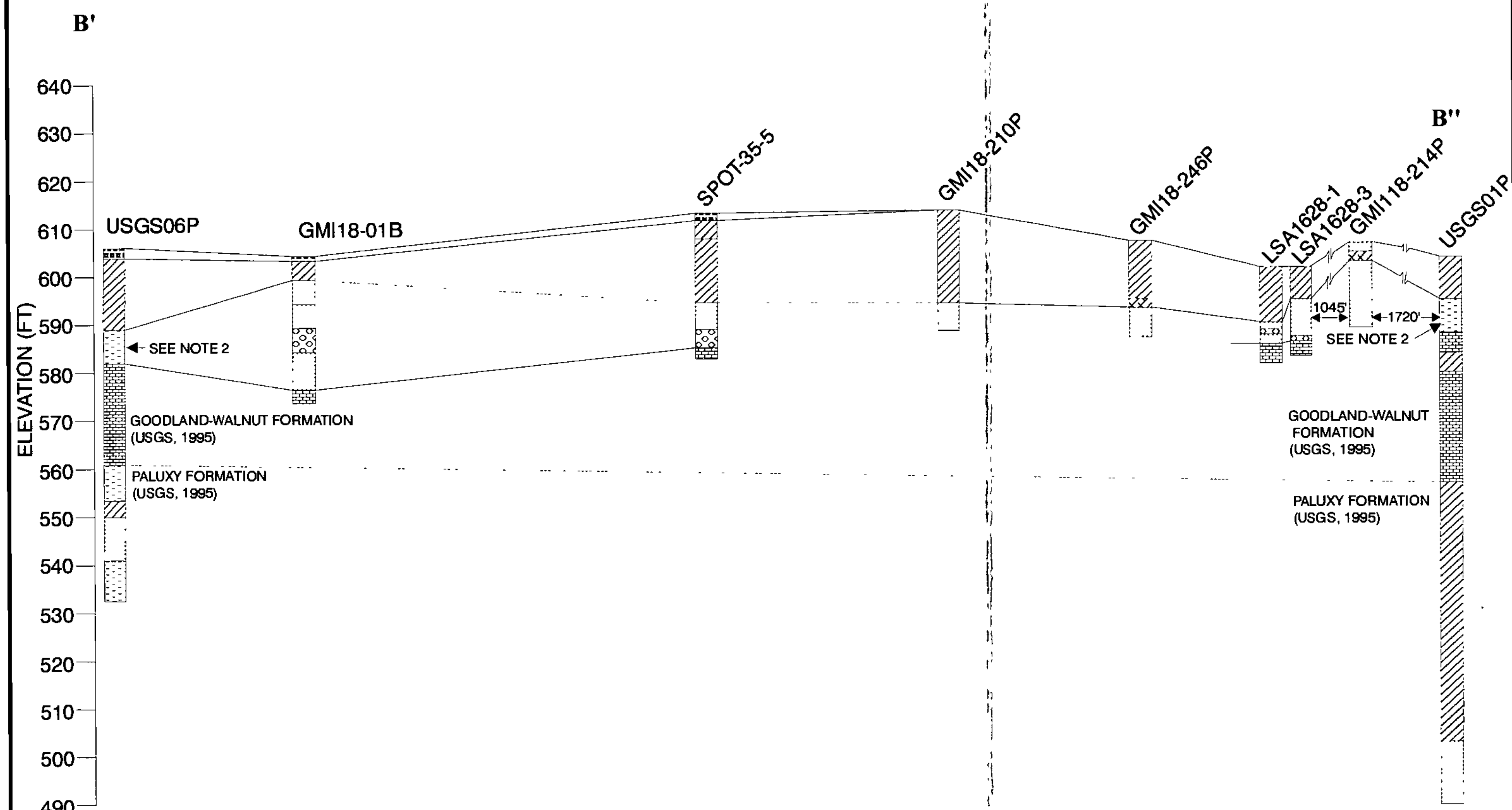
Legend

- Stratigraphic Contact
- Inferred Stratigraphic Contact
- Fine- to Coarse-Grained Sand, Clayey Sand, Silty Sand, Gravelly Sand
- Clay, Silty Clay, Sandy Clay
- Silt, Clayey Silt, Sandy Silt
- Gravelly Clay or Clay w/Limestone
- Fill, Soil, Gravel, Rock
- Coarse Gravel, Silty Gravel, Sandy Gravel
- Limestone
- Claystone/Mudstone/Shale
- Sandstone

0 600 1200
HORIZONTAL SCALE IN FEET

Filename X AFC001\33BAA\Report\B-B'_x-section cdr
Project AFC001-33BAA
Revised 06/08/00 cf
Source CH2M HILL, 1996 b

HYDRO GeoLogic INC



NOTE

1) SEE FIGURE 2 4 FOR THE CROSS SECTION LOCATION AND BORING LOG REFERENCES

2) THE LITHOLOGIC LOGS FOR CERTAIN USGS BORINGS (USGS, 1996) CHARACTERIZE THESE SEQUENCES AS "SANDSTONE" WHICH, WHEN COMPARED WITH OTHER LOGS IN THIS AREA, SEEMS UNEXPECTED AT THIS ELEVATION IN THE SECTION THEREFORE, HYDROGEOLOGIC HAS CORRELATED THESE UNITS WITH THE TERRACE ALLUVIAL SANDS

HydroGeoLogic, Inc —Limited RFI Work Plan, SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

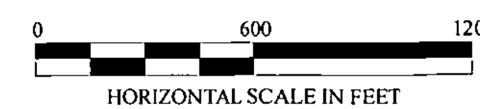
Figure 2.7

Cross Section B'-B''

U.S. Air Force Center for Environmental Excellence

Legend

- Stratigraphic Contact
- Inferred Stratigraphic Contact
- Fine- to Coarse-Grained Sand, Clayey Sand, Silty Sand, Gravelly Sand
- Clay, Silty Clay, Sandy Clay
- Silt, Clayey Silt, Sandy Silt
- Gravelly Clay or Clay w/Limestone
- Fill, Soil, Gravel, Rock
- Coarse Gravel, Silty Gravel, Sandy Gravel
- Limestone
- Claystone/Mudstone/Shale
- Sandstone



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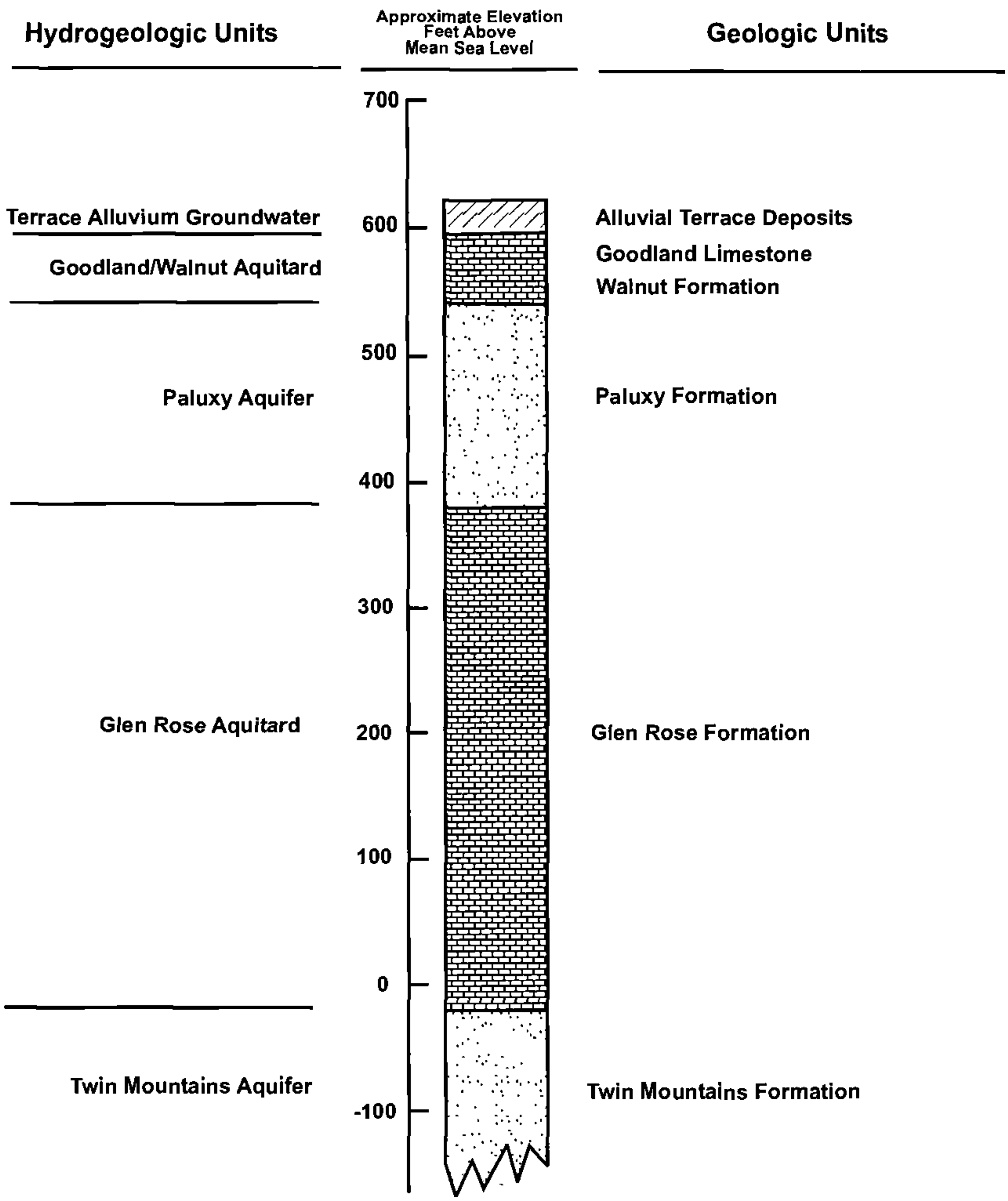
Revised 06/08/00 cf
Source CH2M HILL, 1996 b

HYDRO GeoLogic INC



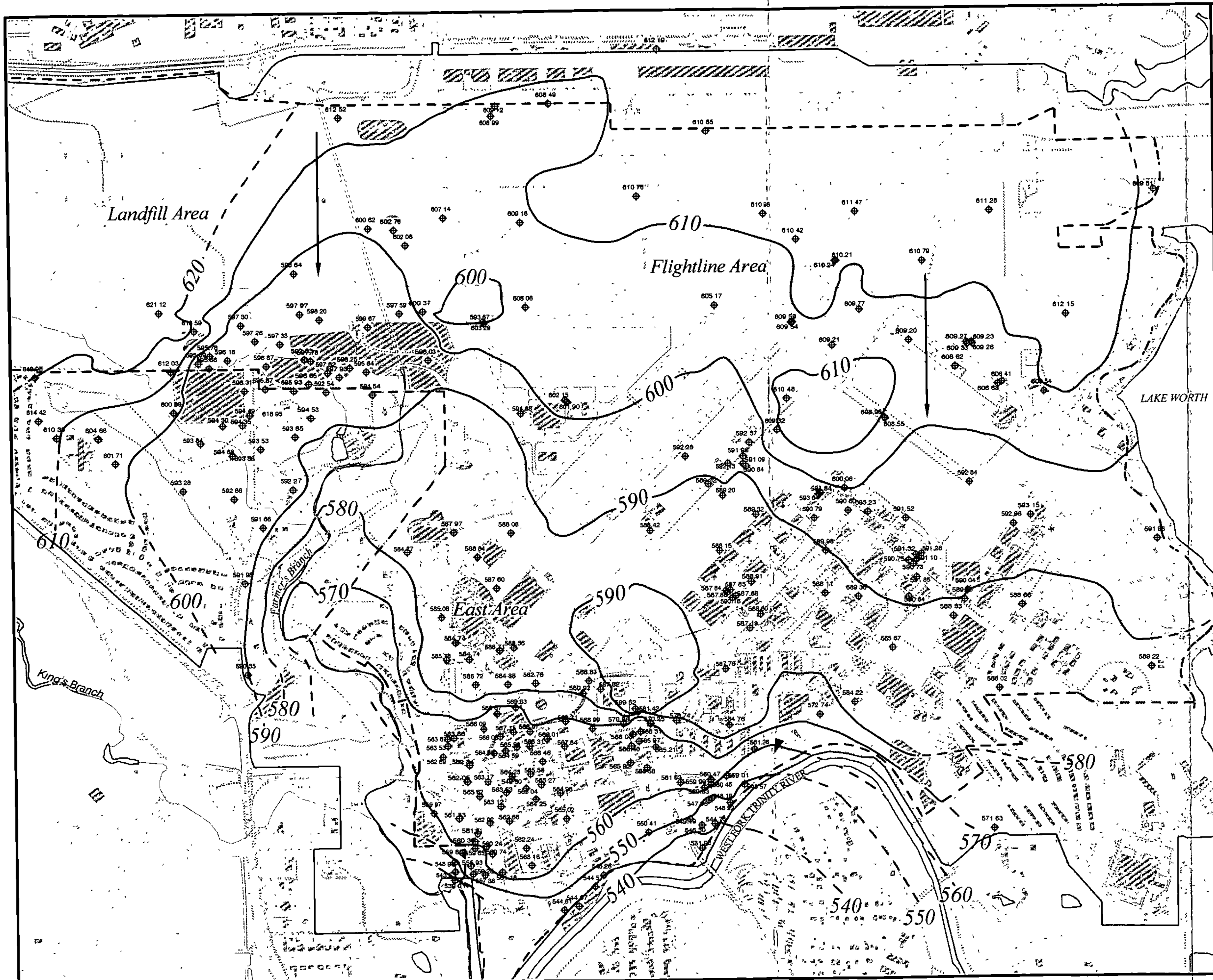
Filename X \AFC001\33BAA\Report \Strat_column cdr
Project AFC001-33BAA
Revised 06/08/00 cf
Map Source Radian, 1989

HYDROGEOLOGIC INC

Legend

- Alluvium
- Limestone
- Sandstone

Figure 2.8
Stratigraphic Column Correlating Hydrogeologic and Geologic Units



HydroGeoLogic, Inc
Limited RFI Work Plan, SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

Figure 2.9
Water Level Elevations
Terrace Alluvium
January 1999

U.S. Air Force Center For Environmental Excellence

Legend

- - - - NAS Fort Worth JRB (Carswell Field)

——— Former Carswell Air Force Base

-600- Groundwater Elevation Contour (Feet Above Mean Sea Level)

⟶ Generalized Groundwater Flow

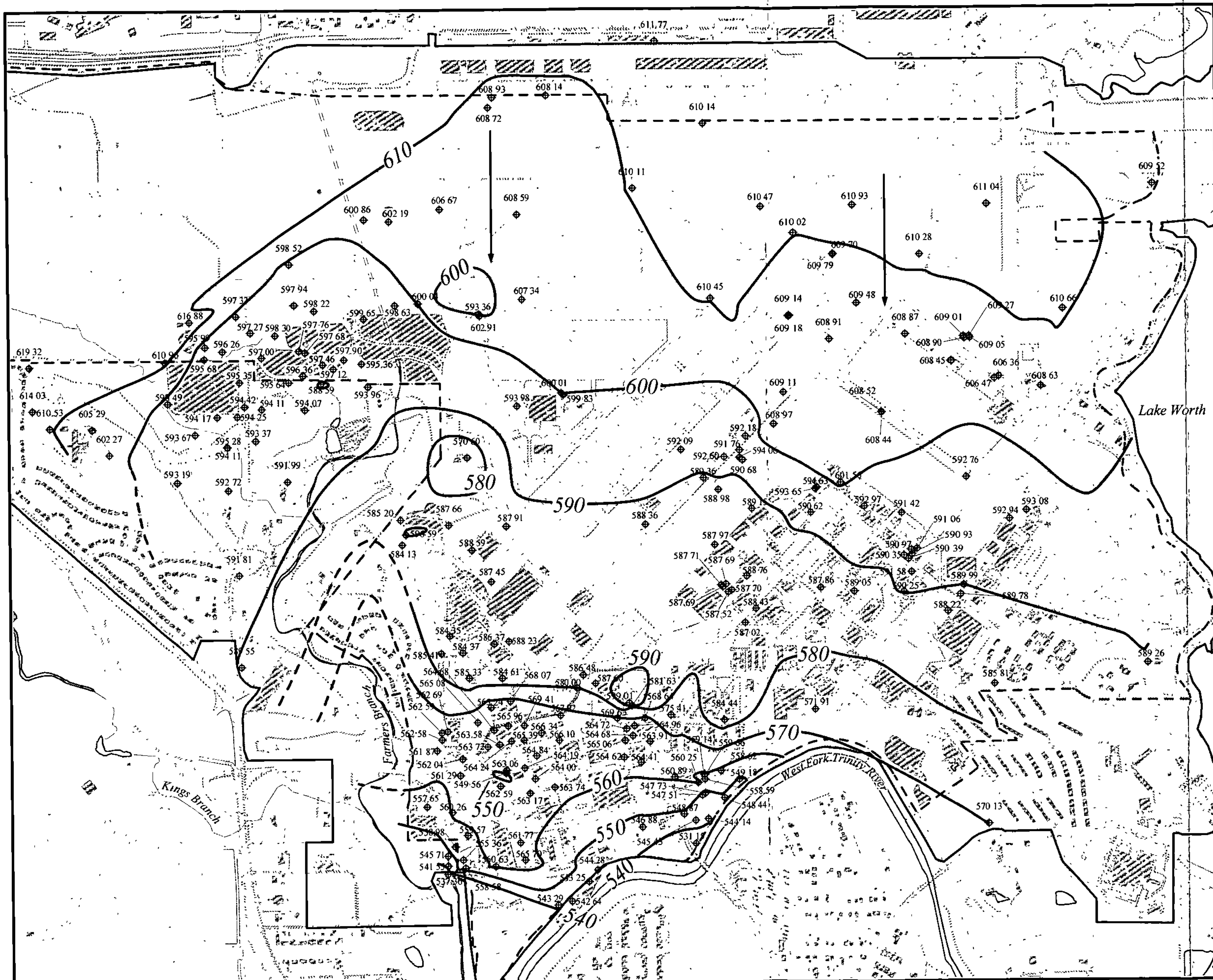
N

0 500 1000 2000

SCALE IN FEET

Filename X \AFC001\33baa\Report\FIG2_9 apr
Project AFC001-33BAA
Created nzehms 03/15/99
Revised 06/07/00 jb
Map Source HGL GIS Database

HYDRO GeoLogic INC



HydroGeoLogic, Inc
Limited RFI Work Plan, SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

Figure 2.10
Water Level Elevations
Terrace Alluvium
July 1999

U.S. Air Force Center For Environmental Excellence

Legend

NAS Fort Worth JRB (Carswell Field)

Former Carswell Air Force Base

-600- Groundwater Elevation Contour (Feet Above Mean Sea Level)

Generalized Groundwater Flow

N

0 500 1000 2000

SCALE IN FEET

Filename X:\AFC001\33BAA\Report\FIG2_10 apr
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Revised 06/07/00 jb
Map Source HydroGeoLogic, Inc GIS Database

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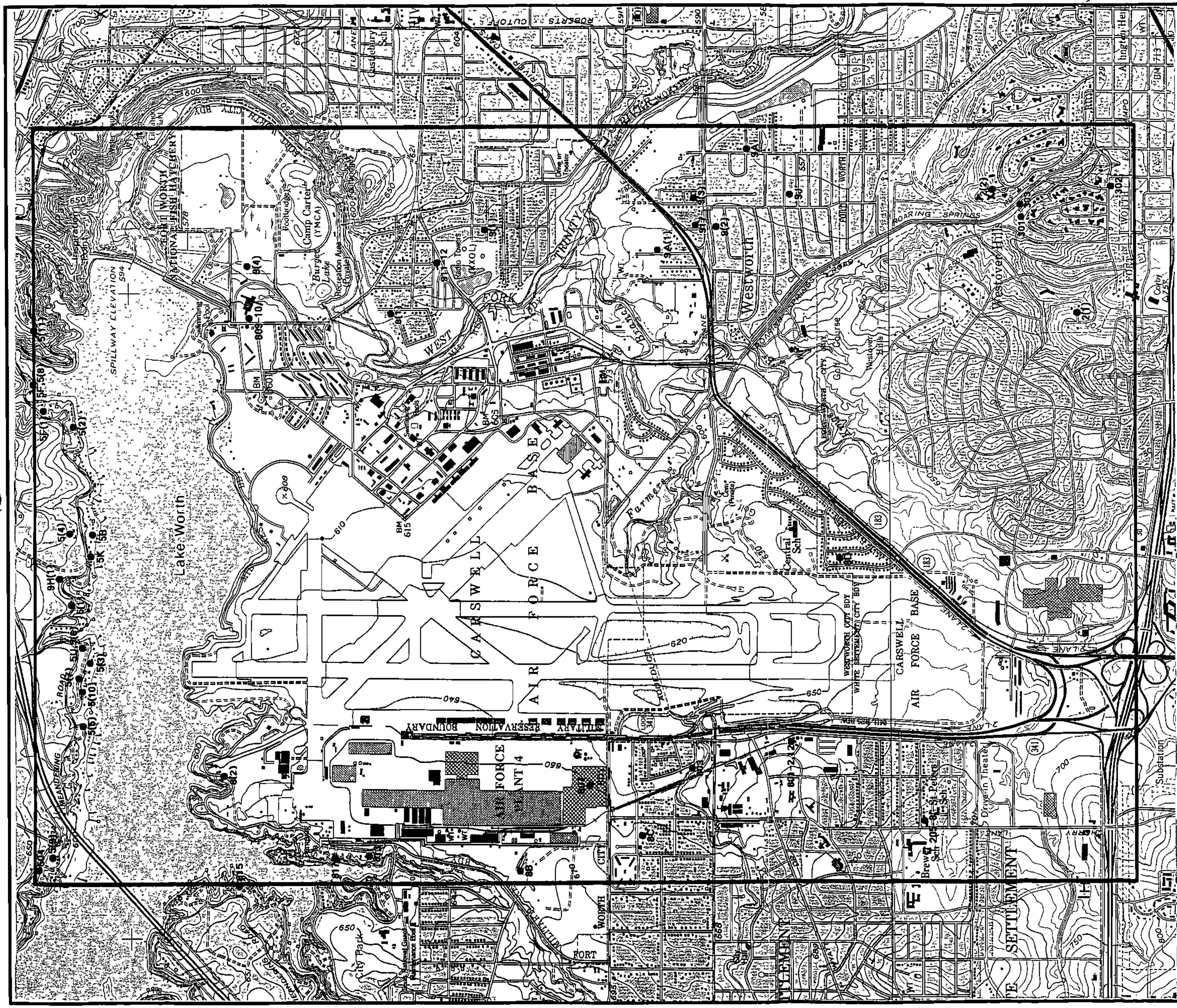

Figure 2.11

Water Well Receptor Survey Within ½ Mile of NAS Fort Worth JRB

U.S. Air Force Center for Environmental Excellence

Legend

917 Water Well Location

7(1) Water Well Location Identifying Multiple Wells

N

Contour Interval: 10 feet
Scale 1:24,000

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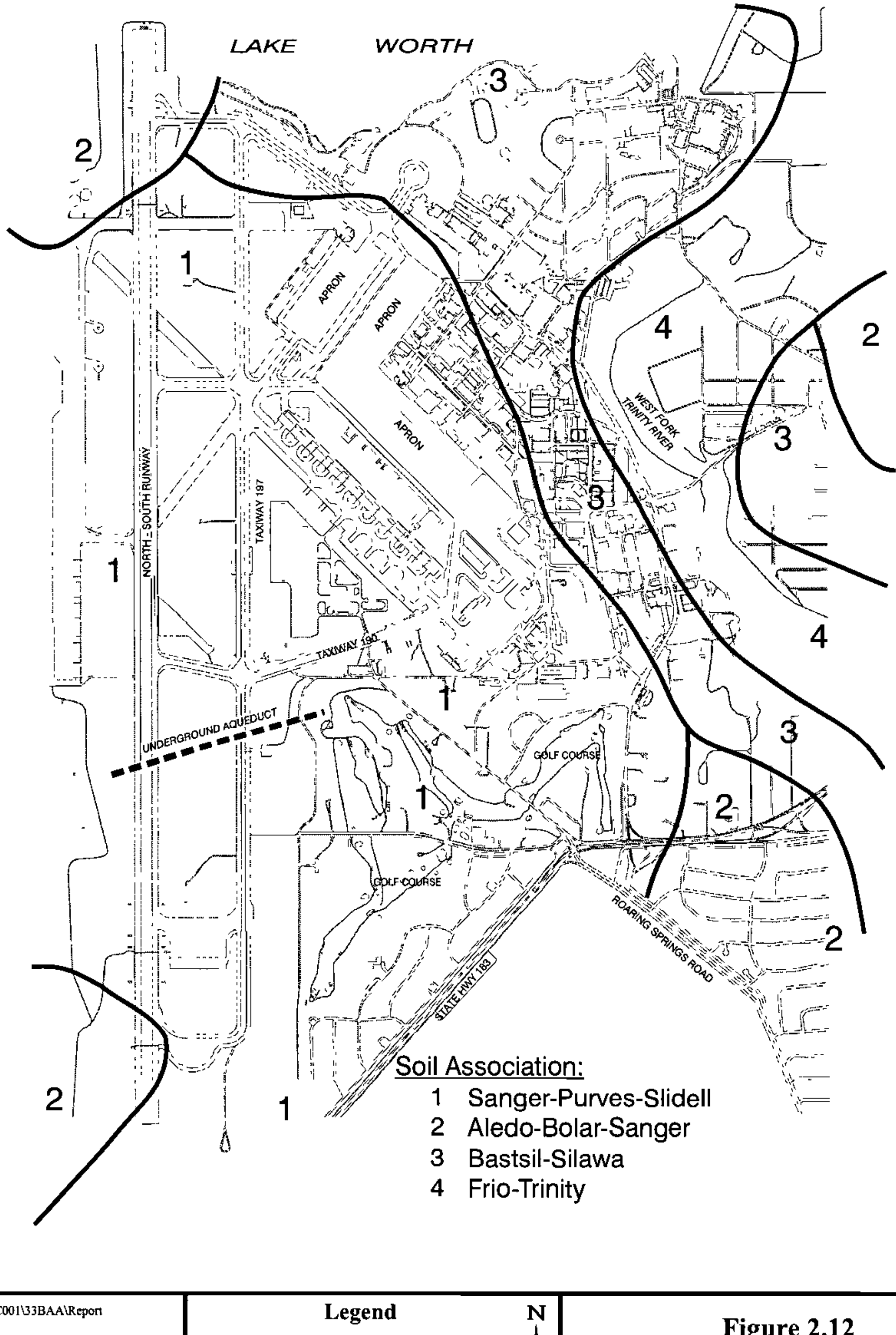
Project AFC001-36BAA
Revised 06/08/00 cf
Source USGS 1981 & 1982

HYDRO GeoLogic INC



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Project AFC001-33BAA
Revised 07/06/00 cf
Source Radian, 1989

Figure 2.12
Soil Association Map
NAS Fort Worth JRB, Texas

TAB

Section 3

3.0 IDENTIFICATION OF DATA NEEDS AND PROPOSED SAMPLING ACTIVITIES

The following sections present the Applicable or Relevant and Appropriate Requirements (ARARs) for the site, the TNRCC HW-50289 Permit requirements for the site, a summary of the basewide background characterization, a summary of previous investigations at each of the subject sites, the data needs at each of the sites, and the proposed field investigation tasks.

3.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

ARARs will be considered during the remedy process (per the requirements of Texas Administrative Code [TAC] § 335.562(b)). Federal statutes that will be used for guidance include the Solid Waste Disposal Act, RCRA, the Toxic Substances Control Act, the Safe Drinking Water Act, the Clean Air Act, the Clean Water Act, the Endangered Species Act, the Fish and Wildlife Conservation Act, and the Marine Protection Research and Sanctuaries Act. The ultimate objective of this project is to obtain closure under the TNRCC RRS Program.

The following requirements comprise the three general types of ARARs:

- Chemical specific requirements are usually health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.

- Location specific requirements are restrictions placed on the concentrations of hazardous substances or the performance of activities solely because they occur in special locations.

- Action specific requirements are usually technology based requirements or limitations on actions taken with respect to hazardous wastes.

Tables that present a preliminary list of ARARs to be considered during this investigation are included as Appendix B. As more information becomes available through project activities, the ARARs will be further refined.

3.2 PERMIT HW-50289 REQUIREMENTS

As bearer of the TNRCC HW Permit (HW-50289), NAS Fort Worth JRB is subject to regulation under RCRA and the Texas Solid Waste Disposal Act, including the corrective action requirements of RCRA and the Texas Risk Reduction Rules (30 TAC § 335 Subchapter S). The overall objective of this project is to obtain closure under the TNRCC RRS program. Specific RFI requirements of the HW-50289 permit are as follows:

- Provision VIII.A.2.b (1) requires a hydrogeologic assessment of the area to characterize the uppermost aquifer beneath the unit. Data on the strata encountered, saturated intervals, and groundwater flow must be collected. Soil samples from borings must be taken continuously from the surface to a depth of 20 feet and then at 5-foot intervals thereafter until groundwater is reached. Soil boring samples submitted for chemical analysis must be collected every 5 feet from the surface to the bottom of the boring and be analyzed in accordance with the EPA SW-846 for all Appendix IX constituents, unless a shorter list can be justified.

- Provision VIII.A.2.b (2) requires the installation of a groundwater monitoring system, based on the soil boring program, consisting of a minimum of one background well located hydraulically upgradient of the unit and removed a sufficient distance so as to not be effected by the unit, and at least three wells located on the downgradient perimeter of the unit. The upper 20 feet of the upper flow zone of the uppermost aquifer must be sampled by wells.

- Provision VIII.A.2.b (4) requires the collection of groundwater samples from monitoring wells during three sampling events spaced at 2-month intervals. These samples will be analyzed in accordance with EPA SW-846 for all Appendix IX constituents, unless a shorter list can be justified.

3.3 CHARACTERIZATION OF BACKGROUND CONDITIONS

Jacobs Engineering conducted a basewide background study in 1996 to establish background concentrations of 24 inorganic constituents in surface soil, subsurface soil, alluvial terrace groundwater, surface water, and sediments at NAS Fort Worth JRB. The study quantified groundwater concentrations in the alluvial terrace using both low stress and bailer sampling techniques. All samples were collected and analyzed for metals, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). Sampling locations were selected based on their proximity to known sources of contamination and contaminated media. Inorganic sample results were not included in the statistical determination of background concentrations at locations where organic compounds were detected above detection limits (Jacobs, 1998).

Results of this background study for all media are presented in Tables C.1 through C.6 of Appendix C The background study used the tolerance interval method to estimate upper tolerance limits (UTLs) of the distribution of each constituent in the background data population. The $UTL_{95,95}$ values listed in the tables are the values that, with 95 percent confidence, will exceed 95 percent of the background concentrations. This RFI will use the UTL95,95 values listed in Appendix C as background values for all investigative work (Jacobs, 1998).

3.4 IDENTIFICATION OF DATA NEEDS

The objective of this investigation is to determine if hazardous constituents have been released to the environment from the subject sites. If a release has been confirmed, the investigation will continue in order to determine the nature and extent of the contamination.

Four primary objectives have been identified for this project, and are summarized in Table 3.1. These objectives are as follows:

- Determine if SWMU 45 exists.
- Inspect the OWS at SWMU 55 to determine the integrity of each part of the unit.
- Determine if a release has occurred at each of the three SWMU sites. Soil borings will be completed to the top of the water table using direct push technology (DPT) methods at each site, and the soil will be sampled every 5 feet to determine if a release has occurred. Surface water and sediment samples may also be collected at one or more locations. Additional borings will be advanced and sampled as necessary to ensure that the horizontal extent of any potential contamination is evaluated.
- If contamination is encountered, the nature and extent of the contamination will be characterized. This will be accomplished by defining the vertical and lateral extent of chemicals that exceed background or RRS 1. Field methods that will be utilized include soil boring installation, monitoring well installation, and groundwater sampling from new and existing monitoring wells.

3.5 FIELD INVESTIGATION TASKS

The proposed field tasks described in the following sections will be conducted to achieve the project objectives listed in Section 3.4. The results of this investigation will support a determination for no further action, or will identify requirements for corrective measures and/or long term monitoring. As previously noted, each of the SWMUs received various types and amounts of hazardous wastes throughout their respective periods of operation. The field tasks described in the following sections were chosen by evaluating the type and purpose of data required to characterize the three SWMUs.

The following sections describe historic investigative activities performed at each SWMU and all investigative activities proposed by HydroGeoLogic. Suggested soil boring and monitoring well locations may change due to site-specific conditions such as utilities, fences, and structures encountered during the field implementation.

3.5.1 SWMU 45

This site consists of a below-grade concrete vault reportedly containing an UST for collection of hydrocarbon liquids from an associated OWS at Building 1027. Although the components are part of a single system, the OWS and surrounding parcel are designated as SWMU 44, and the nearby tank vault and surrounding parcel are designated as SWMU 45. The vault, reportedly an 8- by 8- by 8-foot steel-lined concrete chamber, may contain a UST of unknown capacity.

According to the RFA conducted by A.T. Kearney in 1989, the OWS system was installed in 1987 outside the south end of Building 1027 for treatment of aircraft wash rinsate prior to discharge into the storm sewer. The separator consists of two 7.5- by 3-foot below grade concrete compartments connected to Building 1027 by underground lines that extend from floor drains inside the hangar area. Liquids are directed from the OWS to the storm water system, and oils are apparently collected within a separate cell inside the unit. Although A.T. Kearney stated that the oil phase was pumped into a UST located within the SWMU 45 tank vault, the manufacturer of the OWS unit, AFL Industries, believes that the separated oil phase liquids are contained within an internal cell that is periodically pumped through an access port at the ground surface. An older tank vault may be present at the site and may no longer be in service. The construction contractor for the OWS installation, Ski-Hi Enterprises, did not recall the presence of a tank vault or older OWS during the installation work, but noted that some underground structures may have been removed during an enlargement of Building 1027 underway at that time

3.5.1.1 Site Investigation History

There have been no previous investigations associated with SWMU 45, but because of the system association and proximity of the subject parcel to SWMU 44, information from investigations at that unit are discussed here. Summaries of these activities are presented in the following sections.

3.5.1.1.1 1989 Preliminary Review/Visual Site Inspection

In 1989, A.T. Kearney conducted a Preliminary Review (PR)/Visual Site Inspection (VSI) of SWMUs 44 and 45. Reportedly, the OWS system and UST were only about 2 years old at that time. During this inspection, it was noted that no evidence of a release was observed at either SWMU 44 or 45, and that the potential for a release into soil or groundwater appeared to be low. A.T. Kearney made no recommendation for further investigations at SWMUs 44 or 45 (A.T. Kearney, 1989).

3.5.1.1.2 1995 Oil/Water Separator Assessment Investigation

From September 1993 to August 1995, Law Environmental (Law) conducted an IRP Program Investigation in order to identify possible contaminant presence at OWS systems throughout the installation. The OWS system at SWMU 44 was inspected during a records review visit in September 1993. In March 1994, four soil borings (1027-SB01 through 1027-SB04), ranging in depth from 12 to 14 feet, were advanced at SWMU 44 (Figure 3.1). Groundwater was not encountered in any of the borings, and no visual evidence of a release was observed.

One surface and seven subsurface soil samples were collected from the borings and submitted for chemical analysis. For background purposes, Law also collected three surface and nine subsurface soil samples from five borings located across the NAS Fort Worth JRB. Samples were analyzed for metals by EPA Method SW6010 and VOCs by Method SW8240.

As summarized in Table 3.2 and shown on Figure 3.1, several inorganic analytes and one organic compound were detected above background values (or MQL) and MSCs in soil samples collected at SWMU 44. Concentrations of copper, magnesium, manganese, and zinc exceeded their respective background values (i.e., RRS 1), and arsenic, cadmium, and lead exceeded background and MSCs (i.e., RRS 2). Methylene chloride was detected in each of the eight samples, seven of which exceeded the MQL, but two of these detections had corresponding method blank contamination. Furthermore, methylene chloride was also detected in each of the background soil samples at concentrations ranging from 0.0092 milligrams per kilogram (mg/kg) to 0.2 mg/kg. Law concluded that the methylene chloride detections in the soil samples collected at SWMU 44 were below the maximum "background" concentration, and the groundwater protection MSC for industrial soil. No other VOCs were detected in soil samples collected at SWMU 44.

Law suggested that the detected metals contamination in the surface soil at SWMU 44 may be the result of past overflows of and/or a leak in the OWS, and recommended a reevaluation of the data pending a comprehensive background study. The concentrations of arsenic, cadmium, and lead exceeding RRS 2 were addressed at a later date, as discussed below in Section 3.5.1.1.3. It should be noted that during site interviews, it was reported that the wastewater lift station, located approximately 80 feet southwest of the OWS, occasionally overflows during heavy rains. Law also recommended that site personnel conduct more frequent inspections of the OWS and lift station to reduce the potential for overflows.

3.5.1.1.3 1998 Oil/Water Separator RFI Investigation

In 1997, International Technology Corporation (IT) conducted a RFI at 21 OWS locations throughout NAS Fort Worth JRB. As part of that project, and to more fully characterize conditions at SWMU 44, IT performed a limited investigation of the Building 1027 OWS.

As shown on Figure 3.1, IT advanced two additional soil borings (SB102701 and SB102702) in the vicinity of the OWS, ranging in depth from 17 to 21 feet. Surface soil samples were collected at each boring location, and subsurface soil samples were collected from depths of 6 to 8 feet, and 12 to 14 feet at each borehole. The soil samples were analyzed for SVOCs by EPA Method SW8270 and pesticides/polychlorinated biphenyls (PCBs) by Method SW8080 to supplement soil data compiled by Law in their 1994 investigation at SWMU 44. One subsurface soil sample was also submitted for VOC analysis by Method SW8240, and gasoline-range organic and diesel-range organic analysis by modified Method SW8015. A summary of these analytical soil results is presented in Table 3.3. All VOC, SVOC, and pesticide/PCB detections were below the MQL for those contaminants. Several SVOCs were listed as "unknown," and non-specific hydrocarbon compounds were detected; IT concluded that the source of these compounds was unknown.

In addition to the soil investigation, a groundwater monitoring well (WITCTA037) was installed at the south edge of the site in a downgradient direction from the OWS (Figure 3.1). One groundwater sample was collected, which was analyzed for VOCs by EPA Method SW8260, SVOCs by Method SW8270, and metals by Method SW6010/7471. As summarized in Table 3.4, several inorganic analytes and organic compounds were detected in the groundwater sample collected from monitoring well WITCTA037. Beryllium was detected at a concentration above background, but below the industrial groundwater MSC. *Cis*-1,2-dichloroethene and TCE were also detected, but these compounds are considered to be associated with the basewide TCE plume present at NAS Fort Worth JRB and not considered related to SWMU 44. No other inorganic or organic constituents in the groundwater samples were measured above the MQL and/or MSCs at SWMU 44.

The RFI at SWMU 44 is ongoing. Additional soil and groundwater sampling to confirm/delineate inorganic analytes detected at SWMU 44 was proposed in a Phase II RFI Work Plan (IT, 2000). Executed in Spring 2000, surface soil and subsurface soil samples to delineate arsenic, cadmium, and lead were collected from a boring advanced north of Law boring 1027-SB01, and a subsurface soil sample was collected to confirm the detected concentration of cadmium at Law boring 1027-SB02. A groundwater sample was also collected from monitoring well WITCTA037 to confirm the initial detection of beryllium.

Preliminary results from this phase of the investigation were presented in the June 27, 2000 interim Remedial Project Manager's (RPM) meeting. As shown on Figure 3.1, all target-analyte concentrations in soil samples collected from borings SB102703 and SB102704, and the Spring 2000 groundwater sample collected from monitoring well WITCTA037 were below background values.

3.5.1.1.4 Previous Investigation Summary

The results of previous investigative activities performed by Law and IT have identified the presence of metals in surface and subsurface soils at SWMU 44, and low levels of chlorinated hydrocarbons in groundwater. Additional surface and subsurface soil sampling implemented by IT delineated the extent of the soil contamination at SWMU 44, and did not confirm the metals contamination in the groundwater.

3.5.1.2 Proposed Activities

As part of the WP preparation process, HydroGeoLogic conducted a records search and interviewed site personnel to determine the site history and exact configuration of SWMU 45. The records search produced a generic mechanical drawing for the current OWS and a piping plan drawing for the OWS dated 1985. Neither drawing depicts or references a tank or tank vault associated with the OWS system. Specific documentation pertaining to SWMU 45 itself was not found.

Proposed investigation activities include the following:

- Perform a metal detection survey in and around the estimated location of SWMU 45 before any intrusive activities occur at the site in order to confirm the presence or absence of the tank vault and UST. This survey will be performed using a Geonics EM61 electromagnetic (EM) induction system. The proposed survey grid is depicted on Figure 3.2.

- If no evidence of a tank vault is detected by the EM induction survey, no intrusive investigation will be performed at SWMU 45. If anomalies associated with a tank vault and/or UST are identified at the site, two soil borings will be advanced as described below in the vicinity of the suspected tank vault. Depending upon the initial sampling results, additional DPT borings may be advanced to delineate the extent of contamination, and one or more monitoring wells may be installed at the site.

If a former or existing tank vault is confirmed at SWMU 45, two soil borings will be advanced in the vicinity of the structure. These borings will be placed to determine if contamination is present in soils surrounding the tank vault location, as well as to more fully characterize the entire area. Each boring will be advanced to the top of the water table using a DPT rig, and soil samples will be collected in 5-foot intervals from the ground surface to the water table. Figure 3.2 illustrates the proposed soil boring locations.

The analytical results of these samples are intended to characterize conditions at the site, and to determine if a release from the tank vault has occurred. A specific list of the types of waste handled at SWMU 45 are included in Table 1.1. The proposed field activities are summarized in Table 3.5. A summary of the sampling and analyses proposed for soil and groundwater, respectively, is presented in Tables 3.6 and 3.7. Based on the wastes handled at SWMU 45 during the time this site was operational, soil samples will be analyzed for the following reduced list of Appendix IX analyses:

Appendix IX

- SW8260B - VOCs
- SW8270C - SVOCs
- SW6010B - metals
- SW7471A - mercury

Soil analytical results are intended to determine and characterize the extent to which the wastes handled at SWMU 45 may have been released to the environment. This will be accomplished by attempting to define the vertical and lateral extent of all analytical detections that exceed RRS 1 levels.

A second round of borings may be advanced if the proposed samples identify contamination above RRS 1. The location of these borings would be placed in order to further define the lateral and vertical extent of contamination at the site.

After receiving analytical results of the soil investigation, a second mobilization may be necessary to install a monitoring well. A hollow-stem auger (HSA) drill rig will be used, and soil samples will be continuously logged from the ground surface until bedrock is encountered. This boring will be completed as a monitoring well in order to characterize the groundwater at the site. The selected location for monitoring well installation may change based on initial soil analytical results. A groundwater sample may also be collected from the nearby existing well WITCTA037, installed by IT at SWMU 44.

Three rounds of bimonthly groundwater sampling will be conducted (as outlined in the permit description in Section 3.2) for the analytical methods identified by the soil sampling results. Additional soil borings and or monitoring wells may be installed at a later date if necessary, in order to delineate the extent of any contamination not completely delineated during the initial investigation.

3.5.2 SWMU 54

SWMU 54 consists of five storm water interceptors located at various points throughout NAS Fort Worth JRB. A June 2000 inspection by HydroGeoLogic has verified the exact location and design of each of the five units (described in Section 1.3.2). Although each interceptor unit was constructed within existing storm water structures, some at least 40 years old according to a review of aerial photographs, no previous site information has been located for these sites (National Archives, 1958).

3.5.2.1 Site Investigation History

There have been no previous investigations associated with SWMU 54. As stated above, no site-specific reports have been compiled for the storm water interceptors; however, a site investigation of the Building 1518 Base Service Station (BSS) property included limited surface water sampling of the storm water basin that contains Interceptor 004. A brief summary of those activities is included in the following section.

3.5.2.1.1 1993 Phase I Investigation - Base Service Station

In 1992, the Texas Water Commission issued a Notice of Violation to Carswell AFB for a petroleum release into the West Fork Trinity River following a Carswell AFB report of a subsurface release of gasoline from the BSS. The BSS property is approximately 300 feet northwest of the Interceptor 004 site. In December 1992, the USACE was asked to conduct a Remedial Investigation/Feasibility Study in order to identify potential problems at the former BSS. During a previous base visit, investigators had confirmed the presence of petroleum hydrocarbon contamination in the vicinity of four USTs at the BSS. The location of the (now removed) USTs is approximately 510 feet from Interceptor 004. As a result of this gasoline release, the BSS received a high hazard assessment rating and the site was recommended for Phase II Investigation (USACE, 1993). The BSS is referred to as AOC 1.

Because drainage pathways carry runoff from the BSS site in several directions. Specific surface water points around the perimeter of the site were sampled to determine if contamination from the UST release had migrated away from the site through storm water culverts. Two of the surface water samples were collected at points within SWMU 54: SW-4 was collected at the outfall where storm water from twin culverts discharges into the open basin that contains Interceptor 004. These culverts carry runoff underneath the northwest side of the Rogner-Jennings Drive intersection (near the BSS) to the southeast side (at SWMU 54). The other sample, SW-5, was collected below the overflow outfall of Interceptor 004, but upgradient from the discharge flume of the nearby East Gate OWS (SWMU 55).

The surface water samples were analyzed for TPH, benzene, ethylbenzene, toluene, and total xylenes, and methyl tertiary butyl ether. Neither sample contained any detectable levels of petroleum hydrocarbons for the analytes tested.

3.5.2.2 Proposed Activities

Proposed field activities at SWMU 54 include:

- Limited visual inspection of the integrity of the Interceptor 004 unit and surrounding outfall basin.

- The installation of two soil borings and, if needed, the collection of surface water and sediment samples for laboratory analyses. Because storm water from Interceptors 001, 003, 005, and 006 is diverted through Interceptor 004, this sampling will take place in the vicinity of Interceptor 004.

- If needed, at least one groundwater monitoring well will be installed and sampled to evaluate the condition of local groundwater.

- Assessment of the current status of the installation's National Pollutant Discharge Elimination System (NPDES) permit, review of readily available NPDES sampling data from periods when the system was in fully active, and determination of the applicability of that data to the limited RFI at SWMU 54.

One soil boring will be advanced in the grass adjacent to the southeast end of Interceptor 004, close to the pump well that directs flow from that unit toward the OWS (SWMU 55). The second boring will be placed adjacent to, and halfway along, the stormwater line passing from SWMU 54 to SWMU 55. The boring location is placed to characterize soils in the vicinity of the point where flow from the entire interconnected storm water system would have passed. Both borings will be advanced to the top of the water table and soil samples will be collected in 5-foot intervals from the ground surface to the water table. Figure 3.3 illustrates the proposed soil boring location.

The review of the installation's NPDES permits may determine if surface water at Interceptor 004 is periodically tested. If points at SWMU 54 or 55 have not been sampled under the NPDES program, additional sampling may be carried out as follows: A surface water and sediment sample may be collected just below the outfall flume at the east end of the Interceptor 004 containment basin. This sampling point is along the pathway taken by overflow storm water during heavy rainfall events. A second surface water and sediment sample may be collected farther east along the same flow pathway, at a point just below the confluence where storm water from the aqueous phase in the OWS (SWMU 55) is released into the stream. The location of these possible sampling points are illustrated on Figure 3.3.

The analytical results of these samples are intended to characterize the condition of site soils, surface water, and sediments, and to determine if contamination from storm water interflow through SWMU 54 components has affected the surrounding environment. A specific list of the types of wastes received at SWMU 54 is included in Table 1.1. A field activities summary is shown on Table 3.5, and a summary of the proposed sampling and analyses is presented in Tables 3.6 and 3.7. As there is no historic chemical data at SWMU 54, all soil samples will be analyzed for the following full Appendix IX suite.

<u>Appendix IX</u>

- SW8260B - VOCs
- SW8270C - SVOCs
- SW8080A - organochlorine pesticides and polychlorinated biphenyls (PCBs)
- SW8141A - organophosphorus pesticides
- SW8151A - chlorinated herbicides
- SW8280A - dioxins and furans
- SW9012A - cyanide
- SW9030A - sulfide
- SW6010B - trace elements (metals)
- SW7471A - mercury

Soil analytical results from SWMU 54 are intended to characterize the nature and extent of wastes released into the environment.

A second round of borings may be advanced if the proposed samples identify contamination above RRS 1. The location of these borings would be placed in order to further define the lateral and vertical extent of contamination at the site.

After receiving analytical results from the soil investigation, a second mobilization may be necessary to install a monitoring well at the location of the borehole advanced near Interceptor 004. A HSA drill rig will be used, and soil samples will be continuously logged from the ground surface until bedrock is encountered. This boring will be completed as a monitoring well in order to characterize the groundwater at the site. The selected location for the monitoring well may change based on the initial soil analytical results. The proposed monitoring well location is depicted in Figure 3.3.

Three rounds of bimonthly groundwater sampling will be conducted (as outlined in the permit description in Section 3.2) for the analytical methods identified by the soil sampling results. As stated in Section 3.2, well samples will be analyzed for all Appendix IX constituents unless a shorter list can be justified. If necessary, additional soil borings and/or monitoring wells may be installed at a later date in order to further delineate any contamination encountered during the initial investigation.

3.5.3 SWMU 55

The OWS structure that comprises SWMU 55 is located approximately 100 feet southeast of the storm water drainage outfall basin in which Interceptor 004 is contained. Because of the relative proximity of these features to each other, intrusive site investigation activities at SWMU 55 will be conducted in conjunction with those at SWMU 54 (discussed in Section 3.5.2.2).

3.5.3.1 Site Investigation History

To date there have been no previous investigations associated with the SWMU 55 OWS unit. Investigations have been conducted at the BSS (AOC 1), approximately 550 feet northwest of SWMU 55. There is no connection between activities at AOC 1 and the OWS investigation, and contamination at this sites has not been found to extend into the SWMU 55 vicinity. Current photographs of the OWS site are presented in Figure 1.5

3.5.3.2 Proposed Activities

Proposed field activities include the following:

- Sample and then remove contents of the OWS.
- Visual inspection of the integrity of the OWS structure.
- Installation of borings for visual observation and chemical analysis of surface and subsurface soils.
- If needed, installation of temporary piezometers to determine groundwater flow direction; then installation of monitoring wells to evaluate the condition of local groundwater.
- Sampling of surface water and sediment at the discharge point from the unit.
- Assessment of the current status of the installation's National Pollutant Discharge Elimination System (NPDES) permit, review of readily available NPDES sampling data from periods when the system was in fully active, and determination of the applicability of that data to the RFI at SWMU 55.

Before intrusive activities commence, the OWS unit will be examined to determine if the system has sustained any structural damage from weathering, settling, or operations that could result in a breach of the containment cells. If present, water, sediment, and other residue will be sampled and then removed from each basin The entire unit will then be inspected to evaluate the structural integrity and general overall condition of the OWS system. Significant features will be photographed and all observations will be recorded and documented as part of this investigation.

In order to characterize conditions in the vicinity of SWMU 55 and to determine if storm water passing through the OWS system has released contaminants into the environment, soils adjacent to the OWS will be sampled at the surface and at depth. A minimum of four soil borings will be advanced at SWMU 55 using a DPT rig. Figure 3.3 illustrates the proposed soil boring locations. One boring will be placed on each of three sides of the OWS unit, adjacent to the north, south, and east edge of the concrete containment structure. These boreholes will be drilled through an asphalt pad that surrounds the OWS unit. A fourth boring will be located at the outfall end of a spillway that drains surface water from the asphalt pad. If the visual inspection of the OWS unit reveals damaged areas where a release could have occurred, boring locations will be moved accordingly. Continuous cores will be used to evaluate the physical characteristics of the soil and evidence of contamination Soil samples will be collected at 5-foot intervals from the ground surface to the water table, and submitted for chemical analyses. As there is no historic chemical data at SWMU 55, all soil samples and samples collected from within the unit will be analyzed for the following full Appendix IX suite.

<u>Appendix IX</u>

- SW8260B - VOCs
- SW8270C - SVOCs
- SW8080A - organochlorine pesticides and polychlorinated biphenyls (PCBs)
- SW8141A - organophosphorus pesticides
- SW8151A - chlorinated herbicides
- SW8280A - dioxins and furans
- SW9012A - cyanide
- SW9030A - sulfide
- SW6010B - trace elements (metals)
- SW7471A - mercury

A field activities summary is provided in Table 3.5, and a summary of the proposed sampling and analyses is presented in Tables 3.6 and 3.7.

While the subsurface investigation is in progress, research will be conducted to ascertain the current status of NPDES permits at NAS Fort Worth JRB, and to determine if periodic NPDES sampling has been conducted in the SWMU 55 area. Contingent upon the findings of that research, one or more surface water and sediment samples (as described in Section 3.5.2.2 above) may be collected along the outfall stream that carries discharges from the aqueous phase of the OWS and from the Interceptor 004 overflow channel toward the West Fork Trinity River.

A second round of borings may be advanced if the proposed samples identify contamination above RRS 1. The location of these borings would be placed in order to further define the lateral and vertical extent of contamination at the site.

If contamination is detected during the soil investigation, a second mobilization will occur to install monitoring wells. Although groundwater flow at NAS Fort Worth JRB is generally from west to east across the base, localized variations in groundwater flow directions exist. The soil borings will be converted into temporary piezometers that will be used to evaluate the groundwater flow direction prior to the installation of any monitoring wells. After groundwater flow patterns have been established, at least one 2-inch monitoring well may be installed using a HSA rig. All monitoring wells will be completed at least 1 foot into the bedrock. Proposed piezometer and monitoring well locations are depicted on Figure 3.3.

Three rounds of bimonthly groundwater sampling will be conducted (as outlined in the permit description in Section 3.2) for the analytical methods identified by the soil sampling results. As stated in Section 3.2, well samples will be analyzed for all Appendix IX constituents unless a shorter list can be justified. Additional soil borings and/or monitoring wells may be installed at a later date to delineate the extent of any contamination found to be originating from SWMU 55.

3.5.4 Mobilization

Mobilization to the field is expected to begin as soon as relevant portions of the WP are approved. Several basic requirements for conducting field activities have already been established. Contractor photographic identification badges have been obtained for lead personnel who will escort subcontractors to and from restricted areas. The field office and primary staging area for field equipment and supplies will be located at 6560 White Settlement Road, NAS Fort Worth JRB, Texas.

3.5.5 Aquifer Testing

Aquifer testing will not be conducted during this field effort. Hydrological properties at the subject sites will be characterized using the aquifer data presented in the CH2M HILL RFI report for AOC 2, the basewide TCE plume (CH2M HILL, 1998).

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FIGURES

Method	Analyte (mg/kg)	Background Surface (0-2 ft.)	Background Subsurface (>2 ft.)	GWP-Ind. MSC	1027-SB01 (0-2 ft.)	1027-SB01 (10-12 ft.)
SW6010	Arsenic	5 85	6 58	5	10	<3 4
SW6010	Cadmium	0 556	0 59	0 5	6 1	1 3
SW6010	Copper	17 37	13 72	130	26	4 9
SW6010	Lead	30 97	12 66	1 5	58	5 3
SW6010	Magnesium	3003	2420	NA	2400	430
SW6010	Manganese	849	351 7	1400	240	140
SW6010	Zinc	38 8	31 3	3100	690 JH	12 JH
SW8240	Methylene Chloride	NA	NA	0 5	0 01 JB	0 013

Method	Analyte (mg/kg)	Background Surface	Background Subsurface	GWP-Ind. MSC	SB102703 Surface	SB102703 Subsurface
SW6010	Arsenic	5 85	6 58	5	4 17	4 57
SW6010	Cadmium	0 556	0 59	0 5	0 158	0 161
SW6010	Lead	30 97	12 66	1 5	8 91	NA

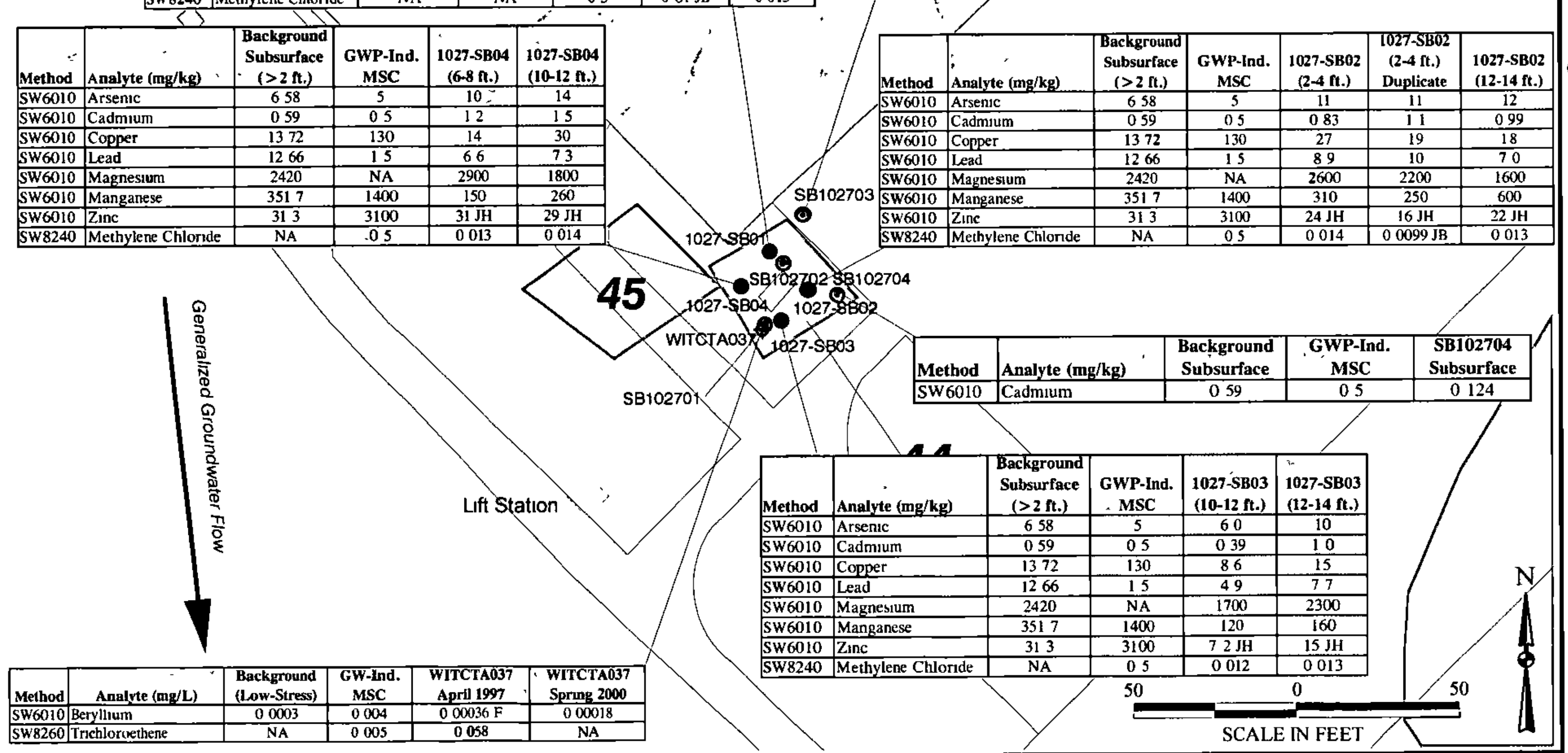
Method	Analyte (mg/kg)	Background Subsurface (>2 ft.)	GWP-Ind. MSC	1027-SB04 (6-8 ft.)	1027-SB04 (10-12 ft.)
SW6010	Arsenic	6 58	5	10	14
SW6010	Cadmium	0 59	0 5	1 2	1 5
SW6010	Copper	13 72	130	14	30
SW6010	Lead	12 66	1 5	6 6	7 3
SW6010	Magnesium	2420	NA	2900	1800
SW6010	Manganese	351 7	1400	150	260
SW6010	Zinc	31 3	3100	31 JH	29 JH
SW8240	Methylene Chloride	NA	.0 5	0 013	0 014

Method	Analyte (mg/kg)	Background Subsurface (>2 ft.)	GWP-Ind. MSC	1027-SB02 (2-4 ft.)	1027-SB02 (2-4 ft.) Duplicate	1027-SB02 (12-14 ft.)
SW6010	Arsenic	6 58	5	11	11	12
SW6010	Cadmium	0 59	0 5	0 83	1 1	0 99
SW6010	Copper	13 72	130	27	19	18
SW6010	Lead	12 66	1 5	8 9	10	7 0
SW6010	Magnesium	2420	NA	2600	2200	1600
SW6010	Manganese	351 7	1400	310	250	600
SW6010	Zinc	31 3	3100	24 JH	16 JH	22 JH
SW8240	Methylene Chloride	NA	0 5	0 014	0 0099 JB	0 013

Method	Analyte (mg/kg)	Background Subsurface	GWP-Ind. MSC	SB102704 Subsurface
SW6010	Cadmium	0 59	0 5	0 124

Method	Analyte (mg/kg)	Background Subsurface (>2 ft.)	GWP-Ind. MSC	1027-SB03 (10-12 ft.)	1027-SB03 (12-14 ft.)
SW6010	Arsenic	6 58	5	6 0	10
SW6010	Cadmium	0 59	0 5	0 39	1 0
SW6010	Copper	13 72	130	8 6	15
SW6010	Lead	12 66	1 5	4 9	7 7
SW6010	Magnesium	2420	NA	1700	2300
SW6010	Manganese	351 7	1400	120	160
SW6010	Zinc	31 3	3100	7 2 JH	15 JH
SW8240	Methylene Chloride	NA	0 5	0 012	0 013

Method	Analyte (mg/L)	Background (Low-Stress)	GW-Ind. MSC	WITCTA037 April 1997	WITCTA037 Spring 2000
SW6010	Beryllium	0 0003	0 004	0 00036 F	0 00018
SW8260	Trichloroethene	NA	0 005	0 058	NA



Filename X \Afc001\33baa\Report\swmu45 apr
Project AFC001-33BAA
Created 06/12/00 jbelcher
Revised 07/14/00 cf
Source HydroGeoLogic, Inc GIS Database 2000

HYDRO GeoLogic INC.

Legend

Solid Waste Management Unit

Existing Monitoring Well

Previous Boring (IT)

Previous Boring (LAW)

Values indicated in yellow exceed RRS 1
Values indicated in gray exceed RRS 2

Figure 3.1

Previous Investigation Results SWMU 45 Building 1027 Waste Oil Tank Vault

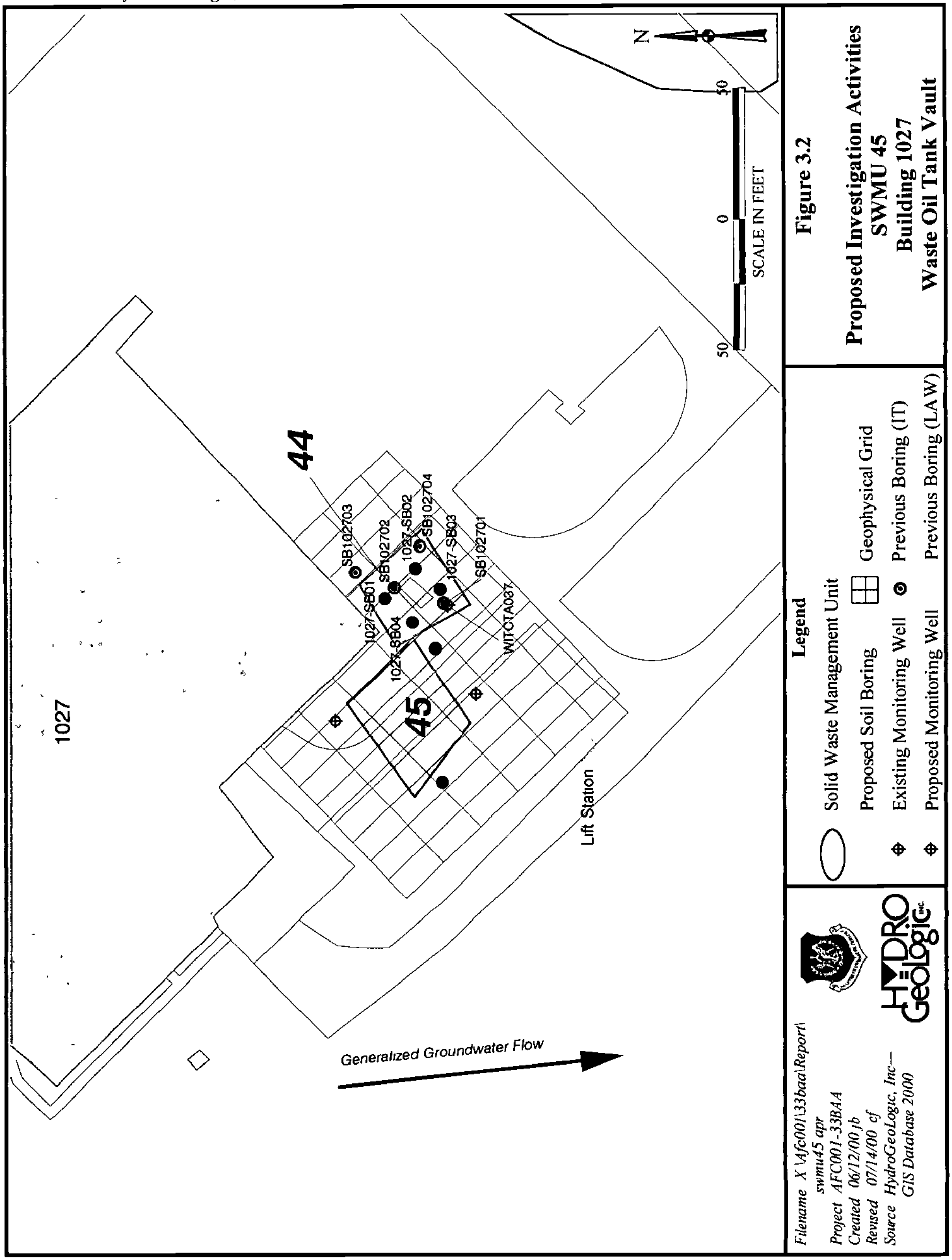


Figure 3.2

Proposed Investigation Activities SWMU 45 Building 1027 Waste Oil Tank Vault

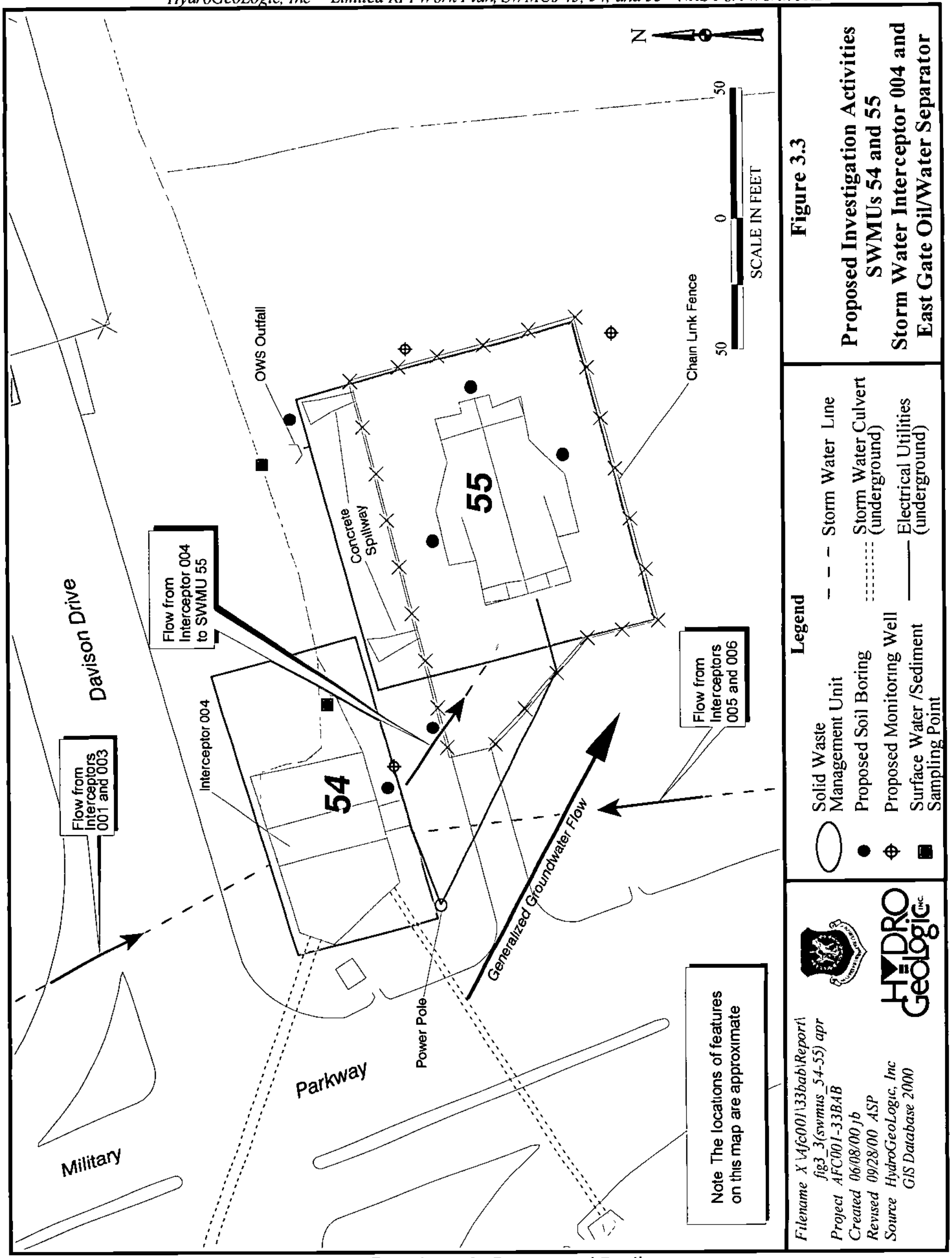


Figure 3.3
Proposed Investigation Activities
SWMUs 54 and 55
Storm Water Interceptor 004 and
East Gate Oil/Water Separator
SCALE IN FEET
50
0
50
N
Legend
Solid Waste Management Unit
Proposed Soil Boring
Proposed Monitoring Well
Surface Water /Sediment Sampling Point
Storm Water Line
Storm Water Culvert (underground)
Electrical Utilities (underground)
Davison Drive
Military
Parkway
Flow from Interceptors 001 and 003
Interceptor 004
Flow from Interceptor 004 to SWMU 55
OWS Outfall
Concrete Spillway
Chain Link Fence
Flow from Interceptors 005 and 006
Generalized Groundwater Flow
Power Pole
54
55
Note The locations of features on this map are approximate
Filename X \Afc001\33bab\Report\fig3_3(swmus_54-55) apr
Project AFC001-33BAB
Created 06/08/00 jb
Revised 09/28/00 ASP
Source HydroGeoLogic, Inc GIS Database 2000
HYDRO GeoLogic INC

TABLES

Table 3.1
Project Objectives and Data Needs
SWMUs 45, 54, and 55
NAS Fort Worth JRB, Texas

Primary Objectives	Data Needs	Work Task[1]
Characterize site specific conditions at each of the SWMUs	Identify soil types, depth to groundwater, information from previous investigations at subject properties and adjacent sites	Review historical and existing technical information from previous site investigations, including NPDES data
Characterize potential sources of contamination	Determine if waste handled at sites has impacted the environment	Advance direct push soil borings, collect surface and subsurface soil samples; collect surface water and sediment samples
Verify integrity of physical structures at SWMU 54 and 55	Confirm that potential contaminant pathways have not developed in containment units	Remove and sample water and sediment from cells, inspect each unit for cracks, weathering, and other damage
Determine nature and extent of any detected contamination	Assess lateral and vertical extent of contamination in soil and groundwater	Install piezometers, install and sample monitoring wells

[1] Soil borings will be advanced using DPT methods while monitoring wells will be installed using HSA drilling methods

Table 3.2
Summary of Positive Surface and Subsurface Soil Results—April 1994
SWMU 44—Building 1027 Oil/Water Separator
NAS Fort Worth JRB, Texas

Method	Analyte (mg/kg)	App. IX Compound	Background Surface (0-2 ft.)	Background Subsurface (>2 ft.)	GWP-Ind. MSC	1027-SB01 (0-2 ft.)	1027-SB01 (10-12 ft.)	1027-SB02 (2-4 ft.)	1027-SB02 (2-4 ft.) Duplicate	1027-SB02 (12-14 ft.)	1027-SB03 (10-12 ft.)
SW6010	Aluminum	No	22035	20260	10000	6800	2000	6000	6100	1800	3700
SW6010	Arsenic	Yes	5 85	6 58	5	**[(10)]**	<3.4	**[(11)]**	**[(11)]**	**[(12)]**	**[(6.0)]**
SW6010	Barium	Yes	233	128.1	200	60	17	48	41	36	20
SW6010	Beryllium	Yes	1.02	1.13	0.4	<1 6	0.24	<1.7	<1.6	<1.6	<1.6
SW6010	Cadmium	Yes	0.556	0.59	0.5	**[(6.1)]**	**[(1.3)]**	**[(0.83)]**	**[(1.1)]**	**[(0.99)]**	0 39
SW6010	Calcium	No	167788	272000	NA	160000	22000	190000	160000	180000	160000
SW6010	Chromium (total)	Yes	25.86	16.31	10	17	4.4	7.4	8 1	4.7	5.2
SW6010	Cobalt	Yes	11 05	6 19	610	4.2	4.6	5 1	5.1	4.2	1.6
SW6010	Copper	Yes	17.37	13.72	130	**(26)**	4.9	**(27)**	**(19)**	**(18)**	8.6
SW6010	Iron	No	17717	17469	NA	8000	8700	78 J	10000 J	6200	3200
SW6010	Lead	Yes	30 97	12 66	1.5	**[(58)]**	5.3	8.9	10	7 0	4 9
SW6010	Magnesium	No	3003	2420	NA	2400	430	**(2600)**	2200	1600	1700
SW6010	Manganese	No	849	351.7	1400	240	140	310	250	**(600)**	120
SW6010	Nickel	Yes	14.6	19.76	200	9.3	5.3	9.1	7 6	7 7	2 6
SW6010	Potassium	No	2895	1717	NA	1100	320	910	880	280	530
SW6010	Sodium	No	37300	53200	NA	89	27	100	90	100	80
SW6010	Vanadium	Yes	46 3	37.4	72	8.9	12	15	18	11	<7.8
SW6010	Zinc	Yes	38 8	31.3	3100	**(690 JH)**	12 JH	24 JH	16 JH	22 JH	7 2 JH
SW8240	Methylene Chloride	Yes	NA	NA	0.5	0.01 JB	0.013	0.014	0 0099 JB	0.013	0.012

Notes:
Values indicated in **bold** and ( ) exceed Risk Reduction Standard 1
Values indicated in **bold** and **[( )]** exceed Risk Reduction Standard 2
J = Estimated quantiation based on QC data
JH = Estimated quantitation—possibly biased high based on QC data
JB = Estimated quantitation—possibly biased high or false positive based upon blank data
Background values per Basewide Background Study (Jacobs, September 1998)
MSC = Medium-Specific Concentration (TNRCC, April 1999)
GWP-Ind. = Soil MSC for industrial use based on groundwater protection
Source: Final Oil/Water Separator Assessment Report; Law Environmental, August 1995.

Table 3.2 (continued)
Summary of Positive Surface and Subsurface Soil Results—April 1994
SWMU 44—Building 1027 Oil/Water Separator
NAS Fort Worth JRB, Texas

Method	Analyte (mg/kg)	App. IX Compound	Background Surface (0-2 ft.)	Background Subsurface (>2 ft.)	GWP-Ind. MSC	1027-SB03 (12-14 ft.)	1027-SB04 (6-8 ft.)	1027-SB04 (10-12 ft.)
SW6010	Aluminum	No	22035	20260	10000	8200	7400	4800
SW6010	Arsenic	Yes	5 85	6 58	5	**[(10)]**	**[(10)]**	**[(14)]**
SW6010	Barium	Yes	233	128.1	200	36	43	32
SW6010	Beryllium	Yes	1.02	1 13	0.4	<1.7	<1.7	<1.8
SW6010	Cadmium	Yes	0 556	0.59	0.5	**[(1.0)]**	**[(1.2)]**	**[(1.5)]**
SW6010	Calcium	No	167788	272000	NA	200000	160000	170000
SW6010	Chromium (total)	Yes	25 86	16 31	10	8.9	9.2	6.1
SW6010	Cobalt	Yes	11.05	6 19	610	3.1	2.9	3 6
SW6010	Copper	Yes	17 37	13 72	130	**(15)**	**(14)**	**(30)**
SW6010	Iron	No	17717	17469	NA	7800	7500	8100
SW6010	Lead	Yes	30.97	12 66	1 5	7.7	6 6	7.3
SW6010	Magnesium	No	3003	2420	NA	2300	**(2900)**	1800
SW6010	Manganese	No	849	351 7	1400	160	150	260
SW6010	Nickel	Yes	14.6	19.76	200	6.7	6 4	7.4
SW6010	Potassium	No	2895	1717	NA	1100	1200	660
SW6010	Sodium	No	37300	53200	NA	88	100	82
SW6010	Vanadium	Yes	46 3	37 4	72	15	8.4	20
SW6010	Zinc	Yes	38.8	31.3	3100	15 JH	31 JH	29 JH
SW8240	Methylene Chloride	Yes	NA	NA	0.5	0.013	0 013	0.014

Notes:
Values indicated in **bold** and ( ) exceed Risk Reduction Standard 1
Values indicated in **bold** and [( )] exceed Risk Reduction Standard 2
J = Estimated quantiation based on QC data
JH = Estimated quantitation—possibly biased high based on QC data
JB = Estimated quantitation—possibly biased high or false positive based upon blank data
Background values per Basewide Background Study (Jacobs, September 1998)
MSC = Medium-Specific Concentration (TNRCC, April 1999)
GWP-Ind. = Soil MSC for industrial use based on groundwater protection
Source: Final Oil/Water Separator Assessment Report; Law Environmental, August 1995.

Table 3.3
Summary of Positive Surface and Subsurface Soil Results—March 1997 and Spring 2000
SWMU 44—Building 1027 Oil/Water Separator
NAS Fort Worth JRB, Texas

Method	Analyte (mg/kg)	App. IX Compound	PQL[1]	Background Surface	Background Subsurface	GWP-Ind. MSC	SB102701 (0-2 ft.)	SB102702 (0-2 ft.)	SB102702 (6-8 ft.)	SB102703 Surface	SB102703 Subsurface	SB102704 Subsurface
SW6010	Arsenic	Yes	NA	5.85	6.58	5	NA	NA	NA	4.17	4 57	NA
SW6010	Cadmium	Yes	NA	0.556	0.59	0.5	NA	NA	NA	0 158	0.161	0.124
SW6010	Lead	Yes	NA	30 97	12 66	1 5	NA	NA	NA	8.91	NA	NA
SW8270	Benzo(a)pyrene	Yes	0.81	NA	NA	0 02	0.089 F	0 081 F	--	NA	NA	NA
SW8270	Benzo(b,k)fluoranthene	Yes[2]	0 81	NA	NA	0.039[3]	0.089 F	0.083 F	--	NA	NA	NA
SW8270	Fluoranthene	Yes	0 80	NA	NA	410	--	0.18 F	--	NA	NA	NA
SW8270	Phenanthrene	Yes	0 80	NA	NA	310	--	0.11 F	--	NA	NA	NA
SW8270	Pyrene	Yes	0.80	NA	NA	310	--	0.12 F	--	NA	NA	NA
M8015D	Diesel Range Organics	No	4.70	NA	NA	NA	--	--	4 3 qrBF	NA	NA	NA
SW8240	Acetone	Yes	0.024	NA	NA	1000	--	--	0 0057 F	NA	NA	NA
SW8240	Toluene	Yes	0.0059	NA	NA	100	--	--	0 005 F	NA	NA	NA

Notes:

Various analytes, assumed to be Tentatively Identified Compounds in the source document (e g., "Unknown", "4,4'-(1-Methylethylidene)BIPHE", "Oxygenated Hydrocarbon", and "Saturated Hydrocarbon"), were omitted from this table

PQL = Practical Quantitation Limit

MSC = Medium-Specific Concentration (TNRCC, April 1999)

GWP-Ind = Soil MSC for industrial use based on groundwater protection

-- = Not reported; assumed to be non-detect

[1] = Although listed as the "Detection Limit", it is assumed that this value is the PQL; concentrations below this value were listed as J-flagged in the source document, but should be F-flagged (as defined below).

[2] = Benzo(b)fluoranthene and benzo(k)fluoranthene are typically quantified separately, which are Appendix IX compounds.

[3] = Assumed to be the lesser MSC for benzo(b)fluoranthene and benzo(k)fluoranthene (3.9E-02 versus 3.9E-01 mg/kg, respectively).

F = The analyte was positively identified, but the associated numerical value is below the PQL

qrB = The source document did not identify the corresponding qualification signficance.

Source· Draft OWS RCRA Facilities Investigation Addendum Report; IT Corporation, July 1998.
June 27, 2000 interim Remedial Project Manager's meeting presentation

Table 3.4
Summary of Positive Groundwater Results—March 1997 and Spring 2000
SWMU 44—Building 1027 Oil/Water Separator
NAS Fort Worth JRB, Texas

Method	Analyte (mg/L)	App. IX Compound	Background (Low-Stress)	GW-Ind. MSC	WITCTA037 April 1997	WITCTA037 Spring 2000
SW6010	Barium	Yes	0.587	2	0 0742	NA
SW6010	Beryllium	Yes	0.0003	0 004	**(0.00036 F)**	0 00018
SW6010	Calcium	No	266 3	NA	119	NA
SW6010	Magnesium	No	37 80	NA	4 78	NA
SW6010	Manganese	No	0.175	14	0 0018 F	NA
SW6010	Potassium	No	15.03	NA	0.538 F	NA
SW6010	Sodium	No	167	NA	9.56	NA
SW6010	Zinc	Yes	0.118	31	0.0052 F	NA
SW8260	Cis-1,2-Dichloroethene	Yes	NA	0.07	0.0084	NA
SW8260	Methylene Chloride	Yes	NA	0 005	0.0019 F	NA
SW8260	Trichloroethene	Yes	NA	0.005	**[(0.058)]**	NA

Notes:
Values indicated in **bold** and ( ) exceed Risk Reduction Standard 1
Values indicated in **bold** and [( )] exceed Risk Reduction Standard 2
F = The analyte was positively identified, but the associated numerical value is below the PQL
Background values per Basewide Background Study (Jacobs, September 1998)
MSC = Medium-Specific Concentration (TNRCC, April 1999)
NA = Not Analyzed
GW-Ind = Groundwater MSC for Industrial Use
Source. Draft OWS RCRA Facilities Investigation Addendum Report, IT Corporation, July 1998.
June 27, 2000 interim Remedial Project Manager's meeting presentation

Table 3.5
Field Activities Summary
NAS Fort Worth JRB, Texas

Site	DPT Borings (to top of water table)	HSA Borings/Wells* (to bedrock)	Borings (total)	Surface Water and Sediment Sampling
SWMU 45	2	1	3	0
SWMU 54	2	1	3	1
SWMU 55	4	2	6	1
Total	7	4	11	2

Notes:
DPT = direct push technology
HSA = hollow stem auger
* = A second phase of activities may occur based on results from initial borings. HSA borings and monitoring wells will be installed only if soil contamination is identified.

Table 3.6
Soil Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples [1]	No. of Equipment Blanks [2]	No. of Ambient Blanks [3]	No. of Trip Blanks [4]	No. of Field Duplicates [5]	No. of MS/MSD [6]	Total No. of Samples
SWMU 45	SW8260B	Soil	10	1	0	1	1	1/1	15
	SW8270C	Soil	10	1	0	0	1	1/1	14
	SW6010B	Soil	10	1	0	0	1	1/1	14
	SW7471A	Soil	10	1	0	0	1	1/1	14
SWMU 54	SW8260B	Soil	6	1	0	1	1	0	9
	SW8270C	Soil	6	1	0	0	1	0	8
	SW8080A	Soil	6	1	0	0	1	0	8
	SW8141A	Soil	6	1	0	0	1	0	8
	SW8151A	Soil	6	1	0	0	1	0	8
	SW8280A	Soil	6	1	0	0	1	0	8
	SW9012A	Soil	6	1	0	0	1	0	8
	SW9030A	Soil	6	1	0	0	1	0	8
	SW6010B	Soil	6	1	0	0	1	0	8
	SW7471A	Soil	6	1	0	0	1	0	8
SWMU 55	SW8260B	Soil	14	2	0	2	1	1/1	21
	SW8270C	Soil	14	2	0	0	1	1/1	19
	SW8080A	Soil	14	2	0	0	1	1/1	19

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Table 3.6 (continued)
Soil Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples [1]	No. of Equipment Blanks [2]	No. of Ambient Blanks [3]	No. of Trip Blanks [4]	No. of Field Duplicates [5]	No. of MS/MSD [6]	Total No. of Samples
SWMU 55 (Continued)	SW8141A	Soil	14	2	0	0	1	1/1	19
	SW8151A	Soil	14	2	0	0	1	1/1	19
	SW8280A	Soil	14	2	0	0	1	1/1	19
	SW9012A	Soil	14	2	0	0	1	1/1	19
	SW9030A	Soil	14	2	0	0	1	1/1	19
	SW6010B	Soil	14	2	0	0	1	1/1	19
	SW7471A	Soil	14	2	0	0	1	1/1	19

Notes
1 Soil samples must be collected every 5 feet from the surface to the groundwater The number of soil samples is based on the estimated average depth to groundwater Three borings with 4 samples each will yield 12 samples. The actual number of soil samples collected will vary depending on the actual depth to groundwater
2 Sites where only one boring will be sampled will be paired with a QC sample from another boring One equipment blank will be taken per day, per analysis (for example, 3 equipment blanks represents 1 sample/day for 3 days)
3 Ambient blanks for VOCs will only be sampled if VOCs are detected by the PID during a sampling effort. One ambient blank will be collected at the beginning of the field investigation for soil
4 One trip blank will be included per cooler when at least one sample is analyzed for VOCs from that cooler.
5 Field duplicates collected on a 10% basis of investigation samples
6 MS/MSDs collected on a 5% basis of investigation samples

Table 3.7
Groundwater Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples[1]	No. of Equipment Blanks[3]	No. of Ambient Blanks[4]	No. of Trip Blanks[5]	No. of Field Duplicates[6]	No. of MS/MSD[7]	Total No. of Samples[2]
SWMU 45	SW8260B	Groundwater	5	1	0	1	1	0	8
	SW8270C	Groundwater	5	1	0	0	1	0	7
	SW6010B	Groundwater	5	1	0	0	1	0	7
	SW7471A	Groundwater	5	1	0	0	1	0	7
SWMU 54	SW8260B	Groundwater	3	1	0	1	1	0	6
	SW8270C	Groundwater	3	1	0	0	1	0	5
	SW8080A	Groundwater	3	1	0	0	1	0	5
	SW8141A	Groundwater	3	1	0	0	1	0	5
	SW8151A	Groundwater	3	1	0	0	1	0	5
	SW8280A	Groundwater	3	1	0	0	1	0	5
	SW9012A	Groundwater	3	1	0	0	1	0	5
	SW9030A	Groundwater	3	1	0	0	1	0	5
	SW6010B	Groundwater	3	1	0	0	1	0	5
	SW7471A	Groundwater	3	1	0	0	1	0	5
SWMU 55	SW8260B	Groundwater	10	1	0	1	1	1/1	15
	SW8270C	Groundwater	10	1	0	0	1	1/1	14
	SW8080A	Groundwater	10	1	0	0	1	1/1	14

Table 3.7 (continued)
Groundwater Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples[1]	No. of Equipment Blanks[3]	No. of Ambient Blanks[4]	No. of Trip Blanks[5]	No. of Field Duplicates[6]	No. of MS/MSD[7]	Total No. of Samples[2]
SWMU 55 (Continued)	SW8141A	Groundwater	10	1	0	0	1	1/1	14
	SW8151A	Groundwater	10	1	0	0	1	1/1	14
	SW8280A	Groundwater	10	1	0	0	1	1/1	14
	SW9012A	Groundwater	10	1	0	0	1	1/1	14
	SW9030A	Groundwater	10	1	0	0	1	1/1	14
	SW6010B	Groundwater	10	1	0	0	1	1/1	14
	SW7471A	Groundwater	10	1	0	0	1	1/1	14

Notes:
1 Monitoring well to be sampled for three consecutive rounds 2 months apart.
2 The number of samples is based on the number of samples collected during each sampling event, and on the assumption that there will be enough water in each well to purge and sample. The actual number of groundwater samples collected may vary depending on seasonal groundwater fluctuations.
3 A maximum of one equipment blank will be taken per day.
4 Ambient blanks for VOCs will only be sampled if VOCs are detected by the PID during the sampling effort.
5 One trip blank will accompany each cooler that contains samples to be analyzed for VOCs. Trip blanks will only be analyzed for VOCs.
6 Field duplicates will be collected on a 10% basis of investigation samples.
7 MS/MSDs will be collected on a 5% basis of investigation samples.

Table 3.8
Sediment Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples [1]	No. of Equipment Blanks [2]	No. of Ambient Blanks [3]	No. of Trip Blanks [4]	No. of Field Duplicates [5]	No. of MS/MSD [6]	Total No. of Samples
SWMU 54	SW8260B	Sediment	2	1	0	1	1	0	5
	SW8270C	Sediment	2	1	0	0	1	0	4
	SW8080A	Sediment	2	1	0	0	1	0	4
	SW8141A	Sediment	2	1	0	0	1	0	4
	SW8151A	Sediment	2	1	0	0	1	0	4
	SW8280A	Sediment	2	1	0	0	1	0	4
	SW9012A	Sediment	2	1	0	0	1	0	4
	SW9030A	Sediment	2	1	0	0	1	0	4
	SW6010B	Sediment	2	1	0	0	1	0	4
	SW7471A	Sediment	2	1	0	0	1	0	4

Table 3.9
Surface Water Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples[1]	No. of Equipment Blanks[3]	No. of Ambient Blanks[4]	No. of Trip Blanks[5]	No. of Field Duplicates[6]	No. of MS/MSD[7]	Total No. of Samples[2]
SWMU 54	SW8260B	Surface water	2	0	0	1	1	0	4
	SW8270C	Surface water	2	0	0	0	1	0	3
	SW8080A	Surface water	2	0	0	0	1	0	3
	SW8141A	Surface water	2	0	0	0	1	0	3
	SW8151A	Surface water	2	0	0	0	1	0	3
	SW8280A	Surface water	2	0	0	0	1	0	3
	SW9012A	Surface water	2	0	0	0	1	0	3
	SW9030A	Surface water	2	0	0	0	1	0	3
	SW6010B	Surface water	2	0	0	0	1	0	3
	SW7471A	Surface water	2	0	0	0	1	0	3

TAB

Section 4

4.0 DATA ASSESSMENT, RECORDS, AND REPORTING REQUIREMENTS

The following sections provide an explanation for procedures that are used in the verification and maintenance of data, and how data will be reported throughout the course of the investigation.

4.1 DATA ASSESSMENT

The project chemist will review all data received from the laboratory. This review consists of the following:

- **Sample Analysis Completeness** - Were all samples analyzed? Were samples analyzed for the parameters listed in the work plans?
- **Evaluation of Holding Times** - Were samples analyzed within the specified holding and extraction times?
- **Evaluation of Quality Control** - Were standard curves within method control limits? Were preparation and method blanks contaminated? Were continuing calibration standards in control? Were matrix spikes (MSs) and matrix spike duplicates (MSDs) performed? How did field duplicates compare? Were corrective actions taken?
- **Establishment of Detection Limits** - Were detection limits met? If not, why?

The project chemist utilizes "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis" (EPA, 1988) and "National Functional Guidelines for Organic Data Review" (EPA, 1991c) as guidance documents for data validation.

In general, for the gas chromatograph (GC), an initial 5-point calibration must exhibit a response factor (RF) of less than 20 percent relative standard deviation (RSD) or a calibration curve with a correlation coefficient of greater than 0.995, and the continuing calibration check standard should not vary over 15 percent of the initial calibration. Retention time windows must be established for each specific GC column initially, followed by daily retention time windows. Quality control check standards must be analyzed for every analytical batch, method blanks for every analytical batch, and a MS and MSD pair for every 20 samples. Surrogates must be added to all standards, blanks, and samples.

If any data points are qualified, they will receive the data qualifiers described on Table 8.1 of the Basewide Quality Assurance Project Plan (QAPP) (HydroGeoLogic, 2000). The data associated with compounds/analytes that exhibit either poor response, poor percent difference, or relative percent difference in the initial calibration or continuing calibration standards, or poor recoveries in the laboratory control sample (LCS) are considered quantitative estimates and are flagged (J, UJ, or R) accordingly. If the internal standard (IS) or surrogate fails criteria (after corrective action was taken), compounds associated with the IS or surrogates would be flagged (J, UJ, or R) as estimated. If sample analysis exceeded holding times, the data would be flagged as estimated (J, UJ, or R). If the method blank was contaminated with common laboratory chemicals or field contamination, any result less than or equal to 10 times that found in the blank would be flagged as estimated (U) (for common organics, less than or equal to 5 times for uncommon organics and for any inorganics). When data exhibit several deficiencies resulting in poor quality assurance (QA) and quality control (QC) support, then the data is rejected, considered unusable, and flagged with an "R." Any MS/MSD data would be reviewed separately and qualified based on all the data available. Estimated data is not necessarily unusable data. All project-wide precision, accuracy, and completeness goals will be reviewed, and the data will be validated according to these goals. If these goals are not met, resampling and analysis may be necessary.

The project chemist also reviews the field and office sampling records made during sample collection along with the results from the field QC samples. This review consists of the following:

- **Field Record Completeness**: Were all field analyses performed as planned? Were all field samples collected as directed in the work plans? Were any problems encountered and how were they resolved? Were all field records complete?

- **Sampling and Decontamination Procedures Review**: Were all field duplicates collected? How did they compare? Were all rinsates collected? Did these rinsates show contamination? Were the trip blanks contaminated? Did samples arrive intact and in proper shipping protocol?

- **Identification of Valid Samples**: Were samples collected using the proper protocol? Were there probable sources of potential contamination during sampling?

- **Correlation of Field Test Data and Identification of Anomalous Field Test Data**: Did different methods of measurement for the same test correlate?

Review of the results of the field QC data such as rinsates, trip blanks, and duplicates can help in assessing sample integrity. The field data and laboratory data will be reviewed and evaluated to the established data quality objectives. Data quality evaluations will be performed on all NAS Fort Worth JRB samples (100 percent). However, formal data validation will only be conducted on 10 percent of the samples collected from each media of concern during this investigation.

4.2 RECORD KEEPING

Records of field and laboratory activities will be documented on standard forms (Appendix D) as noted in the accompanying FSP. Project data such as geophysical surveys, groundwater level measurements, boring logs, survey data, well construction forms, chain-of-custody forms, and equipment calibration logs will be reviewed for accuracy and completeness. These documents will be reviewed by the Project Manager daily and retained in the project files.

4.3 REPORTING REQUIREMENTS

4.3.1 RCRA Facility Investigation

The primary report of the project will be the RFI based on the investigation and reporting requirements of the NAS Fort Worth JRB HW-50289 permit. The RFI report will be submitted as required by Provision VIII.D of the HW-50289 permit once each of the subject sites have been fully characterized.

The report will characterize the environmental conditions at each site, check each sample package for completeness and quality, evaluate data from each site, and recommend a future course of action for each site. Each site potentially has one of two recommended future courses: no or limited action, or advancement to a CMS.

If the SWMU cannot attain closure under RRS 1 or RRS 2, then a CMS will be required. Sites continuing to the CMS will be screened for potential remedial alternatives. One alternative will be selected and proposed as the remedial action to be conducted at the site.

4.3.2 Corrective Measures Study

The purpose of the CMS is to develop and evaluate potential remedial alternatives and to propose the appropriate corrective measure. An evaluation of the risk to human health and the environment will be evaluated in the CMS based on the results of the RFI. The corrective action that best reduces the risks to human health and the environment to acceptable levels will be proposed.

4.3.3 Corrective Measures Implementation Plan

A Corrective Measures Implementation Plan (CMI) will be submitted for sites where the RFI results indicate that remediation is warranted. The CMI work plan details the specific activities that will be undertaken to implement the remedial action. The remedial action alternative selected for an individual site will be based on the alternatives presented in the CMS. The recommendation presented will include preliminary designs, site specific drawings, cost estimates, and schedules for the remedial action. The CMI work plan may be submitted along with the CMS, or the CMS and CMI may be submitted separately.

4.3.4 Decision Documents

If a release of hazardous constituents was not identified at a SWMU, or if the nature and extent of contamination has been defined and the site has attained closure/remediated to RRS 1 or RRS 2 levels, then the RFI report shall also serve the purpose of a Final Closure Report (i.e., NFA decision document). A deed certification (as the CMI) and public notice of the remedy decision is still under an RRS 2 closure.

TAB

Section 5

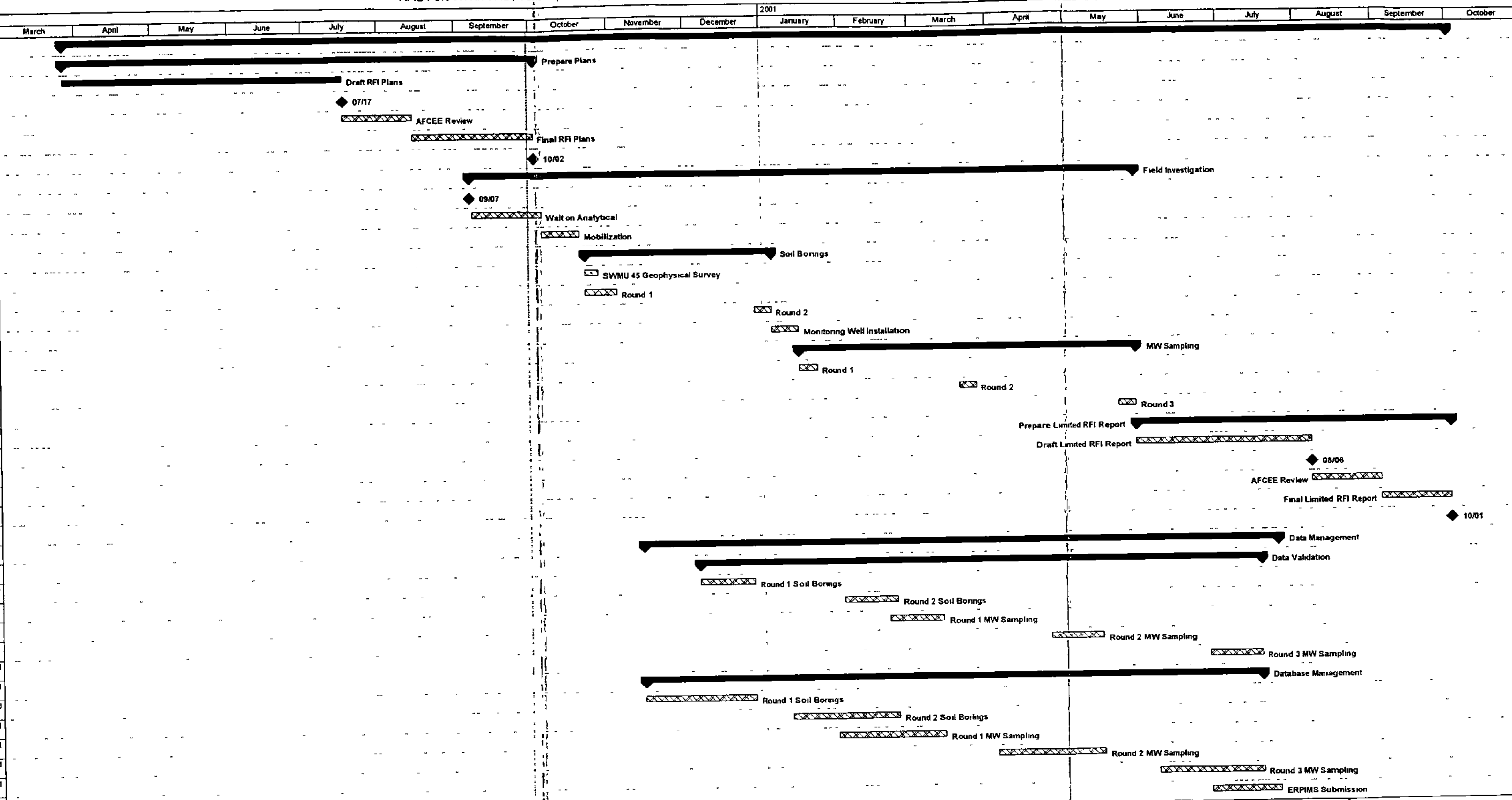
5.0 PROJECT SCHEDULE

The activities described in this WP will be implemented in accordance with the schedule provided in Figure 5.1. The starting date for the field effort will be the date of agency concurrence of the relevant portions of the WP. If possible, this schedule will be accelerated with select activities (e.g., procurement of materials and supplies) occurring when resolution of significant technical issues is made between NAS Fort Worth JRB and regulatory agencies.

FIGURES

Figure 5 1
Project Schedule
Limited RFI at SWMUs 45, 54, & 55
NAS Fort Worth JRB, Texas (Delivery Order No 0033)

ID	WBS	Task Name	Duration	Start	Finish
1	33B	Limited RFI SWMUs 45, 54, and 55	389 days	03/27/00	10/01/01
2	33BA	Prepare Plans	133 days	03/27/00	10/02/00
3	33BAA	Draft RFI Plans	79 days	03/27/00	07/17/00
4		Submit Draft RFI Plans	0 days	07/17/00	07/17/00
5		AFCEE Review	20 days	07/18/00	08/14/00
6	33BAB	Final RFI Plans	34 days	08/15/00	10/02/00
7		Submit Final RFI Plans	0 days	10/02/00	10/02/00
8	33BB	Field Investigation	184 days	09/07/00	05/28/01
9		Sample SWMU 55	1 day	09/07/00	09/07/00
10		Wait on Analytical	20 days	09/08/00	10/05/00
11	33BBA	Mobilization	10 days	10/06/00	10/20/00
12	33BBB	Soil Borings	51 days	10/23/00	01/04/01
13	33BBBA	SWMU 45 Geophysical Survey	5 days	10/23/00	10/27/00
14	33BBBA	Round 1	10 days	10/23/00	11/03/00
15	33BBBB	Round 2	5 days	12/29/00	01/04/01
16	33BBC	Monitoring Well Installation	7 days	01/05/01	01/15/01
17	33BBD	MW Sampling	95 days	01/16/01	05/28/01
18	33BBDA	Round 1	5 days	01/16/01	01/22/01
19	33BBDB	Round 2	5 days	03/20/01	03/26/01
20	33BBDC	Round 3	5 days	05/22/01	05/28/01
21	33BC	Prepare Limited RFI Report	90 days	05/29/01	10/01/01
22	33BCA	Draft Limited RFI Report	50 days	05/29/01	08/06/01
23		Submit Draft Limited RFI Report	0 days	08/06/01	08/06/01
24		AFCEE Review	20 days	08/07/01	09/03/01
25	33BCB	Final Limited RFI Report	20 days	09/04/01	10/01/01
26		Submit Final Limited RFI Report	0 days	10/01/01	10/01/01
27	33BD	Data Management	178 days	11/14/00	07/23/01
28	33BDA	Data Validation	158 days	12/06/00	07/16/01
29		Round 1 Soil Borings	15 days	12/06/00	12/27/00
30		Round 2 Soil Borings	15 days	02/02/01	02/22/01
31		Round 1 MW Sampling	15 days	02/20/01	03/12/01
32		Round 2 MW Sampling	15 days	04/24/01	05/14/01
33		Round 3 MW Sampling	15 days	06/26/01	07/16/01
34	33BDB	Database Management	173 days	11/14/00	07/16/01
35		Round 1 Soil Borings	30 days	11/14/00	12/27/00
36		Round 2 Soil Borings	30 days	01/12/01	02/22/01
37		Round 1 MW Sampling	30 days	01/30/01	03/12/01
38		Round 2 MW Sampling	30 days	04/03/01	05/14/01
39		Round 3 MW Sampling	30 days	06/05/01	07/16/01
40	33BDC	ERPIMS Submission	20 days	06/26/01	07/23/01



POP 3/13/00 6/30/01
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TAB

Field Sampling Plan

FINAL
FIELD SAMPLING PLAN
LIMITED RCRA FACILITY INVESTIGATION OF SWMUs 45, 54, AND 55 AT NAS FORT WORTH JRB, TEXAS

Prepared for

U.S. Air Force Center for Environmental Excellence
Brooks AFB, Texas

Contract Number F41624-95-D-8005

Prepared by

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September 2000

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AFB	Air Force Base
AFCEE	U.S. Air Force Center for Environmental Excellence
ASTM	American Society for Testing and Materials
bgs	below ground surface
BRAC	Base Realignment and Closure
°C	degrees Celsius
CFR	Code of Federal Regulations
COC	chain-of-custody
DNAPL	dense non-aqueous phase liquids
DO	dissolved oxygen
DPT	direct push technology
EC	electrical conductivity
EM	electromagnetic induction
EPA	U.S. Environmental Protection Agency
ERPIMS	Environmental Resources Program Information Management System
Fe	iron
FSP	Field Sampling Plan
HSA	hollow-stem auger
HSO	Health and Safety Officer
HSP	Health and Safety Plan
HW	hazardous waste
HydroGeoLogic	HydroGeoLogic, Inc.
IDW	investigative derived waste
IRP	Installation Restoration Program
IT	International Technology Corporation
JRB	Joint Reserve Base
L/min	liter per minute
LNAPL	light non-aqueous phase liquid
MS	matrix spike
MSD	matrix spike duplicate
NAS	Naval Air Station
NGVD	National Geodetic Vertical Datum

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
ORP	oxidation-reduction potential
OVA	organic vapor analyzer
OWS	oil/water separator
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
PM	Project Manager
POC	point-of-contact
POL	petroleums, oils, and lubricants
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RRS	Risk Reduction Standards
SAP	Sampling and Analysis Plan
SC	specific conductivity
SI	Site Investigation
SVOC	semi volatile organic compound
SWMU	solid waste management unit
TAC	Texas Administrative Code
TNRCC	Texas Natural Resource Conservation Commission
UN	United Nations
USAF	United States Air Force
USCS	United Soil Classification System
USGS	U. S. Geological Survey
UST	underground storage tank
VOC	volatile organic compound
WP	Work Plan

FINAL
FIELD SAMPLING PLAN
LIMITED RCRA FACILITY INVESTIGATION OF
SWMUs 45, 54, AND 55 AT
NAS FORT WORTH JRB, TEXAS

1.0 INTRODUCTION

The Field Sampling Plan (FSP) presents the requirements and procedures for conducting field operations and investigations at the Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), formerly known as Carswell Air Force Base (AFB). This project specific FSP has been prepared to ensure that (1) the data quality objectives specified for this project are met, (2) the field sampling protocols are documented and reviewed in a consistent manner, and (3) the data collected are scientifically valid and defensible. This site specific FSP and the Basewide Quality Assurance Project Plan (QAPP) (HydroGeoLogic, Inc. [HydroGeoLogic], 2000), shall constitute, by definition, the Sampling and Analysis Plan (SAP).

Guidelines followed in the preparation of this plan are set out in the Resource Conservation and Recovery Act (RCRA) Hazardous Waste (HW) permit number HW-50289 issued by the Texas Natural Resource Conservation Committee (TNRCC) on February 7, 1991. Additional reference documents followed in the preparation of this FSP include the U.S. Air Force Center for Environmental Excellence (AFCEE) "AFCEE's Model Field Sampling Plan" (AFCEE, 1996) and the "Handbook for the Installation Restoration Program (IRP) for Remedial Investigations and Feasibility Studies" (AFCEE, 1993).

This FSP is required reading for all staff participating in the work effort. The FSP shall be in the possession of the field teams during sample collection. HydroGeoLogic and its subcontractors shall be required to comply with the procedures documented in this FSP in order to maintain comparability and representativeness of the collected and generated data.

Controlled distribution of the Final FSP shall be implemented by HydroGeoLogic to ensure that the current approved version is being used. A sequential numbering system shall be used to identify controlled copies of the Final FSP. Controlled copies shall be provided to applicable United States Air Force (USAF) managers, regulatory agencies, remedial project managers (PMs), and quality assurance (QA) coordinators. Whenever USAF revisions are made or addenda added to the FSP, a document control system shall be put into place to ensure that (1) all parties holding a controlled copy of the FSP shall receive the revisions/addenda, and (2) outdated material is removed from circulation. The document control system does not preclude making and using copies of the FSP; however, the holders of controlled copies are responsible for distributing additional material to update any copies within their organizations. The distribution list for controlled copies shall be maintained by HydroGeoLogic.

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2.0 PROJECT BACKGROUND

The following sections briefly describe the project objectives and present site descriptions for this FSP.

2.1 SITE HISTORY

Carswell AFB was officially closed on September 30, 1993. A parcel of the former Carswell AFB, NAS Fort Worth JRB, is in the process of being transferred from USAF to U.S. Navy management. Before the property transfer can be completed, required environmental investigations of potential contamination related to USAF activities at the NAS Fort Worth property are to be completed and contaminated sites are to be remediated.

This investigation will be managed by the USAF under the Environmental Restoration Account. Other portions of the former Carswell AFB that are not being transferred to the U.S. Navy remain under Base Realignment and Closure (BRAC) funding and management.

2.2 PROJECT OBJECTIVES

The overall objective of this project, and purpose of the field investigations, is to gather sufficient data to obtain closure of three solid waste management units (SWMUs) under the TNRCC Risk Reduction Standards (RRS) program. An overview of the RRS program is presented in Section 4.1 of the Work Plan (WP). In addition, the SWMUs at NAS Fort Worth JRB are subject to the specific requirements of the TNRCC Permit HW-50289. Specific permit requirements are discussed in greater detail in Section 3.2 of the WP.

In order to obtain closure of the three subject SWMUs, an investigation will be conducted at each site in order to determine if hazardous constituents have been released into the environment. The four primary objectives for this project are as follows:

- Determine if SWMU 45 exists.
- Determine if a release from the units has occurred.
- If contamination is encountered, characterize the nature and extent of the contamination.
- Determine the appropriate RRS to be used for closure at each site.

These objectives are discussed in greater detail in Section 3.4 of the WP. When delineation of the contamination is complete at each of the SWMUs, the data will be compiled and presented in a RCRA Facility Investigation (RFI) Report with a discussion of the RRS standard that is appropriate for closure at each of the sites.

Field studies that will be used to characterize these sites include the following:

- Geophysical investigations will be conducted using electromagnetic (EM) induction and metal detection methods. Data will be collected to determine the existence and/or extent of subsurface anomalies.

- Continuous soil borings from the ground surface to the top of the water table. Samples will be collected at 5-foot intervals with surface samples starting from 0 to 2 feet below ground surface (bgs) and subsurface samples starting at 5 to 7 feet bgs to determine the presence or absence of soil contamination at each location.

- Monitoring well installation and/or sampling. At sites where soil contamination is found, a minimum of one downgradient soil boring will be advanced to the top of the water table and further sampled every 5 feet for hydrogeologic characterization until bedrock is encountered. The boring will be completed as a monitoring well for groundwater sampling beneath the site. Where available, previous groundwater elevation data will be used to characterize aquifer conditions beneath the areas of interest.

2.3 PROJECT SITE DESCRIPTION

NAS Fort Worth JRB is located on 2,555 acres of land in Tarrant County, Texas, 8 miles west of downtown Fort Worth. The sites covered by this FSP are three SWMUs located throughout NAS Fort Worth JRB. These SWMUs are identified as follows:

- SWMU 45 (Building 1027 Waste Oil Tank Vault)
- SWMU 54 (Storm Water Interceptors)
- SWMU 55 (East Gate Oil/Water Separator)

The locations of the SWMUs in relation to the Base are presented on Figure 2.1. A detailed description of the sites to be investigated (i.e., SWMUs 45, 54, and 55) is provided in the WP. Please refer to the WP for project site descriptions.

2.4 PROJECT SITE CONTAMINATION HISTORY

Section 3.0 of the WP provides the history of environmental investigations conducted at each site and documents contamination discovered at each site. Please refer to this section for the investigative history of the sites.

3.0 PROJECT SCOPE AND DATA QUALITY OBJECTIVES

The following sections describe the objectives of the RFI and the specific field activities that will be conducted during the investigations.

3.1 DATA QUALITY OBJECTIVES

The data generated by this project must be of sufficient quality and quantity to support the overall project objective: the closure of three SWMUs located at NAS Fort Worth JRB under the TNRCC Risk Reduction Program. The objectives and focus of this work will be to characterize the nature and extent of any contamination detected.

Data from the following categories are required for this study:

Site Characterization - Data will be used to evaluate physical and chemical properties of soil and groundwater. The data will also be used to characterize the nature and extent of any contaminants detected.

Health and Safety - Data will be used to establish the level of protection needed for the work party and other site-related personnel. This data will be gathered during intrusive activities by the use of organic vapor monitors, Draeger tubes, and the explosimeter.

Site characterization data will be a combination of screening data and definitive data. Health and safety data will be collected as screening data. The definitions of screening data and definitive data, as established by the "Data Quality Objectives Process for Superfund Interim Final Guidance" (U.S. Environmental Protection Agency (EPA)/540/G-93/071, 1993), are described below:

- Screening Data with Definitive Confirmation - Screening data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data provides analyte identification and quantification. Although the quantification may be determined using analytical methods with QA/quality control (QC) procedures and criteria associated with definitive data, screening data without associated confirmation data are not considered to be data of known quality.

- Definitive Data - Definitive data will be generated using rigorous analytical methods, such as approved EPA reference methods. Data will be analyte-specific, with confirmation of analyte identity and concentration. These methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined.

The data generated by the laboratory analysis of samples must be sufficiently sensitive to allow comparison of the results to the TNRCC RRS. The Basewide QAPP (HydroGeoLogic, 2000) describes each method that will be performed as part of the investigation and outlines the quality assurance measures the contract laboratory must follow. The methods of analysis selected for samples collected from NAS Fort Worth JRB will produce screening as well as definitive data. Table 3.1 is a summary of the data quality levels and intended use for data collected during the RFI.

3.2 SAMPLE ANALYSIS SUMMARY

Provision VIII of Permit HW-50289 requires that soil and groundwater samples submitted for chemical analysis be analyzed in accordance with EPA SW-846 for all Appendix IX constituents, unless a shorter list can be justified. Table 3.2 provides a summary of the materials handled or potentially handled at each of the subject sites.

3.3 FIELD ACTIVITIES

The following sections describe the proposed field investigation activities for each site to be investigated during this study. More detailed descriptions of the rationale and justification for each of the proposed activities are presented in Section 3.0 of the WP.

The proposed field tasks described in this FSP will be conducted to achieve the project objectives as presented in Section 2.2. Field investigative activities will be conducted at three SWMUs. Table 3.3 provides a summary of the field activities at each site, and Tables 3.4 and 3.5 present the number of soil and groundwater samples to be collected and the analytical methods to be performed during the field investigation.

3.3.1 SWMU 45

As part of the WP preparation process, HydroGeoLogic conducted a records search and interviewed site personnel to determine the site history and exact configuration of SWMU 45. The records search included an attempt to obtain "as-built" plans for the tank vault and related oil/water separator (OWS) systems. Documentation confirming the existence, configuration, and location of SWMU 45 was not found.

Proposed investigation activities include the following:

- Perform a metal detection survey in and around the estimated location of SWMU 45 before any intrusive activities occur at the site in order to confirm the presence or absence of the tank vault and underground storage tank (UST). This survey will be performed using a Geonics EM61, an EM induction system. The Geonics EM61 instrument is described in Section 5.7.2.1. The proposed survey grid is depicted on Figure 3.2. If anomalies associated with a UST are identified at the site, two soil borings will be advanced as described below in the vicinity of the suspected tank vault. Depending upon the initial sampling results, additional direct push technology (DPT) borings may be advanced to delineate the extent of contamination, and one or more monitoring wells may be installed at the site. If no evidence of a tank vault is detected by the EM induction survey, no intrusive investigation will be performed at SWMU 45.

If a former or existing tank vault is confirmed at SWMU 45, the two soil borings will be advanced in the vicinity of the structure. The locations of these borings will be placed to determine if contamination is present in soils surrounding the tank vault location, as well as to more fully characterize the entire area. Each boring will be advanced to the top of the water table using a DPT rig, and soil samples will be collected in 5-foot intervals from the ground surface to the water table. Figure 3.2 illustrates the proposed soil boring locations.

The analytical results of these samples are intended to characterize conditions at the site, and to determine if a release from the tank vault has occurred. A specific list of the types of waste handled at SWMU 45 are included in Table 1.1. A field activities summary is shown on Table 3.5, and a summary of the proposed sampling and analyses is presented in Tables 3.6 and 3.7. Based on the wastes handled at SWMU 45 during the time this site was operational, all soil samples will be analyzed for the following reduced list of Appendix IX analyses:

<u>Appendix IX</u>

- SW8260B - Volatile organic compounds (VOCs)
- SW8270C - Semivolatile organic compounds (SVOCs)
- SW6010B - metals
- SW7471A - mercury

Soil analytical results are intended to determine and characterize the extent to which the wastes handled at SWMU 45 may have been released to the environment. This will be accomplished by attempting to define the vertical and lateral extent of all analytical detections that exceed RRS1 levels.

A second round of boreholes may be advanced if the proposed samples identify contamination above RRS 1. The location of these holes would be placed in order to further define the lateral and vertical extent of contamination at the site.

After receiving analytical results of the soil investigation, an additional mobilization may occur to install a monitoring well. A hollow-stem auger (HSA) rig will be used and samples will be logged continuously from the water table until bedrock is encountered. This boring will be completed as a monitoring well in order to characterize the groundwater at the site. The selected location for monitoring well installation may change based on initial soil analytical results. A groundwater sample may also be collected from the nearby existing well WITCTA037, installed by International Technology Corporation (IT) at the SWMU 44 parcel.

Three rounds of bimonthly groundwater sampling will be conducted (as outlined in the permit description in Section 3.2) for the analytical methods identified by the soil sampling results. As stated in Section 3.2, well samples will be analyzed for all Appendix IX constituents unless a shorter list can be justified. Additional soil borings and or monitoring wells may be installed at a later date if necessary, in order to delineate the extent of any contamination not completely delineated during the initial investigation.

3.3.2 SWMU 54

Proposed field activities at SWMU 54 include:

- Limited visual inspection of the integrity of the Interceptor 004 unit and surrounding outfall basin.

- The installation of two soil borings and, if needed, the collection of surface water and sediment samples for laboratory analyses. Because storm water from Interceptors 001, 003, 005, and 006 is diverted through Interceptor 004, this sampling will take place in the vicinity of that unit.

- If needed, the installation of at least one groundwater monitoring well to evaluate the condition of local groundwater.

- Assessment of the current status of the installation's NPDES permit, review of readily available NPDES sampling data from periods when the system was fully active, and determination of the applicability of that data to the limited RFI at SWMU 54.

One soil boring will be advanced in the grass adjacent to the southeast end of Interceptor 004, close to the pump well that directs flow from that unit toward the OWS (SWMU 55). The second boring will be placed adjacent to, and halfway along, the stormwater line passing from SWMU 54 to SWMU 55. The boring location is placed to characterize soils in the vicinity of the point where flow from the entire interconnected storm water system would have passed. Both borings will be advanced to the top of the water table and soil samples will be collected in 5-foot intervals from the ground surface to the water table. Figure 3.4 illustrates the proposed soil boring location.

The examination of the installation's NPDES permits may determine if surface water at Interceptor 004 is periodically tested. If points at SWMU 54 or 55 have not been sampled under the NPDES program, additional sampling may be carried out as follows: A surface water and sediment sample may be collected just below the outfall flume at the east end of the Interceptor 004 containment basin. This sampling point is along the pathway taken by overflow storm water during heavy rainfall events. A second surface water and sediment sample may be collected farther east along the same flow pathway, at a point just below the confluence where storm water from the aqueous phase in the OWS (SWMU 55) is released into the stream.

The analytical results of these samples are intended to characterize the condition of site soils, surface water, and sediments, and to determine if contamination from storm water interflow through SWMU 54 components has affected the surrounding environment. A specific list of the types of wastes received at SWMU 54 is included in Table 1.1. A field activities summary is shown on Table 3.5, and a summary of the proposed sampling and analyses is presented in Tables 3.6 and 3.7. As there is no historic chemical data at SWMU 54, all soil samples will be analyzed for the following full Appendix IX suite.

Appendix IX

- SW8260B - VOCs
- SW8270C - SVOCs
- SW8080A - organochlorine pesticides and polychlorinated biphenyls (PCBs)
- SW8141A - organophosphorus pesticides
- SW8151A - chlorinated herbicides
- SW8280A - dioxins and furans
- SW9012A - cyanide
- SW9030A - sulfide
- SW6010B - trace elements (metals)
- SW7471A - mercury

Soil analytical results from SWMU 54 are intended to characterize the nature and extent of wastes released into the environment.

A second round of boreholes may be advanced if the proposed samples identify contamination above RRS 1 The location of these holes would be placed in order to further define the lateral and vertical extent of contamination at the site.

After receiving analytical results from the soil investigation, an additional mobilization may occur to install a monitoring well at the location of the borehole advanced near Interceptor 004. A HSA drill rig will be used and samples will be logged continuously from the water table until bedrock is encountered. The well will be used to characterize groundwater at the site. The selected location for the monitoring well may change based on the initial soil analytical results. The proposed monitoring well location is depicted in Figure 3.4.

Three rounds of bimonthly groundwater sampling will be conducted (as outlined in the permit description in Section 3.2) for the analytical methods identified by the soil sampling results. As stated in Section 3.2, well samples will be analyzed for all Appendix IX constituents unless a shorter list can be justified. If necessary, additional soil borings and/or monitoring wells may be installed at a later date in order to further delineate any contamination encountered during the initial investigation.

3.3.3 SWMU 55

Proposed field activities include the following:

- Sample and then remove contents of the OWS.
- Visual inspection of the integrity of the OWS structure.
- Installation of borings for visual observation and chemical analysis of surface and subsurface soils.
- If needed, installation of temporary piezometers to determine groundwater flow direction; then installation of monitoring wells to evaluate the condition of local groundwater.
- Sampling of surface water and sediment at the discharge point from the unit.
- Assessment of the current status of the installation's NPDES permit, review of readily available NPDES sampling data from periods when the system was fully active, and determination of the applicability of that data to the limited RFI at SWMU 55.

Before intrusive activities commence, the OWS unit will be examined to determine if the system has sustained any structural damage from weathering, settling, or operations that could result in a breach to the containment cells. If present, water, sediment, and other residue will be sampled and then removed from each basin. The entire unit will then be inspected to evaluate the structural integrity and general overall condition of the OWS system. Significant features will be photographed and all observations will be recorded and documented as part of this investigation.

In order to characterize conditions in the vicinity of SWMU 55 and to determine if storm water passing through the OWS system has released contaminants into the environment, soils adjacent to the OWS will be sampled at the surface and at depth. A minimum of four soil borings will be advanced at SWMU 55 using a DPT rig. Figure 3.5 illustrates the proposed soil boring locations. One boring will be placed on each of three sides of the OWS unit, adjacent to the north, south, and east edge of the concrete containment structure. These boreholes will be drilled through an asphalt pad that surrounds the OWS unit. A fourth boring will be located at the outfall end of a spillway that drains surface water from the asphalt pad. Each boring will be advanced to a depth of at least 2 feet below groundwater or to bedrock. Continuous cores will be used to evaluate the physical characteristics of the soil and/or waste. All soil samples will be collected at 5-foot intervals from the ground surface to the water table, and submitted for chemical analyses. As there is no historic chemical data at SWMU 55, all soil samples will be analyzed for the following full Appendix IX suite.

Appendix IX

- SW8260B - VOCs
- SW8270C - SVOCs
- SW8080A - organochlorine pesticides and PCBs
- SW8141A - organophosphorus pesticides
- SW8151A - chlorinated herbicides
- SW8280A - dioxins and furans
- SW9012A - cyanide
- SW9030A - sulfide
- SW6010B - trace elements (metals)
- SW7471A - mercury

A field activities summary is shown on Table 3.5, and a summary of the proposed sampling and analyses is presented in Tables 3.6 and 3.7.

While the subsurface investigation is in progress, research will be conducted to ascertain the current status of NPDES permits at NAS Fort Worth JRB, and to determine if periodic NPDES sampling has been conducted in the SWMU 55 area. Contingent upon the findings of that research, one or more surface water and sediment samples (as described in Section 3.5.2.2 above) may be collected along the outfall stream that carries discharges from the aqueous phase of the OWS and from the Interceptor 004 overflow channel toward the West Fork of the Trinity River.

A second round of boreholes may be advanced if the proposed samples identify contamination above RRS 1. The location of these holes would be placed in order to further define the lateral and vertical extent of contamination at the site.

If contamination is detected during the soil investigation, an additional mobilization may occur to install monitoring wells. Although groundwater flow at NAS Fort Worth JRB is generally from west to east across the base, localized variations in groundwater flow directions exist. The soil borings will be converted into temporary piezometers that will be used to evaluate the groundwater flow direction prior to the installation of any monitoring wells. After groundwater flow patterns have been established, at least one monitoring well may be installed using a HSA rig. Each of these borings will be completed 1 foot into the bedrock. Proposed piezometer and monitoring well locations are depicted on Figure 3.5.

Three rounds of bimonthly groundwater sampling will be conducted (as outlined in the permit description in Section 3.2) for the analytical methods identified by the soil sampling results. As stated in Section 3.2, well samples will be analyzed for all Appendix IX constituents unless a shorter list can be justified. Additional soil borings and/or monitoring wells may be installed at a later date to delineate the extent of any contamination found to be originating from SWMU 55.

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4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Figure 4.1 shows the project organization, reporting relationships, and lines of authority. Table 4.1 lists key project personnel and their respective telephone numbers. Other personnel will be assigned as necessary. The specific responsibilities are described in the following subsections.

4.1 MANAGEMENT RESPONSIBILITIES

4.1.1 Program Manager

The Program Manager's responsibilities will include the following:

- Reviewing and approving the WP, QAPP, FSP, and Health and Safety Plan (HSP)
- Providing sufficient resources to the project team so that it can respond fully to the requirements of the investigation
- Providing direction and guidance to the PM
- Reviewing the final project report
- Providing other responsibilities as requested by the PM

4.1.2 Project Manager

The PM will be the prime point of contact with AFCEE and will have primary responsibility for technical, budget, and scheduling matters. PM duties will include:

- Reviewing and approving project plans and reports
- Assigning duties to the project staff and orienting the staff to the needs and requirements of the project
- Obtaining the approval of the QA Manager for proposed variances to the WP and FSP
- Supervising the performance of project team members
- Providing budget and schedule control
- Reviewing subcontractor work and approving subcontract invoices

- Ensuring that major project deliverables are reviewed for technical accuracy and completeness before their release, including data validity
- Ensuring that all resources of the laboratory are available on an as-required basis
- Overseeing final analytical reports

4.2 QA AND HEALTH AND SAFETY RESPONSIBILITIES

4.2.1 QA Manager

Responsibilities of the QA Manager will include:

- Serving as official contact for QA matters for the project
- Identifying and responding to QA/QC needs and problem resolution needs
- Answering requests for guidance or assistance
- Reviewing, evaluating, and approving the FSP and QAPP and all changes to these documents
- Verifying that appropriate corrective actions are taken for all nonconformances
- Verifying that appropriate methods are specified in the FSP and QAPP for obtaining data of known quality and integrity
- Fulfilling other responsibilities as requested by the PM
- Evaluating subcontractor quality program
- Training staff on QA subjects
- Supervising staff in QA Program related tasks
- Recommending changes in the QA Program

4.2.2 Health and Safety Officer

Responsibilities of the Health and Safety Officer (HSO) will include:

- Developing the HSP

- Ensuring that the requirements of the QAPP are satisfied

- Providing other responsibilities as identified in the HSP

4.3 LABORATORY RESPONSIBILITIES

4.3.1 Laboratory Project Manager

The laboratory's PM will report directly to HydroGeoLogic's PM and will be responsible for the following:

- Ensuring that all resources of the laboratory are available on an as-required basis

- Overseeing final analytical reports

4.3.2 Laboratory Operations Manager

The laboratory's Operation Manager will report to the laboratory's PM and will be responsible for the following:

- Coordinating laboratory analyses

- Supervising in-house chain-of-custody (COC)

- Scheduling sample analyses

- Overseeing data review

- Overseeing preparation of analytical reports

- Approving final analytical reports prior to submission to HydroGeoLogic

4.3.3 Laboratory QA Officer

The laboratory's QA officer has the overall responsibility for data after it leaves the laboratory. The QA officer will be independent of the laboratory but will communicate data issues through the laboratory's PM. In addition, the QA officer will be responsible for the following:

- Conduct audits of laboratory analyses

- Provide oversight of laboratory QA

- Provide oversight of QA/QC documentation

- Conduct detailed reviews of data
- Determine whether to implement laboratory corrective actions, if required
- Define appropriate laboratory QA procedures
- Prepare laboratory Standard Operation Procedures

4.3.4 Laboratory Sample Custodian

The laboratory's Sample Custodian will report to the Operations Manager. Responsibilities of the Sample Custodian will include:

- Receiving and inspecting the incoming sample containers
- Recording the condition of the incoming sample containers
- Signing appropriate documents
- Verifying COC and its correctness
- Notifying laboratory manager and laboratory supervisor of sample receipt and inspection
- Assigning a unique identification number and customer number, and entering each into the sample receiving log
- Initiating transfer of the samples to appropriate lab sections with the help of the laboratory operations manager
- Controlling and monitoring access/storage of samples and extracts

4.4 FIELD RESPONSIBILITIES

4.4.1 Project Geologist

The Project Geologist will be responsible for geologic interpretations as well as acting as lead coordinator for field activities. The Project Geologist's duties and responsibilities will include:

- Providing orientation and any necessary training to field personnel (including subcontractors) on the requirements of the FSP, HSP, and QAPP before the start of work
- Providing direction and supervision to the sampling crews

- Monitoring sampling operations to ensure that the sampling team members adhere to the QAPP and FSP
- Ensuring the use of calibrated measurement and test equipment
- Maintaining a field records management system
- Coordinating activities with the PM
- Supervising geological data interpretation activities
- Overseeing field data documentation and conducting quality checks on interpretive geologic work products
- Reviewing reports for compliance with State of Texas and EPA requirements
- Assuming the duties of the HSO if directed by the HSO

4.5 SUBCONTRACTORS

Subcontractors will be used for the laboratory analyses, and the drilling of soil borings and monitoring wells during the field investigation.

Qualified subcontractors will be selected in accordance with AFCEE requirements and HydroGeoLogic procurement and QA procedures. Subcontractors will meet predetermined qualifications developed by the PM and defined in the procurement bid packages. Each bid submitted will be reviewed for technical, QA, and purchasing requirements. All subcontractors will be required to follow the procedures of the WP, FSP, QAPP, and HSP. Periodic QC inspections of each subcontractor may be performed as specified in the FSP (Section 7.4), QAPP (Section 9.1), and HSP (Section 1.3.2). These inspections will be performed by the QA Manager, or his designee, as unannounced audits to confirm adherence to the procedures and guidance outlined in the aforementioned documents. Such inspections may relate to health and safety, QAPP requirements, or field standard operating procedures.

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5.0 FIELD OPERATIONS

The overall project field logistics and activities necessary to complete the project sampling objectives described in the WP are presented in this section. All field work will be conducted in accordance with the site HSP. HydroGeoLogic is the prime contractor for the field investigation. The point-of-contact (POC) at the Base will be Mr. Michael Dodyk.

5.1 GEOLOGIC STANDARDS

The lithologic descriptions for consolidated materials (igneous, metamorphic, and sedimentary rocks) shall follow the standard professional nomenclature (cf. Tennissen, A.C., 1983, Nature of Earth Materials, 2nd Edition, p. 204-348), with special attention given to describing fractures, vugs, solution cavities and their fillings or coatings, and any other characteristics affecting permeability. Colors shall be designated by the Munsell Color System.

The lithologic descriptions for unconsolidated materials (soils [engineering usage] or deposits) shall use the name of the predominant particle size (e.g., silt, fine sand, etc.). The dimensions of the predominant and secondary sizes shall be recorded using the metric system. The grain size and name of the deposit shall be accompanied by the predominant mineral content, accessory minerals, color, particle angularity, and any other characteristics The classic deposit descriptions shall include, as a supplement, symbols of the Unified Soil Classification System (USCS). The color descriptions shall be designated by the Munsell Color System.

The scales for maps, cross sections, or three-dimensional (3-D) diagrams shall be selected in accordance with the geologic and hydrologic complexity of the area and the purposes of the illustrations Geophysical logs shall be run at a constant vertical scale of 1 inch equals 20 feet. When geophysical logs are superimposed on geologic logs, cross sections, or 3-D diagrams, the scales shall be the same. If defining geological conditions requires other scales, additional logs at those scales shall be provided.

For orientation, the cross sections shall show the northern end on the viewer's right. If the line of cross section is predominantly East-West, the eastern end is on the right. Maps shall be oriented with North toward the top, unless the shape of the area dictates otherwise. The orientation will be indicated with a North arrow.

5.2 SITE RECONNAISSANCE, PREPARATION, AND RESTORATION PROCEDURES

Areas designated for intrusive sampling shall be surveyed for the presence of underground utilities. Utility locations are determined using existing utility maps and are verified in the field using a hand-held magnetometer or utility probe. Prior to commencement of drilling activities, digging permits will be obtained from NAS Fort Worth JRB. The base civil engineer will be contacted to verify that selected locations are free of underground utilities. Those locations not clear of underground utilities will be relocated to achieve clearance, and then verified for clearance a second time Vehicle access routes to sampling locations shall be determined prior to any field activity.

A centralized decontamination area shall be provided for drilling rigs and equipment. The decontamination area shall be large enough to allow storage of cleaned equipment and materials prior to use, as well as to stage drums of decontamination waste. The decontamination area shall be lined with a heavy gauge plastic sheeting, and designed with a collection system to capture decontamination waters. Solid wastes shall be accumulated in 55-gallon drums and subsequently transported to a waste storage area designated by the USAF. Smaller decontamination areas for personnel and portable equipment shall be provided as necessary. These locations shall include basins or tubs to capture decontamination fluids, which shall be transferred to a large accumulation tank as necessary. These designated areas of decontamination shall be determined during the pre-construction meeting. The field office and the primary staging area for field equipment and supplies will be located at 6560 White Settlement Road.

Each work site or sampling location shall be returned to its original condition when possible. Efforts shall be made to minimize impacts to work sites and sampling locations, particularly those in or near sensitive environments such as wetlands. Following the completion of work at a site, all drums, trash, and other waste shall be removed. Decontamination and/or rinse water and soil cuttings shall be transported to the designated locations as described in Section 5.9. At the completion of field activities, all capital equipment and consumable materials will be removed or turned over to base personnel in accordance with AFCEE procedures. A final site walk will be conducted with the base representative, at his/her discretion, to ensure that all sampling locations have been restored satisfactorily before final demobilization from the site.

5.3 BOREHOLE DRILLING, LITHOLOGIC SAMPLING, LOGGING, AND ABANDONMENT

5.3.1 General Drilling Procedures

All drilling activities shall conform with state and local regulations and will be supervised by a professional geologist or engineer. HydroGeoLogic will obtain and pay for all permits, applications, and other documents required by state and local authorities.

The location of all borings will be coordinated, in writing, with the base civil engineer, or equivalent, before drilling commences. Soil borings will be installed using either HSA drilling or DPT. When installing boreholes through more than one water bearing zone or aquifer, HydroGeoLogic and its subcontractors will take measures to prevent cross-connection or cross-contamination of the zones or aquifers.

Drilling fluids shall not be used for this project unless prior authorization is obtained by the TNRCC or the EPA. A log of drilling activities will be kept in a bound field notebook. Information in the log book will include location, time on site, personnel and equipment present, down time, materials used, samples collected, measurements taken, and any observations or information that would be necessary to reconstruct field activities at a later date At the end of each day of drilling, the drilling supervisor will complete a Log of Daily Time and Materials Form. An example of this form is provided in Appendix D of the WP.

HydroGeoLogic will dispose of all trash, waste grout, cuttings, and drilling fluids as coordinated with the base civil engineer or NAS Fort Worth JRB representative.

5.3.2 Sampling and Logging

The lithology in all boreholes will be logged. The boring log form will be used for recording the lithologic logging information. Information on the boring log sheet includes the borehole location, drilling information, sampling information (such as sample intervals), recovery, blow counts (if applicable), and sample description information.

Unconsolidated samples for lithologic description will be obtained continuously at 5-foot intervals using split spoon samplers and standard penetration tests. Lithologic descriptions of unconsolidated materials encountered in the boreholes will generally be described in accordance with American Society for Testing and Materials (ASTM) D-2488-90 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM, 1990). Descriptive information to be recorded in the field will include the following: (1) identification of the predominant particles: size and range of particle sizes, (2) percent of gravel, sand, fines, or all three, (3) description of grading and sorting of coarse particles, (4) particle angularity and shape, and (5) maximum particle size or dimension.

Plasticity of fines description include the following: (1) color using Munsell Color System, (2) moisture (dry, wet, or moist), (3) consistency of fine grained soils, (4) structure of consolidated materials, and (5) cementation (weak, moderate, or strong).

Identification of the USCS group symbol will be used. Additional information to be recorded includes the depth to the water table, caving or sloughing of the borehole, changes in drilling rate, depths of laboratory samples, presence of organic materials, presence of fractures or voids in consolidated materials, and other noteworthy observations or conditions, such as the locations of geologic boundaries.

All samples will be monitored with an organic vapor monitor (e.g., photoionization detector [PID], organic vapor analyzer [OVA]). The samples shall be handled in such a way as to minimize the loss of volatiles; these procedures are described in Section 6.2. Cuttings will be examined for their hazardous characteristics. Materials suspected to be hazardous because of abnormal color, odor, or organic vapor monitor readings will be containerized in conformance with RCRA, state, and local requirements.

5.3.3 Abandonment

Boreholes will be abandoned in accordance with 30 Texas Administrative Code (TAC) Chapter 238, Water Well Driller Rules (TNRCC, 1997). Since the borings will not exceed 100 feet, the boring will be plugged to the ground surface with a solid column of ⅜ inch or larger granular sodium bentonite. The granular bentonite shall be hydrated at frequent intervals while strictly adhering to the manufacturer's specifications (TNRCC, 1997).

All abandoned boreholes will be checked 24 to 48 hours after mud/solid bentonite emplacement to determine whether curing is occurring properly. More specific curing specifications may be recommended by the manufacturer and will be followed. If settling has occurred, a sufficient amount of bentonite will be added to fill the hole to the ground surface. Curing checks and any addition of bentonite will be recorded in the field log.

5.4 MONITORING WELL CONSTRUCTION

The on-site Project Geologist will supervise the drilling, soil boring, geophysical surveys, lithologic sampling, and monitoring well construction. Although floating petroleum products (i.e., light non-aqueous phase liquids [LNAPLs]) are not anticipated, shallow monitoring wells shall be screened across the water table if they are encountered. The length of the screen will be such that tidal and seasonal water table fluctuations shall not cause water levels to rise above or fall below the screened interval. If dense petroleum products (i e., dense non-aqueous phase liquids [DNAPLs]) are encountered, monitoring wells will be screened at the bottom of the aquifer to capture the DNAPL.

5.4.1 Drilling Requirements

All drilling and well installations will conform to state and local regulations, and HydroGeoLogic will obtain and pay for all permits, applications, and other documents required by state and local authorities. The location of all borings will be coordinated in writing with the base civil engineer, or equivalent, before drilling commences.

The DPT and HSA rigs to be used will be cleaned and decontaminated according to the guidelines described in Section 5.9. The rig will not leak any fluids that may enter the borehole or contaminate equipment that is placed in the hole. Rags or absorbent materials will not be used to absorb leaking fluids.

HydroGeoLogic and its drilling subcontractors will dispose of all trash, waste grout, cuttings, and drilling fluids as coordinated with the base civil engineer or representative. Monitoring wells will be completed in the alluvial terrace groundwater only, thereby preventing cross-connection or cross-contamination of other water bearing zones or aquifers.

5.4.2 Monitoring Well Borehole Requirements

HSA drilling is to be used to install monitoring wells for this project. The inside diameter of the auger will be at least 4 inches larger than the outside diameter of the casing and well screen.

The completed monitoring wells will be sufficiently straight to allow passage of pumps or sampling devices and will be pumped within 1 degree of vertical where the water level is greater than 30 feet below land surface, unless otherwise approved by AFCEE. AFCEE may waive a plumbness requirement. Any request for a waiver from straightness or plumbness specifications will be made in writing to AFCEE, in advance of mobilization for drilling. HydroGeoLogic or its drilling subcontractor will use a single-shot declination tool to demonstrate plumbness. Monitoring wells not meeting straightness or plumbness specifications will be redrilled and/or reconstructed.

Formation samples for lithologic description will be obtained continuously at 5-foot sampling intervals. All samples will be monitored with an organic vapor monitor (e.g., PID, OVA). The samples will be handled in such a way as to minimize the loss of volatiles; these procedures will be described in Section 6.2. Cuttings will be examined for their hazardous characteristics. Materials that are suspected to be hazardous because of abnormal color, odor, or organic vapor monitor readings shall be containerized in conformance with RCRA, state, and local requirements. The documentation record and forms (Appendix D in the WP) will document the following information for each boring: (1) boring or well identification (this identification shall be unique, and HydroGeoLogic will ensure it has not been used previously at the installation.), (2) purpose of the boring (e.g., soil sampling, monitoring well), (3) location in relation to an easily identifiable landmark, (4) names of drilling contractor and logger, (5) start and finish dates and times, (6) drilling method, (7) types of drilling fluids and depths at which they were used (not applicable to the drilling method used for this project), (8) diameters of surface casing, casing type, and methods of installation, (9) depth at which saturated conditions were first encountered, (10) lithologic descriptions and depths of lithologic boundaries, (11) sampling-interval depths, (12) zones of caving or heaving, (13) drilling rate, and (14) drilling rig reactions, such as chatter, rod drops, and bouncing.

A standard penetration test shall be performed each time a split spoon sample is taken. The test shall be performed in accordance with ASTM D-1586.

5.4.3 Casing Requirements

The casing requirements that will be followed are the following: (1) all casing will be new, unused, and decontaminated according to the specifications of Section 5.9, (2) glue will not be used to join casing, and casings will be joined only with compatible welds or couplings that shall not interfere with the planned use of the well, (3) all polyvinyl chloride (PVC) will conform to the ASTM Standard F-480-88A or the National Sanitation Foundation Standard 14 (Plastic Pipe System), (4) the casing will be straight and plumb within the tolerance stated for the borehole, and (5) the driller shall cut a notch in the top of the casing to be used as a measuring point for water levels.

All monitoring wells for this project will be constructed using flush threaded two-inch diameter Schedule 40 PVC casing. The notches cut in the top of the monitoring well casings for water level measuring points will be oriented on the north side of each casing for uniformity.

5.4.4 Well Screen Requirements

AFCEE well screen requirements are the following: (1) all requirements that apply to casing will also apply to well screen, except for strength requirements, (2) monitoring wells will not be screened across more than one water-bearing unit, (3) screens will be factory slotted or wrapped, (4) screen slots will be sized to prevent 90 percent of the filter pack from entering the well, and (5) the bottom of the screen is to be capped, and the cap will be joined to the screen by threads.
The monitoring wells will be constructed using flush-threaded 2-inch diameter Schedule 40 PVC casing and screen. The upper 20 feet of the uppermost flow zone of the uppermost aquifer will be screened with 0.010 inch continuous slotted PVC. No well screen will be over 20 feet in length, however, every effort will be made to install monitoring wells with a maximum screen length of 10 feet. It is anticipated that well screens will be placed from the lowest portion of the alluvial terrace groundwater zone through the surface of the water table. The bottom of the screen will be capped using a flush threaded PVC cap.

5.4.5 Annular Space Requirements

The annular space requirements are the following: (1) the annular space will be filled with a filter pack, a bentonite seal, and casing grout between the well string and the borehole wall, and (2) as the annular space is being filled, the well string will be centered and suspended such that it does not rest on the bottom of the hole, and for wells greater than 50 feet deep, at least two stainless steel centralizers will be used, one at the bottom and one at the top of the screen. Additional centralizers will be used as needed.

5.4.6 Filter Pack Requirements

The filter pack will consist of silica sand or gravel and will extend from the bottom of the hole to at least 2 feet above the top of the well screen. After the filter pack settles the top of the sand pack will be sounded to verify its depth during placement. Additional filter pack will be emplaced as required to return the level of the pack to 2 feet above the screen.

The filter pack material will be clean, inert, and well-rounded and will contain less than 2 percent flat particles. The sand will be certified free of contaminants by vendor or contractor. If decontamination is necessary, the methods shall be approved in writing by AFCEE.

The filter pack will have a grain size distribution and uniformity coefficient compatible with the formation materials and the screen. This will be calculated as described in Chapter 12, Ground Water and Wells, 2nd Edition (Driscoll, 1986). The grain size of the filter pack material will be determined based on existing grain size analysis prior to mobilization to the field. The filter pack will not extend across more than one water-bearing unit. In all wells (deep or shallow), the filter pack will be emplaced with a bottom discharge tremie pipe of at least 1½ inches in diameter to prevent bridging. The tremie pipe will be lifted from the bottom of the hole at the same rate the filter pack is set. HydroGeoLogic will record the volume of the filter pack emplaced in the well. If potable water is necessary to place the filter pack, HydroGeoLogic will obtain prior approval from the regulatory agency providing oversight, and will ensure that no contaminants are introduced into the well.

5.4.7 Bentonite Seal Requirements

The bentonite seal requirements that will be followed are the following: (1) the bentonite seal will consist of at least 2 feet of bentonite between the filter pack and the casing grout, (2) the bentonite will be hydrated before placement and shall be installed by pump tremie methods, and (3) only 100 percent sodium bentonite shall be used.

5.4.8 Casing Grout Requirements

The casing grout requirements are the following: (1) the casing grout will extend from the top of the bentonite seal to ground surface, (2) the grout will be mixed in the following proportions: 94 pounds of neat Type I Portland or American Petroleum Institute Class A cement, not more than 4 pounds of 100 percent sodium bentonite powder, and not more than 8 gallons of potable water, (3) all grout will be pump tremied using a side-discharge tremie pipe, and pumping will continue until 20 percent of the grout has been returned to the surface, and (4) in wells where the bentonite seal is visible and within 30 feet of the land surface, the 20 percent return is not necessary so long as the tremie pipe is pulled back as the grout is emplaced.

5.4.9 Surface Completion Requirements

For flush-mounted completions, the casing will be cut about three inches below the land surface and provide a water-tight casing cap to prevent surface water from entering the well. To allow for escape of gas, a small diameter (e.g., ¼-inch) vent hole will be placed in the upper portion of the casing, or a ventilated well cap will be used. A freely draining valve box with a locking cover will be placed over the casing. The top of the casing will be at least 1 foot above the bottom of the box. The valve box lid will be centered in a three-foot diameter, four-inch thick concrete pad that slopes away from the box at ¼ inch per foot. The identity of the well will be permanently marked on the valve box lid and the casing cap. Where heavy traffic may pass over the well or for other reasons, the concrete pad and valve box/lid assembly will be constructed to meet the strength requirements of surrounding surfaces.

When above-ground surface completion is used, the well casing will be extended 2 or 3 feet above land surface. A casing cap will be provided for each well, and the extended casing will be shielded with a steel sleeve that is placed over the casing and cap and seated in a 3-foot by

3-foot by 4-inch concrete surface pad. To allow for escape of gas, a small diameter (e.g., ¼-inch) vent hole will be placed in the well casing, or a ventilated well cap will be used. The concrete surface pad will be reinforced with steel reinforcing bars at least ¼-inch in diameter. The ground surface will be freed of grass and scoured to a depth of 2 inches before setting the concrete pad. The diameter of the sleeve will be at least 6 inches greater than the diameter of the casing. The pad will be sloped away from the well sleeve. A lockable cap or lid will be installed on the guard pipe. The identity of the well will be permanently marked on the casing cap and the protective sleeve. Three 3-inch diameter concrete-filled steel guard posts, each 5 feet in total length, will be installed radially from each well head. The guard posts will be recessed approximately 2-feet into the ground and set in concrete. The guard posts will not be installed in the concrete pad placed at the well base. The protective sleeve and guard posts will be painted with a color specified by the installation civil engineer.

All wells will be secured as soon as possible after drilling with corrosion-resistant locks for both flush and above-ground surface completions. The locks will either have identical keys or be keyed for opening with one master key. The lock keys will be delivered to the appropriate Air Force personnel following completion of the field effort. A Monitoring Well Construction Form will be completed for each well. Examples of field forms are presented in Appendix D of the WP.

5.5 MONITORING WELL DEVELOPMENT

The monitoring well development requirements are the following: (1) all newly installed monitoring wells will be developed no sooner than 24 hours after installation to allow for grout curing, (2) all drilling fluids used during well construction will be removed during development, (3) wells will be developed using surge blocks and bailers or pumps (prior approval for any alternate method will be obtained, in writing, from AFCEE before well construction begins), and wells will be developed until the turbidity of the well is less than or equal to 10 nephelometric turbidity units (NTU) and remains within a 5 NTU range for at least 30 minutes and the stabilization criteria in Section 6.1 are met, (4) discharge water color and volume will be documented, (5) no sediment will remain in the bottom of the well, (6) no detergents, soaps, acids, bleaches, or other additives will be used to develop a well, and (7) all development equipment will be decontaminated according to the specifications of Section 5.9.

5.6 ABANDONING MONITORING WELLS

All abandonment of monitoring wells, when necessary, shall be performed in accordance with state and local laws and regulations. If slurry is used, a mud balance and/or Marsh Funnel will be used to ensure that the density (pounds per gallon) of the abandonment mud mixture conforms with the manufacturer's specification. All abandoned monitoring wells will be checked 24 to 48 hours after mud/solid bentonite emplacement to determine whether curing is occurring properly. More specific curing specifications or quality assurance checks may be recommended by the manufacturer and will be followed. Additionally, if significant settling has occurred, a sufficient amount of mud/solid bentonite will be added to attain its initial level.

These slurry/solid bentonite curing checks and any addition of mud/solid bentonite will be recorded in the field logs.

5.7 GEOPHYSICAL INVESTIGATIONS

One geophysical method will be utilized during this investigation: an EM survey will be conducted in the SWMU 45 area. This survey will be used in an attempt to determine the exact location of the tank vault and associated UST in the vicinity of the OWS at Building 1027.

5.7.1 General Requirements for Geophysical Surveys

All geophysical surveys will include the following:

- A professional geologist or engineer will be provided by HydroGeoLogic to supervise the project.
- The locations of surface geophysical grid system layouts shall be shown on a site map.
- Final results shall be presented in plain views and cross sections and contours shall be used where appropriate.
- The interpretation of results shall discuss positive and negative results, as well as limitations of the method and data.
- The interpretation of the data shall be incorporated into the conceptual site model.

5.7.2 Electromagnetic Methods

5.7.2.1 Geonics EM61

The Geonics EM61 is a time domain metal detector that detects both ferrous and non-ferrous metals. The response to an isolated buried metal object is a quick, sharply-defined peak, facilitating quick and accurate location of the object. In addition, the EM61 is relatively insensitive to nearby cultural interferences such as fences, buildings, and power lines although if present, such objects could still obscure an UST. Consequently, the EM61 is ideal for confirming the presence or absence of the abandoned USTs.

A systematic grid, typically oriented approximately north-south, will be established at the site as shown on Figure 3.1, using a tape measure for distance and a transit for trueness. The grid location will be based on the estimated location of existing structures, and will be supplemented by a review of historic documents and personnel interviews. The grid location, orientation, and size may be modified based on field observations, such as surface depressions or variations in vegetation. Grid lines will be spaced every 10 feet; however, grid points will be marked with pin flags or fluorescent paint at a spacing of 20 feet. Wooden stakes will be placed as temporary location markers to locate the grid for future reference. The location and elevation of the wooden stakes will be surveyed and correlated to existing coordinate systems, and a sketch of surface features will be drawn in the field to facilitate the geophysical interpretation. The survey procedure will consist of carrying the instruments along lines to effectively provide a 5-foot line spacing. Data will be digitally recorded approximately every 5 feet along lines except where prevented by obstructions.

5.7.3 Data Interpretation

The geophysical data will be downloaded and evaluated in the field for data quality, and to make preliminary interpretations. The results will be gridded and contoured, and displayed as contour maps and 3-D mesh diagrams to identify anomalous areas. Descriptions of the instruments used during the geophysical surveys, the methods of data collection, and an interpretation of the data will be provided in an appendix and summarized in the RFI report.

5.8 SURVEYING

All surveying locations of field activities will be measured by a state of Texas certified land surveyor. The surveys will be third order and references will be tied to the Texas State Plane Coordinate System (cf. Urquhart, L.C., 1962 Civil Engineering Handbook, 4th Edition, p. 96 and 97). All surveyed locations will be reported using the Texas State Plane Coordinate System, North Central Zone. The horizontal datum will be the North American Datum of 1983 and the units will be in U.S. Survey feet. The vertical datum will be the National Geodetic Vertical Datum (NGVD) of 1988 and the units will be in U S. survey feet. The surveyed control information for all data collection points will be recorded and displayed in a table. The table will give the northing (Y) and easting (X) coordinates, the ground elevation and the measuring point elevation if the location is a groundwater monitoring well. The reference location is the origin. The elevation of all newly installed wells will be surveyed at the water level measuring point (notch) on the riser pipe. The elevation of the ground surface at each water level measuring point will be included in the survey. The accuracy of the X-Y coordinates for each sample location will be accurate to within 0.1 feet.

5.9 EQUIPMENT DECONTAMINATION

All equipment that may directly or indirectly contact samples will be decontaminated in a designated decontamination area. This includes casing, drill bits, auger flights, portions of drill rigs that stand above boreholes, sampling devices, and instruments, such as slugs and sounders. In addition, HydroGeoLogic and its subcontractors will take care to prevent the sample from coming into contact with potentially contaminating substances such as tape, oil, engine exhaust, corroded surfaces, and dirt.

The following procedure will be used to decontaminate large pieces of equipment such as casings, auger flights, pipe and rods, and those portions of the drill rig that may stand directly over a boring or well location or that come into contact with casing, auger flights, pipe, or rods. The external surfaces of equipment will be washed with high-pressure hot water and Alconox™, or equivalent laboratory-grade detergent, and if necessary, scrubbed until all visible dirt, grime, grease, oil, loose paint, rust flakes, etc., have been removed. The equipment will then be rinsed with potable water. The inside surfaces of casing, drill rod, and auger flights will also be washed as described.

The following procedure will be used to decontaminate sampling and drilling devices such as split spoons and augers that can be hand-manipulated. For sampling and smaller drilling devices, the equipment will be scrubbed with a solution of potable water and Alconox™, or equivalent laboratory-grade detergent. The equipment will then be rinsed with copious quantities of potable water followed by a rinse with ASTM Type II reagent-grade water. High pressure liquid chromatograph-grade water and distilled water purchased in stores are not acceptable substitutes for ASTM Type II reagent-grade water. The equipment will then be rinsed with pesticide-grade methanol followed by a rinse with pesticide-grade hexane. The equipment will then be allowed to air dry on a clean surface or rack, such as Teflon®, stainless steel, or oil-free aluminum, elevated at least 2 feet above ground. If the sampling device will not be used immediately after being decontaminated, it will be wrapped in oil-free aluminum foil, or placed in a closed container made of stainless steel, glass, or Teflon®.

Reagent-grade II water, methanol, and hexane will be purchased, stored, and dispensed only in glass, stainless steel, or Teflon® containers. These containers will have Teflon® caps or cap liners. HydroGeoLogic and its subcontractors will assure that these materials remain free of contaminants. If any question of purity exists, new materials will be used.

All fluids generated during decontamination activities will be placed in United Nations (UN)-approved steel 55-gallon drums. All drums will be properly labeled as to content and shall be staged in a central location designated by the base representative for temporary storage pending removal and disposal.

5.10 WASTE HANDLING

Waste handling will be dealt with on a site-by-site basis. Waste will be classified as either non-investigative waste or investigative waste per the requirements of 30 TAC §335 Subchapter R and 40 Code of Federal Regulations (CFR) Part 261, Subpart C. Non-investigative waste, such as litter and household garbage, will be collected on an as-needed basis to maintain each site in a clean and orderly manner. This waste will be containerized and transported to the designated sanitary landfill or collection bin. Acceptable containers will be sealed boxes or plastic garbage bags.

Waste containers will be labeled with the following information: type of matrix being contained, depth from which matrix was obtained, date matrix was contained, company name and phone number, and whether matrix is considered hazardous or not.

Characterization of investigative derived waste (IDW) will be based on sample analysis obtained during the field investigation following EPA approved methods. Hazardous waste classification will first be determined as per 40 CFR §261.2, §261.3, or §261.4. Waste that is nonhazardous, is then classified as Class 1, Class 2, or Class 3 according to 30 TAC §335.505 - 335.507. Once the IDW has been characterized, an eight digit waste code number will be provided as required in §335.501. The disposal of IDW will be conducted in a timely and cost effective manner, and in accordance with all state and federal regulations.

IDW will be properly containerized and temporarily stored at each site, prior to transportation. Depending on the constituents of concern, fencing or other special markings may be required. The number of containers will be estimated on an as-needed basis. Acceptable containers will be sealed in either 55-gallon drums or small dumping bins with lids. The containers will be transported in such a manner to prevent spillage or particulate loss to the atmosphere.

The IDW will be segregated at the site according to matrix (solid or liquid) and as to how it was derived (drill cuttings, drilling fluid, decontamination fluids, and purged groundwater). Each container will be properly labeled with site identification, sampling point, date, depth, matrix, constituents of concern, and other pertinent information for handling.

Waste generated during the field activities will be handled and disposed of in accordance with applicable federal, state, and local regulations. Disposable materials such as latex gloves, aluminum foil, paper towels, etc., shall be placed and sealed in plastic garbage bags for disposal with sanitary waste from the site. Soil cuttings will be placed in 55-gallon steel open top drums with lids. Development and purge waters evacuated from groundwater monitoring wells, and all fluids generated during decontamination activities, will be placed in 55-gallon steel drums or equivalent. Drums will be properly labeled with the appropriate boring or well number, and content, and will be staged in a central location designated by the base representative for temporary storage pending removal and disposal.

5.11 HYDROGEOLOGICAL CONCEPTUAL MODEL

For the RFI investigations the project geologist or engineer will develop a base and site geological and hydrological conceptual model from pre-existing U.S. Geological Survey (USGS), regional, state, and local studies and information developed during the project. Maps and cross sections will be used to depict the conceptual model. The model will be the basis for evaluating soil boring and monitoring well locations, contaminant distribution (plume delineation), and the closeness of fit to natural conditions of analytical models.

5.12 CORRECTIVE ACTION

Table 5.1 contains a summary of field quality control procedures and corrective actions.

6.0 ENVIRONMENTAL SAMPLING

6.1 SAMPLING PROCEDURES

All purging and sampling equipment will be decontaminated according to the specifications in Sections 5.9 and 7.3 prior to any sampling activities and will be protected from contamination until ready for use. The construction material of the sampling devices (e.g., plastic, PVC, metal, etc.) discussed below will be appropriate for the contaminant of concern and shall not interfere with the chemical analyses being performed.

6.1.1 Groundwater Sampling

When numerous monitoring wells are to be sampled in succession, wells expected to have low levels of contamination or no contamination will be sampled prior to wells expected to have higher levels of contamination. This practice will help reduce the potential for cross contamination between wells. All sampling activities will be recorded in the field log book. Additionally, all sampling data will be recorded on a Field Sampling Report form.

Before groundwater sampling begins, wells will be inspected for signs of tampering or other damage. If tampering is suspected, (i.e., casing is damaged, lock or cap is missing) this shall be recorded in the field log book and on the well sampling form, and reported to the Project Geologist/Field Coordinator. Wells that are suspected to have been tampered with will not be sampled until the Project Geologist has discussed the matter with the PM.

Before the start of sampling activities, plastic sheeting will be placed on the ground adjacent to the well. The plastic sheeting will be used to provide a clean working area for clean equipment to be placed during sampling. Water will be removed from the protective casing or from vaults around the well casing prior to venting and purging. Every time a casing cap is removed to measure water level or collect a sample, the air in the breathing zone will be checked with an organic vapor monitor and the air in the well bore shall be checked with an explosimeter. Procedures in the HSP will be followed when high concentrations of organic vapors or explosive gases are detected. Air monitoring data will be recorded on the well sampling form.

Purge pump intakes will be equipped with a positive check valve to prevent purged water from flowing back into the well. Purging and sampling will be performed in a manner that minimizes aeration in the well bore and the agitation of sediments in the well and formation. Equipment will not be allowed to free-fall into a well.

In addition to the information required in Section 8.0, the following information will be recorded each time a well is purged and sampled: (1) depth to water before and after purging; (2) sounded total depth of the monitoring well, (3) the condition of each well, including visual (mirror) survey; (4) the thickness of any nonaqueous layer and; (5) field parameters, such as pH, temperature, electrical conductivity (EC), oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity. This information will be encoded in IRP Environmental Resources Program Information Management System (ERPIMS) files when required.

6.1.1.1 Water Level Measurement

An interface probe will be used to determine the presence of floating product, if any, prior to measurement of the ground-water level. The ground-water level will then be measured to the nearest 0.01 foot using an electric water level indicator. Water levels will be measured from the notch located at the top of the well casing and recorded on the well sampling form. If well casings are not notched, measurements will be taken from the north edge of the top of the well casing, and a notch will be made using a decontaminated metal file. The groundwater elevation (mean sea level) is calculated by subtracting the depth to the water from the top of the well casing elevation.

Following water level measurement, the total depth of the well from the top of the casing will be determined using a weighted tape or electric sounder and recorded on the well sampling form. The water level depth will then be subtracted from the total depth of the well to determine the height of the water column present in the well casing. All water level and total depth measuring devices will be routinely checked with a tape measure to ensure measurements are accurate.

6.1.1.2 Purging Prior to Sampling

Purging of monitoring wells is performed to evacuate water that has been stagnant in the well and may not be representative of the aquifer. Purging will be accomplished using the micropurge technique. Micropurge is a low flow-rate monitoring well purging and sampling method that induces laminar (non turbulent) flow in the immediate vicinity of the sampling pump intake, thus drawing groundwater directly from the sampled aquifer, horizontally through the well screen, and into the sampling device.

Pumps capable of achieving low-flow rates in the range of 0.1 to 0.5 liters per minute (L/min) will be used for purging and sampling. These low flow rates minimize disturbance in the screened aquifer, resulting in the following: (1) minimal production of artificial turbidity and oxidation; (2) minimal mixing of chemically distinct zones; (3) minimal loss of volatile organic compounds, and (4) collection of representative samples while minimizing purge volume.

Pumps will be lowered to the middle of the screened interval or slightly above the interval (i.e., a measured depth of 43 percent of the saturated screened interval below the top of the water table). This is to minimize the resuspension of solids which have collected at the bottom of the well and to minimize the potential mixing of stagnant water trapped in the casing above the screen. The key is to minimize the disturbance of water and solids in the well casing.

As a guide to flow rate adjustment during purging, water levels will be checked and recorded to monitor drawdown in the well. Groundwater will be pumped in a manner which minimizes the stress to the system to the extent practical, taking into account established site sampling objectives. The goal is to purge the well at a rate that does not draw down the static water level more than 0.33 feet.

Temperature, pH, EC, DO, ORP, and turbidity will also be measured during purging and recorded on the well sampling form. Measurements will be taken every 3 to 5 minutes when flow rates are in the 0.1 to 0.5 L/min range. Stabilization is achieved after all parameters have stabilized for three consecutive readings. Successive readings should be approximately within $\pm$ 1.0 degrees Celsius ($^\circ$ C) for temperature, $\pm$ 0.1 units for pH, $\pm$ 3 percent for EC, $\pm$ 0.1 mg/L or 10 percent (whichever is greater) for DO, $\pm$ 10 percent for ORP, and $\pm$10 percent for turbidity. In general, the order of stabilization is pH, temperature, and EC, followed by ORP, DO, and turbidity. Turbidity readings below 10 NTUs are desired, especially when metal samples are to be collected. When turbidity is high, the purge time will be extended in order for turbidity to reach 10 NTUs; however, if turbidity stabilizes above 10 NTUs for 15 to 30 minutes, then turbidity will be considered stable as defined above.

Groundwater samples will be collected using the pump used in the purging procedure. If the parameters do not stabilize after one to two hours when the drawdown indicates a laminar flow, a subset (pH, EC, and turbidity or DO) will be used as the stabilization parameters. If subset parameters do not stabilize, then the sample will be collected when a maximum number of parameters stabilize, and the anomalous parameters will be brought to the Field Coordinator's attention. Water samples will be collected immediately after parameter stabilization using the same pump as was used in purging. Field equipment will be calibrated in accordance with the Basewide QAPP (HydroGeoLogic, 2000), Section 6.0, and in Section 7.2 of this FSP.

If during low-flow purging the drawdown is greater than 0.33 feet, then the micropurge technique is assumed to be invalid and will be discontinued. The reason is that groundwater flow to the pump is no longer considered to be laminar across the screen from the aquifer. The flow in the vicinity of the pump would then contain a vertical component from the stagnant water column in the filter pack and casing.

In this situation (i.e., drawdown >0.33 feet at low-flow rates), the pumping rate will be increased and a minimum of three borehole volumes will be removed to ensure that all of the stagnant water has been removed from the borehole. The drawdown will continue to be monitored and the pumping rate will be adjusted to avoid pumping the well dry. Measurements for water quality parameters will be taken every 3 to 5 minutes. After three well volumes have been removed water samples will be collected when the water level has recovered to 80 percent of its static water level or 16 hours after completion of purging. Water samples will be collected using either a low-flow pump or a Teflon® bailer.

If a well is purged dry, then the well will be sampled as soon as a sufficient volume of groundwater has entered the well to enable the collection of necessary groundwater samples (EPA, 1992). Water samples will be collected using either a low-flow pump or a Teflon® bailer.

Water removed from the well during purging will be containerized. Detailed information concerning IDW is presented in Section 5.9. A maximum of five well volumes may be removed from any well before it is sampled. The well volume is defined as the volume of submerged casing, screen, and filter pack. One borehole volume can be calculated using the following equation (Ohio EPA, 1993):

$$V = H \times F$$

where V = one borehole volume

H = the difference between the depth of well and depth to water (feet)
F = factor for volume of one foot section of borehole (gallons) from Table 6.1

F can also be calculated from the formula:

$$F = \Pi\, (D/2)^2 \times 7.48 \text{ gal/ft}$$

where D = the inside diameter of the borehole (feet) and Π = 3.141593.

6.1.1.3 Sample Collection

At newly developed wells, water samples may only be collected after a 24-hour period has elapsed from the conclusion of monitoring well development activities.

Following the micropurge techniques, or 3 well volume techniques outlined above, the bladder pump will be used to collect water samples. Samples to be analyzed for volatile or gaseous constituents will not be withdrawn with pumps or at flows that degas the samples. Water-quality indicators will be monitored during micropurge (turbidity, DO, specific conductance, temperature, etc.).

Groundwater samples will be collected after the critical water quality indicators have stabilized for three consecutive readings. Stabilization criteria are presented above in Section 6.1.1.2. Where possible, groundwater samples will be collected using the same pump used in the purging procedure. If the parameters do not stabilize, a subset (pH, EC, and turbidity or DO) will be used as the stabilization parameters. If subset parameters do not stabilize, then the sample shall be collected as described above in Section 6.1.1.2, and the anomalous parameters shall be brought to the Field Coordinator's attention. Field equipment will be calibrated in accordance with the Basewide QAPP (HydroGeoLogic, 2000).

The preservative hydrochloric acid shall be added to the VOC sample bottle before introducing the sample water. The sample shall be collected from the pump discharge line using a slow, controlled pour down the side of a tilted sample vial to minimize volatilization. The sample vial shall be filled until a meniscus is visible and immediately sealed. When the bottle is capped, it shall be inverted and gently tapped to ensure no air bubbles are present in the vial. If bubbles are present after the initial filling, the vials shall be discarded and the VOC sampling effort shall be repeated. Refilling of vials will result in loss of preservatives. After the containers are sealed, degassing may cause bubbles to form in the sample. These bubbles shall be left in the container. These samples shall never be composited, homogenized, or filtered.

Following the collection of VOC samples, the remaining water samples shall be collected in the following order: SVOCs including polynuclear aromatic hydrocarbons (PAHs); pesticides/PCBs; herbicides organophosphorus pesticides, dioxins/furans; metals; mercury; cyanide; and sulfide. Field filtering of metals will not occur.

Required sample containers, preservation methods, volumes and holding times are given in Section 6 2 and Table 6.2. Sampling equipment shall be decontaminated in accordance with Section 5.8 upon completion of sampling activities.

6.1.2 Surface Soil Sampling

Although surface soil sampling is not currently proposed, if field conditions warrant their collection the following procedures will be used.

Surface soil samples shall be collected from the land surface to two feet below the surface. The sample shall be homogenized and quartered before being containerized. Samples collected for VOC analysis shall be containerized in En Core™ core samplers prior to sample homogenization. Stainless steel scoops or trowels, glass jars with Teflon® lids or equivalent equipment compatible with the chemical analyses proposed shall be used to collect and store samples. Above ground plant parts and debris will be excluded from the sample.

In addition to records outlined in Section 8.0, unusual surface conditions that may affect the chemical analyses will be recorded, such as (1) asphalt chunks that may have been shattered by mowers, thus spreading small fragments of asphalt over the sampling area, (2) distance to roadways, aircraft runways, or taxiways, (3) obvious, deposition of contaminated or clean soil at the site, (4) evidence of dumping or spillage of chemicals, (5) soil discoloration, and/or (6) unusual condition of growing plants, etc.

6.1.3 Subsurface Soil Sampling

Soil samples will be collected based on odors, discoloration and, organic vapor monitor readings. If no odors, discoloration or organic vapor readings are observed, subsurface samples will be collected directly above the water table surface.
During borehole installation using HSA and DPT methods, soil samples will be collected using steel, continuous drive, California modified split-spoon samplers, or equivalent. These samplers are typically 24 inches in length and accommodate four stainless steel/brass sleeves, each of which is 6 inches in length. Soil samples from selected locations will be collected for chemical analysis every 5 feet from the ground surface to the water table.

As soon as the split-spoon is opened, the open ends of the stainless steel/brass sleeves will be monitored for organic vapors using the PID. Air monitoring results will be recorded on the boring log and in the field log book. Section 7.1.1 details field screening procedures for soils.

Samples for VOC analysis will be collected as an entire 5 gram core using an En Core™ core sampler. En Core™ is a sampling device which collects, stores, and delivers soil samples. The sealing cap prevents transfer of volatiles, and is therefore ideal when collecting soil samples for VOC analysis. Three such cores will be collected from each VOC sampling location. Each core sampler will be completely filled to eliminate headspace. VOC samples from large gravel or debris will be collected using a 6-inch stainless steel/brass sleeve rather than an En Core™ core sampler. Following sample collection, each sampler will be capped to prevent volatilization. Each core sampler is associated with a dedicated plastic/aluminum foil zip lock bag on which is affixed a sample label. The sample label will be completed, the unique identification number label (matching the number on the bag) will be affixed to the core sampler, and the sampler will be placed into the bag and placed in an iced cooler held at a temperature below 4°C.

Samples collected concurrently with VOC samples to be tested for other analytical parameters will be collected immediately adjacent to (above and below) the VOC sample interval. If VOCs are not collected while using DPT, acetate liners may be utilized. Soil chemistry samples not being analyzed for VOCs will be placed in 4-ounce, laboratory-cleaned, EPA-approved glass containers with Teflon® lined lids. This will be done using clean stainless steel sampling tools. If soil from several sampling intervals must be composited to provide sufficient sample volume for a particular analysis (other than VOCs), the sample will be composited and homogenized in a stainless steel bowl using a stainless steel trowel or scoop. The sample will then be transferred into the appropriate sample container, sealed, labeled, and placed in an iced cooler held at a temperature below 4°C. If initial screening results indicate the presence of organic vapors, a headspace analysis will be conducted on remaining portions of the sample.

6.1.3.1 Hollow Stem Auger Sampling

For split-spoon samples collected using HSA, a standard penetration test will be performed in accordance with ASTM D-1586 "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils." The sample is obtained by driving the sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. The sampler is first driven 6 inches to seat it in undisturbed soil; then the test is performed. The number of hammer blows for seating the spoon and making the test are then recorded for each 6 inches of penetration on the drill log (i.e., 5/7/8). The standard penetration test result (N) is obtained by adding the last two figures (i.e., 7+8=15 blows per foot). The sampler is then driven an additional 6 inches to fill the remainder of the split-spoon prior to retrieval.

6.1.3.2 Direct Push Sampling

Direct push sampling involves advancing a sampling probe by direct hydraulic pressure or by using a slide or rotary hammer. Samples will be collected using stainless steel/brass sleeves or an En Core™ sampler as described in Section 6.1.3. Acetate liners may be used when collecting soil for non-VOC analysis in order to expedite the sampling process.

6.2 SAMPLE HANDLING

6.2.1 Sample Containers

Sample containers will be provided to field personnel, precleaned and treated according to EPA specifications for the methods. No sampling containers will be reused for the sampling events of this RFI. Containers will be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants.

6.2.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, and preservation requirements for the analytical methods performed on AFCEE samples are listed in Table 6.2. The pH of preserved samples will be checked by the laboratory prior to analysis. Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. Holding times for methods used in this FSP are specified in Table 6.2.

6.2.3 Sample Identification

The following information will be written in the log book and on the sample label when samples are collected for laboratory analysis:

- Project identification (name and number)
- Sample identification number
- Sample location
- Preservatives added
- Date and time of collection
- Requested analytical methods
- Sampler's name

Each sample will be assigned a unique identification number that describes where and what type of sample was collected. The number that will be used in the field will consist of a maximum 15 digit alphanumeric code. Once data is ready to be entered into the ERPIMS database, the alphanumeric code will be truncated to 15 digits. This system is explained in detail as follows:

abbbccccdd-ee

where:

a represents the medium (e.g., W= monitoring well, B = soil boring, or E = sediment sample).

bbb represents HydroGeoLogic designation (e.g. HGL)

cccccc represents the SWMU number (e.g., SWMU 45, SWMU 54, SWMU 55, etc.)

dd represents the location identification (Locid) (e.g., 01, 02)

ee represents the order that the sample was obtained within the soil boring; i.e., a surface soil sample would be 01, a 5- to 7-foot sample would be 02, etc. These two digits will dropped once the data is entered into the ERPIMS database.

For example, the first soil sample collected from soil boring 01 located at SWMU 54 would be identified as "BHGLSWMU5401-01." The second sample collected from soil boring 01 located at SWMU 54 would be identified as "BHGLSWMU5401-02". Duplicate samples will be submitted to the laboratory blind. A note in the field log book and the Field Sampling Report form will identify the location and sample number that has been duplicated.

QC samples will be identified by the use of a similar system of identifiers with a maximum of 10 characters. The QC sampling number system is summarized below.

aabbccdd

where:

aa represents medium (e.g. ER = equipment rinsate, TB = trip blank, AB = ambient blank, EB = equipment blank)

bb represents the month, e.g. 06
cc represents the day, e.g. 15

dd represents the year, e.g. 00

For example, an equipment blank collected on the 15th day of June in the year 2000 will be "EB061500."

The Project Geologist will maintain a list that describes how each QC sample corresponds with specific environmental samples. For instance, each trip blank will be correlated with a particular set of samples shipped to the laboratory, and each rinsate will be correlated to those samples collected by a particular set of decontaminated sampling tools.

6.3 SAMPLE CUSTODY

Procedures to ensure the custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in field and laboratory records.

COC records will be maintained for all field and field QC samples. A sample is defined as being under a person's custody if any of the following conditions exist: (1) it is in their possession, (2) it is in their view, after being in their possession, (3) it was in their possession, and they locked it up, or (4) it is in a designated secure area. All sample containers will be sealed in a manner that will prevent or detect tampering if it occurs. In no instance will tape be used to seal sample containers. Samples will not be packaged with activated carbon. Appendix D in the WP contains a sample COC form.

The following minimum information concerning the sample will be documented on the COC form:

- Unique sample identification
- Date and time of sample collection
- Source of sample (including name, location, and sample type)
- Designation of Matrix Spike/Matrix Spike Duplicate (MS/MSD)
- Preservative used
- Analyses required
- Name of collector(s)
- Serial numbers of custody seals and transportation cases (if used)
- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratory or laboratories
- Bill of lading or transporter tracking number (if applicable)

All samples will be uniquely identified, labeled, and documented in the field at the time of collection in accordance with Section 6.2.3 of the FSP. Samples collected in the field will be transported to the laboratory or field testing site as expeditiously as possible. When a 4°C requirement for preserving the sample is indicated, the samples will be packed in ice or chemical refrigerant to keep them cool during collection and transportation. During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples. A temperature blank (a VOC sampling vial filled with water) will be included in every cooler and used to determine the internal temperature of the cooler upon receipt of the cooler at the laboratory.

6.4 FIELD QUALITY CONTROL SAMPLES

Field quality control samples such as blanks and duplicates will be collected as described in the following sections.

6.4.1 Ambient Blank

The ambient blank consists of ASTM Type II reagent-grade water poured into a VOC sample vial at the sampling site. It is handled like an environmental sample and transported to the laboratory for analysis. Ambient blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes.

Ambient blanks are used to assess the potential introduction of contaminants from ambient sources (e.g., active runways, engine test cells, gasoline motors in operation, etc.) to the samples during sample collection. Ambient blanks will be collected downwind of possible VOC sources. One ambient blank will be collected at the beginning of the field investigation. Additional ambient blanks will be collected if site conditions warrant.

6.4.2 Equipment Blank

An equipment blank is a sample of ASTM Type II reagent-grade water poured into, over, or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. Equipment blanks are used to assess the effectiveness of equipment decontamination procedures. Equipment blanks will be collected immediately after the equipment has been decontaminated. The blank will be analyzed for all laboratory analyses requested for the environmental samples collected at the site. One equipment blank will be collected per day when environmental samples are collected.

6.4.3 Trip Blank

The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II reagent-grade water, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank will accompany each cooler of samples sent to the laboratory for analysis of VOCs.

6.4.4 Field Duplicates

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate samples are collected simultaneously, or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. The sample containers are assigned an identification number in the field so that they cannot be identified (blind duplicate) as duplicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field duplicate samples prior to the beginning of sample collection.

Duplicate sample results are used to assess precision of the sample collection process. Precision of soil samples to be analyzed for VOCs is assessed from collocated samples because the compositing process required to obtain uniform samples could result in loss of the compounds of interest. One duplicate sample will be collected for every ten groundwater samples collected.

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7.0 FIELD MEASUREMENTS

7.1 PARAMETERS

7.1.1 Field Screening of Soils

RFI field activities will utilize field screening of soil samples for VOCs to provide data on the chemical characteristics of the soil at the sites. During hand auguring and HSA drilling activities, sample cores will be monitored for organic vapors using an OVA or PID, and headspace readings will be recorded from collected soils. Headspace analysis will be performed on each lithologic and analytical soil sample collected. A portion of the recovered soil sample will be placed into a quart-size, resealable plastic bag, and the bag will be labeled, sealed, and shaken to mix the sample. The sample will be allowed to volatilize in a shaded area for approximately 15 minutes after which a headspace reading will be taken by punching through the bag with an OVA or PID sampling tip. The OVA or PID shall be calibrated using a standard of known concentration (e.g., isobutylene at 100 parts per million) in accordance with the requirements of the Final Basewide QAPP (HydroGeoLogic, 2000). The sampling tip will not be placed in the soil, but in the headspace of the bag. A background headspace value will be obtained from empty reseal able plastic bags handled in a manner identical to the plastic bag containing the headspace sample. The headspace reading and the background reading will be recorded on the Soil Boring Log (located in Appendix D of the work plan).

7.1.2 Field Parameters for Water Samples

The pH will be measured during groundwater purging using a portable pH meter. The pH meter will be calibrated with three buffer solutions of the appropriate range for the expected values of pH. The meter will be recalibrated daily.

7.2 EQUIPMENT CALIBRATION AND QUALITY CONTROL

Field equipment will be maintained and calibrated to the standards in their respective operations manuals. Equipment failures will be repaired in the field if possible; if not, the instrument will be tagged, removed from use, and returned for repair or replacement. Field equipment will be calibrated daily before the start of sampling activities. Calibration records will be maintained on the Calibration Log (Appendix D of the WP). The calibration record will include a unique instrument number (e.g., serial number), standards used, concentrations, and meter readings.

7.3 EQUIPMENT MAINTENANCE AND DECONTAMINATION

7.3.1 Equipment Maintenance

Field equipment will be kept in a controlled storage room and will be decontaminated prior to return to storage; any malfunctions will be reported to the Project Geologist. The Field

Coordinator will initiate actions necessary for the repair or replacement of defective equipment. Equipment maintenance logs are kept updated and on file. Power supplies of battery-powered instruments will be checked daily. Rechargeable instruments will be recharged daily.

7.3.2 Decontamination of Field Instruments

Decontamination of field instruments will be instrument-specific. The probes of the pH meters will be rinsed with reagent-grade water before and after each use, and at the end of each day. No decontamination is required for the OVA.

7.4 FIELD PERFORMANCE AND SYSTEM AUDITS

The Project Geologist or a designated representative will conduct weekly informal audits of the field activities. The weekly audit for completeness will include the following items:

- Sample labels
- COC records
- Field notebooks
- Sampling operations
- Document control

The first three items above will be checked for completeness. Sampling operations will be reviewed to determine if they are performed as stated in the WP or as directed by the Project Geologist. The informal document control audit will consist of checking each document for completeness, including items such as signatures, dates, and project numbers.

An unscheduled systems audit of field operations will be conducted using the project-specific WP and will be used to review the total data generation. The audit will include on-site review of the field operational system, physical facilities for sampling, and equipment calibrations. A performance audit may be conducted by the PM and Project Geologist if deemed necessary by the PM, Project Geologist, Lab Coordinator, or Client. The audit may focus on verifying that proper procedures are being followed so that subsequent sample data will be valid. Prior to the audit, a checklist will be prepared by the PM and Project Geologist that will serve as a guide for the performance audit.

The audit will verify whether or not the following items are being accomplished: (1) collection of samples follows the available written procedures, (2) COC procedures are followed for traceability of samples origin, (3) appropriate QC checks are being made in the field and documented in the field log book, (4) specified equipment is available, calibrated, and working properly, (5) sampling crews are adequately trained, (6) record-keeping procedures are being followed and appropriate documentation is maintained, and (7) corrective action procedures are followed. An audit report summarizing the results and corrections will be prepared and filed in the project files.

8.0 RECORD KEEPING

HydroGeoLogic will maintain field records sufficient to recreate all sampling and measurement activities and to meet all ERPIMS data loading requirements. The information shall be recorded with indelible ink in a permanently bound notebook with sequentially numbered pages. These records shall be archived in an easily accessible form and made available to the USAF upon request.

The following information will be recorded for all field activities: (1) location, (2) date and time, (3) identity of people performing activity, and (4) weather conditions. The following information will be recorded for all field measurements: (1) the numerical value and units of each measurement, and (2) the identity of and calibration results for each field instrument will also be recorded.

The following additional information will be recorded for all sampling activities: (1) sample type and sampling method, (2) the identity of each sample and depth(s), where applicable, from which it was collected, (3) the amount of each sample, (4) sample description (e.g., color, odor, clarity), (5) identification of sampling devices, and (6) identification of conditions that might affect the representativeness of a sample (e.g., refueling operations, damaged casing).

The following section describes the field documentation procedures, which will be followed as a means of recording observations and findings during the RFI field investigation. Documentation will include the form of field log books, various sample and calibration forms, site photographs, and drawings/sketches. All documentation will be completed in indelible ink and corrections will be stricken out with a single line and initialed. Examples of field forms are included in Appendix D of the WP.

8.1 FIELD LOG BOOK

Log books with sequentially numbered pages will be kept at the site during all field activities and will be assigned to each sample team. These logs will be updated, continually, and will constitute master field investigation documents. Information to be recorded in the logs includes, but is not limited to, the following:

- Project identification
- Field activity subject
- General work activity, work dates, and general time of occurrence
- Unusual events
- Subcontractor progress or problems
- Communication with the client or others
- Weather conditions
- HydroGeoLogic personnel, subcontractors, and visitors on site
- Sample number and time of day for each sample collected for analysis

- Listing by sample number of samples collected during the day, sorted by COC record number (compiled at the end of the day)
- Record of telephone call to laboratory informing it of sample shipment
- Accomplishment of decontamination of drilling rig, construction materials, and sampling equipment
- Accomplishment of required calibration checks
- Disposition of purge water, decontamination fluids, and soil cuttings
- Variances from project plans and procedures (details will be recorded in the log book and presented in the RFI)
- Accomplishment of tailgate safety meetings
- Review of project procedures with site personnel
- Head space screening and breathing zone readings
- Accomplishment of decontamination of water sampling equipment
- Photographs taken and identification numbers
- Name and signature of person making log book entries
- Inspections and results of inspections.

8.2 FIELD EQUIPMENT LOG BOOK

A field equipment log book will be kept on site to document the proper use, maintenance, and calibration of field testing equipment. Accompanying the field equipment log book will be a three-ring binder containing operator manuals, specifications, and calibration requirements and procedures for all field testing equipment. Information to be recorded in the field equipment log book includes the following:

- Equipment calibration status
- Equipment decontamination status
- Equipment nonconformance
- Equipment inspection and repair records
- Name and signature of person making entry
- Date of entry
- Name of equipment and its identifying number
- Nature of work conducted
- List or reference of procedures used for calibration or maintenance
- Manufacturer, lot number, and expiration date of calibration standards
- Measurement results.

8.2.1 Sample Collection Log

A sample collection log form (i.e., Field Sampling Report) will be completed for each sample collected during the investigation. An example of the Field Sampling Report Form is included in Appendix D of the WP. Information to be included on the form includes the following:

- Date and time of sample collection
- Sample location
- Sample type (i.e., surface soil, sediment, groundwater, etc.)
- Name of person collecting samples
- Sample volumes and container types.

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9.0 REFERENCES

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FIGURES

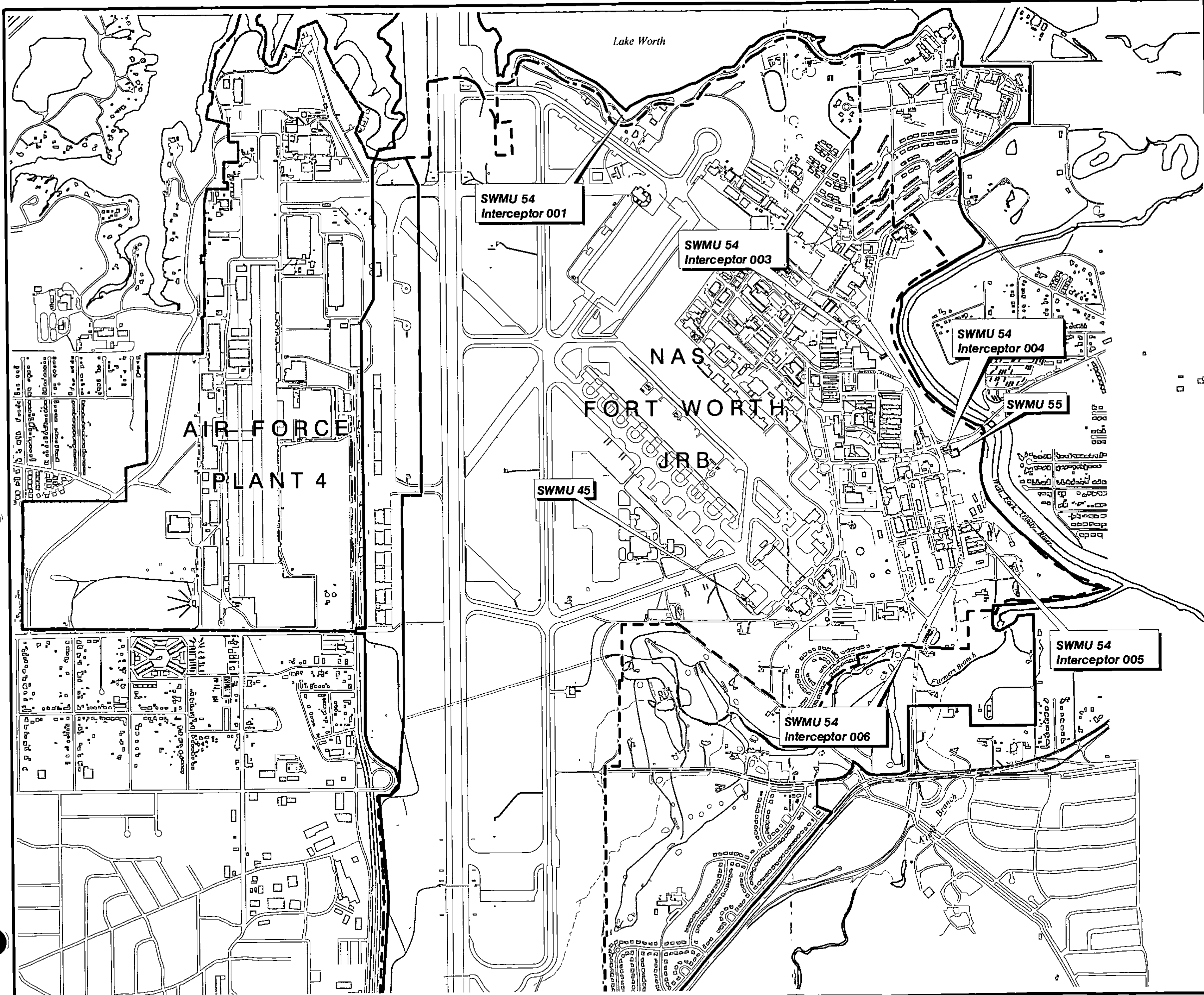

Figure 2.1

SWMU Location Map
NAS Fort Worth JRB, Texas

U.S. Air Force Center for Environmental Excellence

Legend

- NAS Fort Worth JRB (Carswell Field)
- Former Carswell Air Force Base Boundary
- Air Force Plant 4 Bounday
- Solid Waste Management Unit (SWMU)

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USACE Site Plan & Vicinity Map, November 1976

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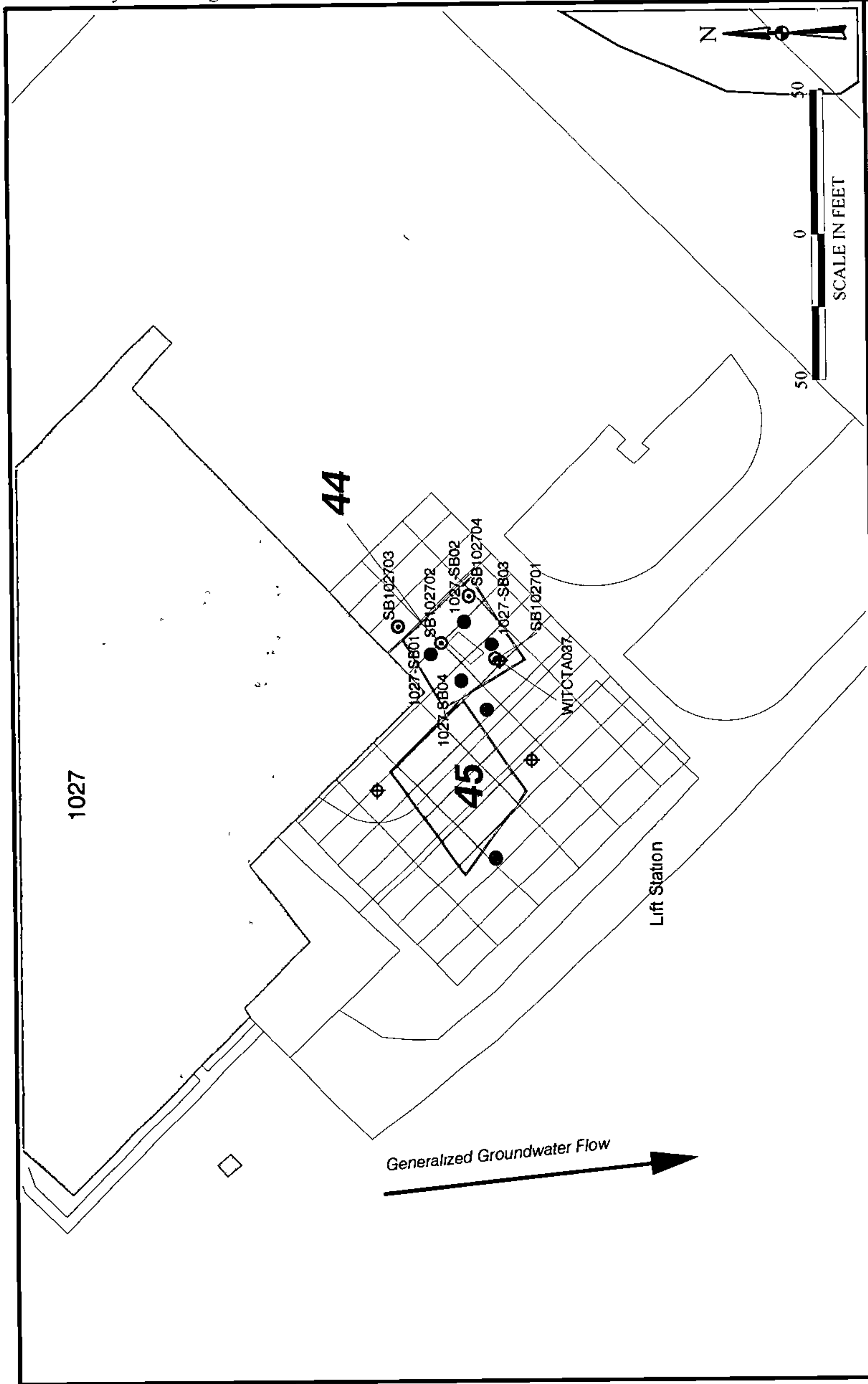

Figure 3.1
Proposed Investigation Activities
SWMU 45
Building 1027
Waste Oil Tank Vault

Legend

- Solid Waste Management Unit
- Proposed Soil Boring
- Existing Monitoring Well
- Proposed Monitoring Well
- Geophysical Grid
- Previous Boring (IT)
- Previous Boring (LAW)

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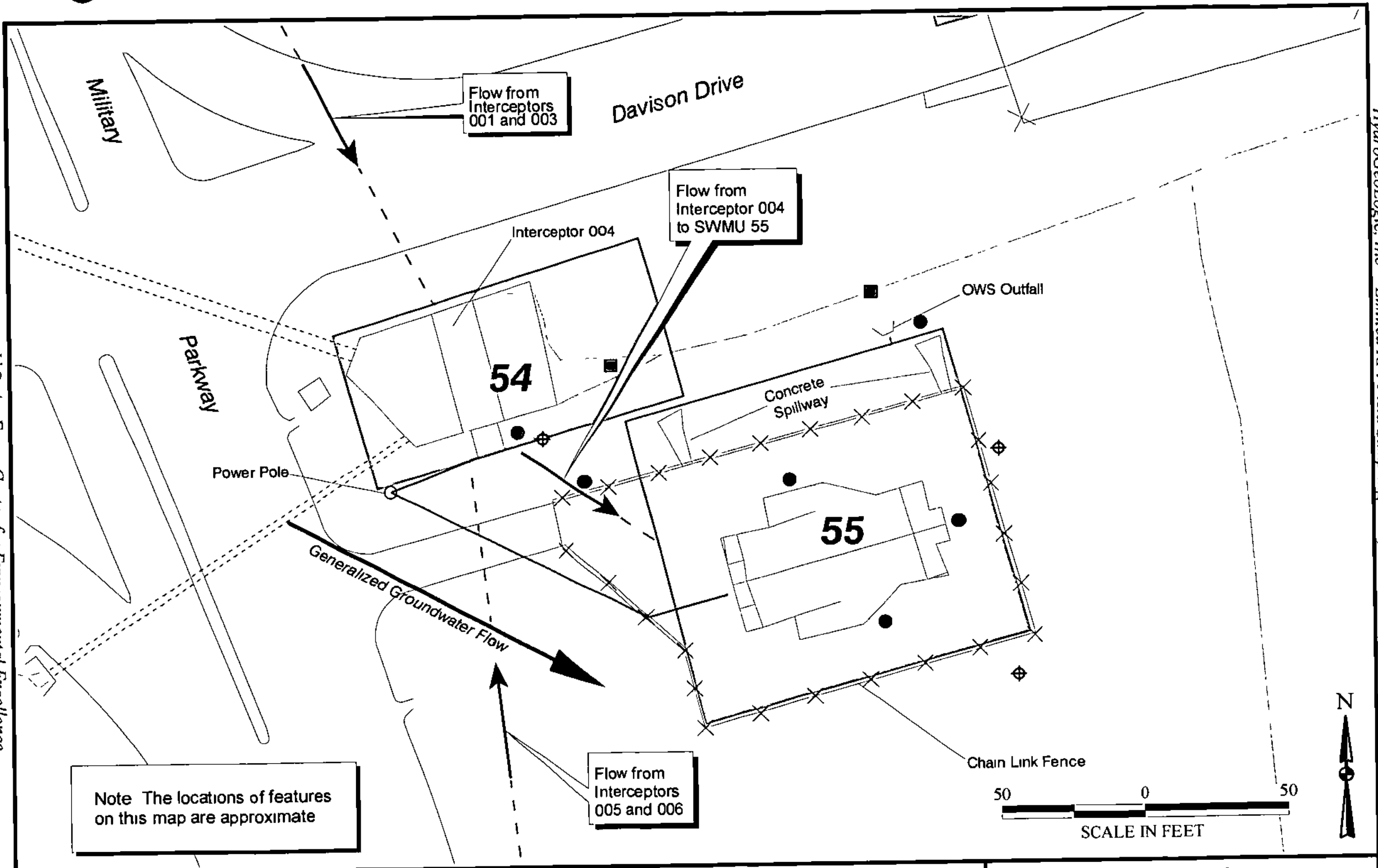

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HYDROGEOLOGIC INC.

Legend

- Solid Waste Management Unit
- Proposed Soil Boring
- Proposed Monitoring Well
- Surface Water /Sediment Sampling Point
- Storm Water Line
- Storm Water Culvert (underground)
- Electrical Utilities (underground)

Figure 3.2

Proposed Investigation Activities SWMUs 54 and 55 Storm Water Interceptor 004 and East Gate Oil/Water Separator

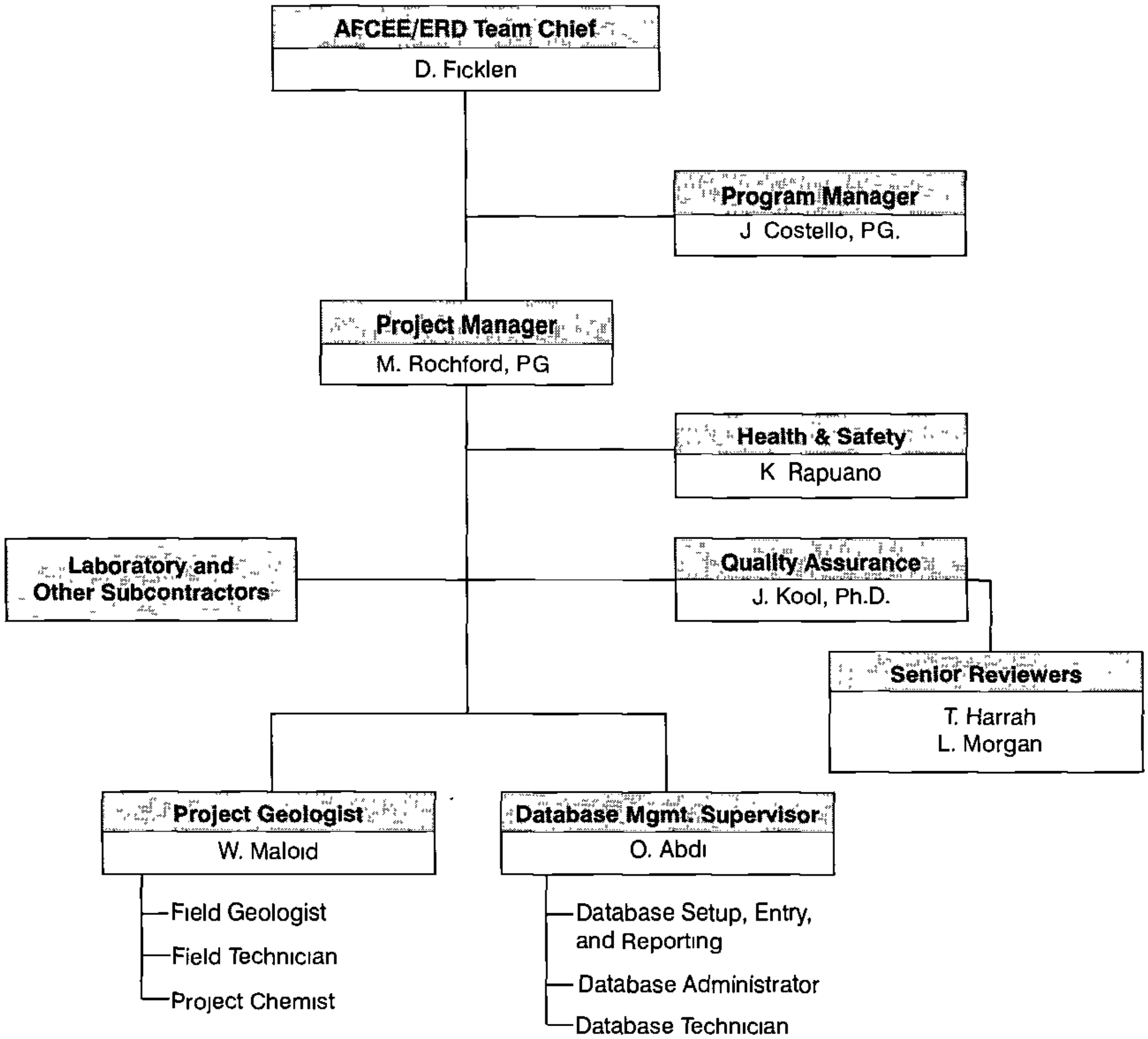

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Figure 4.1
Project Organizational Chart
NAS Fort Worth JRB, Texas

TABLES

Table 3.1
Data Quality Levels and Intended Use for Field and Laboratory Data

Sampling Matrix	Parameters[a]	Analytical Method	Field/Lab Analysis	Data Quality Level	Intended Use
Surface Soil Subsurface Soil	VOCs VOCs	PID PID	Field Field	Screening	Field screening for selecting samples for lab analysis To differentiate the stratigraphy, to identify buried waste
Soil	Trace Elements (metals) Mercury Organochlorine Pesticides and PCBs Organophosphorus Pesticides Chlorinated Herbicides VOCs SVOCs Dioxins and Furans Cyanide Sulfide	6010B/7000 7470A/7471 8080A 8140 8150 8260B 8270C 8290 9010A/9012 9030	Lab Lab Lab Lab Lab Lab Lab Lab Lab Lab	Definitive Definitive Definitive Definitive Definitive Definitive Definitive Definitive Definitive Definitive	Nature/extent of contaminants, risk assessment, corrective measures study
Groundwater	Trace Elements (metals)/ Mercury VOCs SVOCs	6010B/7000 7470A/7471A 8260B 8270C	Lab Lab Lab Lab	Definitive Definitive Definitive Definitive	Nature/extent of contaminants, risk assessment, corrective measures study

[a] VOCs - Volatile Organic Compounds
SVOCs - Semivolatile Organic Compounds
PCBs - Polychlorinated Biphenyls

Table 3.2
Current SWMU Summary Table
NAS Fort Worth JRB, Texas

SWMU	Description	Waste Managed	Operational Period	Status
45	Building 1027 Waste Oil Tank Vault	Waste oils, recovered fuels, spent solvents and cleaners	1987 to present	Reportedly out of use
54	Storm Water Interceptors	Storm water from large portions of installation, including traces of waste fuels, solvents, and flightline runoff	Late 1970s - present	Intact, but currently inactive
55	East Gate Oil/Water Separator	Basewide stormwater, including traces of waste fuels, solvents, and flightline runoff	Late 1970s - present	Intact, but currently inactive

*Note: The actual waste handled at these sites is unknown. The wastes reported in Table 3.2 are based on the general disposal practices of the former Carswell AFB during the time the site was in operation

Sources: A.T. Kearney 1989, RCRA Facility Assessment, Carswell AFB, Fort Worth, Texas
CH2M HILL, 1984, Installation Restoration Program Records Search for Carswell AFB, Texas

Table 3.3
Field Activities Summary
NAS Fort Worth JRB, Texas

Site	DPT Borings (to top of water table)	HSA Borings/Wells	Borings (Total)	Surface Water and Sediment Sampling
SWMU 45	2	1	3	0
SWMU 54	2	1	3	1
SWMU 55	4	2	6	1
Total	**8**	**4**	**12**	**2**

Notes:
DPT = direct push technology
HSA = hollow stem auger
* = A second phase of activities may occur based on results from initial borings. HSA borings and monitoring wells will be installed only if soil contamination is found.

Table 3.4
Soil Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples [1]	No. of Equipment Blanks [2]	No. of Ambient Blanks [3]	No. of Trip Blanks [4]	No. of Field Duplicates [5]	No. of MS/MSD [6]	Total No. of Samples
SWMU 45	SW8260B	Soil	10	1	0	1	1	1/1	15
	SW8270C	Soil	10	1	0	0	1	1/1	14
	SW6010B	Soil	10	1	0	0	1	1/1	14
	SW7471A	Soil	10	1	0	0	1	1/1	14
SWMU 54	SW8260B	Soil	6	1	0	1	1	0	9
	SW8270C	Soil	6	1	0	0	1	0	8
	SW8080A	Soil	6	1	0	0	1	0	8
	SW8141A	Soil	6	1	0	0	1	0	8
	SW8151A	Soil	6	1	0	0	1	0	8
	SW8280A	Soil	6	1	0	0	1	0	8
	SW9012A	Soil	6	1	0	0	1	0	8
	SW9030A	Soil	6	1	0	0	1	0	8
	SW6010B	Soil	6	1	0	0	1	0	8
	SW7471A	Soil	6	1	0	0	1	0	8
SWMU 55	SW8260B	Soil	14	2	0	2	1	1/1	21
	SW8270C	Soil	14	2	0	0	1	1/1	19
	SW8080A	Soil	14	2	0	0	1	1/1	19

Table 3.4 (continued)
Soil Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples [1]	No. of Equipment Blanks [2]	No. of Ambient Blanks [3]	No. of Trip Blanks [4]	No. of Field Duplicates [5]	No. of MS/MSD [6]	Total No. of Samples
SWMU 55 (continued)	SW8141A	Soil	14	2	0	0	1	1/1	19
	SW8151A	Soil	14	2	0	0	1	1/1	19
	SW8280A	Soil	14	2	0	0	1	1/1	19
	SW9012A	Soil	14	2	0	0	1	1/1	19
	SW9030A	Soil	14	2	0	0	1	1/1	19
	SW6010A	Soil	14	2	0	0	1	1/1	19
	SW7471A	Soil	14	2	0	0	1	1/1	19

Notes
1 Soil samples must be collected every 5 feet from the surface to the groundwater The number of soil samples is based on the estimated average depth to groundwater Three borings with 4 samples each will yield 12 samples The actual number of soil samples collected will vary depending on the actual depth to groundwater
2 Sites where only one boring will be sampled will be paired with a QC sample from another boring One equipment blank will be taken per day, per analysis (for example, 3 equipment blanks represents 1 sample/day for 3 days)
3 Ambient blanks for VOCs will only be sampled if VOCs are detected by the PID during a sampling effort
4 One ambient blank will be collected at the beginning of the field investigation for soil
5 Field duplicates collected on a 10% basis of investigation samples
6 MS/MSDs collected on a 5% basis of investigation samples

Table 3.5
Groundwater Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples[1]	No. of Equipment Blanks[3]	No. of Ambient Blanks[4]	No. of Trip Blanks[5]	No. of Field Duplicates[6]	No. of MS/MSD[7]	Total No. of Samples[2]
SWMU 45	SW8260B	Groundwater	5	1	0	1	1	0	8
	SW8270C	Groundwater	5	1	0	0	1	0	7
	SW6010B	Groundwater	5	1	0	0	1	0	7
	SW7471A	Groundwater	5	1	0	0	1	0	7
SWMU 54	SW8260B	Groundwater	3	1	0	1	1	0	6
	SW8270C	Groundwater	3	1	0	0	1	0	5
	SW8080A	Groundwater	3	1	0	0	1	0	5
	SW8141A	Groundwater	3	1	0	0	1	0	5
	SW8151A	Groundwater	3	1	0	0	1	0	5
	SW8280A	Groundwater	3	1	0	0	1	0	5
	SW9012A	Groundwater	3	1	0	0	1	0	5
	SW9030A	Groundwater	3	1	0	0	1	0	5
	SW6010B	Groundwater	3	1	0	0	1	0	5
	SW7471A	Groundwater	3	1	0	0	1	0	5
SWMU 55	SW8260B	Groundwater	10	1	0	1	1	1/1	15
	SW8270C	Groundwater	10	1	0	0	1	1/1	14
	SW8080A	Groundwater	10	1	0	0	1	1/1	14
	SW8141A	Groundwater	10	1	0	0	1	1/1	14

Table 3.5 (continued)
Groundwater Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples[1]	No. of Equipment Blanks[3]	No. of Ambient Blanks[4]	No. of Trip Blanks[5]	No. of Field Duplicates[6]	No. of MS/MSD[7]	Total No. of Samples[2]
SWMU 55 (continued)	SW8151A	Groundwater	10	1	0	0	1	1/1	14
	SW8280A	Groundwater	10	1	0	0	1	1/1	14
	SW9012A	Groundwater	10	1	0	0	1	1/1	14
	SW9030A	Groundwater	10	1	0	0	1	1/1	14
	SW6010A	Groundwater	10	1	0	0	1	1/1	14
	SW7471A	Groundwater	10	1	0	0	1	1/1	14

Notes
1 Monitoring well to be sampled for three consecutive rounds 2 months apart
2 The number of samples is based on the number of samples collected during each sampling event, and on the assumption that there will be enough water in each well to purge and sample The actual number of groundwater samples collected may vary depending on seasonal groundwater fluctuations
3 A maximum of one equipment blank will be taken per day
4 Ambient blanks for VOCs will only be sampled if VOCs are detected by the PID during the sampling effort
5 One trip blank will accompany each cooler that contains samples to be analyzed for VOCs Trip blanks will only be analyzed for VOCs
6 Field duplicates will be collected on a 10% basis of investigation samples
7 MS/MSDs will be collected on a 5% basis of investigation samples

Table 3.6
Sediment Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples [1]	No. of Equipment Blanks [2]	No. of Ambient Blanks [3]	No. of Trip Blanks [4]	No. of Field Duplicates [5]	No. of MS/MSD [6]	Total No. of Samples
SWMU 54	SW8260B	Sediment	2	1	0	1	1	0	5
	SW8270C	Sediment	2	1	0	0	1	0	4
	SW8080A	Sediment	2	1	0	0	1	0	4
	SW8141A	Sediment	2	1	0	0	1	0	4
	SW8151A	Sediment	2	1	0	0	1	0	4
	SW8280A	Sediment	2	1	0	0	1	0	4
	SW9012A	Sediment	2	1	0	0	1	0	4
	SW9030A	Sediment	2	1	0	0	1	0	4
	SW6010B	Sediment	2	1	0	0	1	0	4
	SW7471A	Sediment	2	1	0	0	1	0	4

Table 3.7
Surface Water Sample Analysis Summary
NAS Fort Worth JRB, Texas

Site	Method	Matrix	No. of Samples[1]	No. of Equipment Blanks[3]	No. of Ambient Blanks[4]	No. of Trip Blanks[5]	No. of Field Duplicates[6]	No. of MS/MSD[7]	Total No. of Samples[2]
SWMU 54	SW8260B	Surface water	2	0	0	1	1	0	4
	SW8270C	Surface water	2	0	0	0	1	0	3
	SW8080A	Surface water	2	0	0	0	1	0	3
	SW8141A	Surface water	2	0	0	0	1	0	3
	SW8151A	Surface water	2	0	0	0	1	0	3
	SW8280A	Surface water	2	0	0	0	1	0	3
	SW9012A	Surface water	2	0	0	0	1	0	3
	SW9030A	Surface water	2	0	0	0	1	0	3
	SW6010B	Surface water	2	0	0	0	1	0	3
	SW7471A	Surface water	2	0	0	0	1	0	3

Table 4.1
Key Project Personnel

Name	Title	Organization	Telephone
Don Ficklen	Team Chief	AFCEE/ERD	(210) 536-5290
Michael Dodyk	NAS Forth Worth JRB POC	AFCEE/ERD	(817) 782-7167
Jim Costello	Program Manager	HydroGeoLogic	(703) 478-5186
Miquette Rochford	Project Manager	HydroGeoLogic	(703) 736-4511
Jan Kool	QA Manager	HydroGeoLogic	(703) 478-5186
Ken Rapuano	Health & Safety Officer	HydroGeoLogic	(703) 736-4546
TBD	Lab Project Manager	TBD	TBD
TBD	Lab Operations Manager	TBD	TBD
TBD	Lab QA Officer	TBD	TBD
TBD	Lab Sample Custodian	TBD	TBD
Brad Nielsen	Project Geologist	HydroGeoLogic	(512) 336-1170
William Maloid	Project Geologist	HydroGeoLogic	(703) 478-5186
Omar Abdi	Data Mgmt. Supervisor	HydroGeoLogic	(703) 478-5186
Lynn Morgan	Senior Reviewer	HydroGeoLogic	(703) 478-5186
Todd Harrah	Senior Reviewer	HydroGeoLogic	(512) 336-1170

TBD - To Be Determined

Table 5.1
Field Corrective Action Procedures
NAS Forth Worth JRB, Texas

Situation	Calibration	Frequency	Field Objective Affected	Corrective Action Procedure
Equipment malfunction			Equipment is calibrated and operating properly	- Notification of site supervisory personnel
PID/OVA	- Calibrated to ±20% of known calibration gas	- Daily		- Correct problem, recalibrate
pH	- Calibrated with two buffer solutions that bracket expected sample pH	- Daily		- Repair or replace malfunctioning parts
SC	- Calibrated with two standards in expected range of sample SC	- Daily		- Recalibrate and/or replace standards
Temperature	- Calibrate within expected temperature range of samples	- Monthly		- Repair or replace malfunctioning parts
Turbidity	- Calibrate within expected range of sample turbidity	- Daily		- Submission of document to Project Geologist, Project Manager, and Quality Assurance Manager
Incorrect sample collection procedures	NA	NA	Samples are taken according to standard operating procedures	- Notification of site supervisory personnel - Review of situation and correct procedures - Submission of document to Project Geologist, Project Manager, and Quality Assurance Manager

Table 5.1 (continued)
Field Corrective Action Procedures
NAS Forth Worth JRB, Texas

Situation	Calibration	Frequency	Field Objective Affected	Corrective Action Procedure
Insufficient sample volume collection	NA	NA	Sufficient sample volume is provided to maintain sample integrity so that all required analyses can be conducted.	- Notification of site supervisory personnel by laboratory manager - Review site affected and impact of samples on site characterization - correct procedures - Submission of document to Project Geologist, Project Manager, and Quality Assurance Management
Incorrect measurement data collection	NA	NA	Measurements are conducted according to standard operating procedures	- Notification of site supervisory personnel - Review of situation and correct procedures - Submission of document to Project Geologist, Project Manager, and Quality Assurance Management

NA = Not Applicable
PID = Photoionization detect or/organic vapor analyzer
SC = Specific conductivity

Table 6.1
Volume of Water in 1-Foot Section of Well Casing

Diameter of Borehole (inches)	F Factor (gallons)
1.5	0.09
2	0.16
3	0.37
4	0 65
6	1 47
8	2.60
10	4.04
12	5 81

Table 6.2
Requirements for Containers, Preservation Techniques, Sample Volumes, and Holding Times

Name	Analytical Methods	Container[a]	Preservation[b,C]	Minimum Sample Volume or Weight	Maximum Holding Time
Metals (except mercury)	SW6010A SW6020 and SW-846 AA methods	P, G, T	HNO_3 to pH <2, 4°C	500 mL or 8 ounces	180 days (water and soil)
Mercury	SW7470 SW7471	P, G, T	HNO_3 to pH < 2, 4°C	500 mL or 8 ounces	28 days (water and soil)
Chlorinated herbicides	SW8150B SW8151	G, Teflon-lined cap, T	4°C, pH 5-9	1 liter or 8 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
Cyanide, total and amenable to chlorination	SW9010A SW9012	P, G, T	4°C, NaOH to pH > 12; 0.6g ascorbic acid	500 mL or 4 ounces	14 days (water and soil)
Dioxins and furans	SW8280	G, Teflon-lined cap, T	4°C, 0.008% $Na_2S_2O_3$ (Kept Dark)	1 liter or 8 ounces	30 days to extraction and 45 days after extraction (water and soil)
Organochlorine pesticides and polychlorinated biphenyls (PCBs)	SW8080A, SW8081	G, Teflon-lined cap, T	4°C, pH 5-9	1 liter or 8 ounces	7 days until extraction (water); 14 days until extraction and 40 days after extraction (soil)
Organophosphorus Pesticides	SW8140	G, Teflon-lined cap, T	4°C, pH 5-9	1 liter or 8 ounces	7 days until extraction (water); 14 days until extraction and 40 days after extraction (soil)
Sulfide	SW9030	P, G, T	4°C; NaOH to pH >9, 2ml zinc acetate	500ml or 4 ounces	7 days

Table 6.2 (continued)
Requirements for Containers, Preservation Techniques, Sample Volumes, and Holding Times

Name	Analytical Methods	Container[a]	Preservation[b,c]	Minimum Sample Volume or Weight	Maximum Holding Time
Semivolatile organics	SW8270 SW8310C	G, Teflon-lined cap, T	4°C, 0.008% $Na_2S_2O_3$	1 liter or 8 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
Volatile organics (water)	SW8260B	G, Teflon-lined septum	4°C, 0.008% $Na_2S_2O_3$ (HCl to pH < 2 for volatile aromatics by SW8260)[b]	2 x 40 mL or 4 ounces	14 days; 7 days if unpreserved by acid
Volatile organics (soil)	SW8260B/ SW5035	En Core™ Sampler	4°C, frozen at -12 °C within 2 days of collection	3 x 5 gram cores	14 days

[a] Polyethylene (P); glass (G); brass sleeves in the sample barrel, sometimes called California brass (T).
[b] No pH adjustment for soil.
[c] Preservation with 0.008 percent $Na_2S_2O_3$ or by ascorbic acid is only required when residual chlorine is present.

TAB

Health + Safety Plan

646 188

FINAL
HEALTH AND SAFETY PLAN
LIMITED RCRA FACILITY INVESTIGATION OF SWMUs 45, 54, AND 55 AT NAS FORT WORTH JRB, TEXAS

Prepared for

U.S. Air Force Center for Environmental Excellence
Brooks AFB, Texas

Contract Number F41624-95-D-8005

Prepared by

HydroGeoLogic, Inc.
1155 Herndon Parkway, Suite 900
Herndon, VA 20170

September 2000

FINAL
HEALTH AND SAFETY PLAN
LIMITED RCRA FACILITY INVESTIGATION OF
SWMUs 45, 54, AND 55 AT
NAS FORT WORTH JRB, TEXAS

PROJECT:	U.S. Air Force Center for Environmental Excellence
PROJECT NUMBER:	Contract No. F41624-95-D-8005 HydroGeoLogic Project No. AFC001-0033
PROJECT SITE LOCATION:	NAS Fort Worth JRB, Texas
PROJECT MANAGER:	Miquette Rochford
HEALTH AND SAFETY OFFICER:	Ken Rapuano
SITE SAFETY OFFICER:	TBA
PLAN PREPARER:	Lawson Gullette
PREPARATION DATE:	August 24, 2000

APPROVED BY:

9.29.00

Ken Rapuano Date
HydroGeoLogic, Inc.
Health and Safety Officer

9/29/00

Miquette Rochford Date
HydroGeoLogic, Inc.
Project Manager

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEE	U.S. Air Force Center for Environmental Excellence
ANSI	American National Standards Institute
°C	degrees Celsius
CFR	Code of Federal Regulations
COR	contracting officer's representative
CPR	cardiopulmonary resuscitation
dB(A)	decibel A-weighted scale
eV	ionization Potential
°F	degrees Fahrenheit
FSP	Field Sampling Plan
HAZWOPER	Hazardous Waste Site Operations
HCS	hazard communication standard
HPS	Hantarirus Pulmoney Syndrome
HSO	Health and Safety Officer
HSP	Health and Safety Plan
HydroGeoLogic	HydroGeoLogic, Inc.
JRB	Joint Reserve Base
LEL	lower explosive limit
MEK	methyl ethyl ketone
mg/m^3	milligrams per cubic meter
MSDS	Material Safety Data Sheet
NA	not applicable
ND	not determined
NAS	Naval Air Station
NIOSH	National Institute for Occupational Safety and Health
O_2	oxygen
OWS	oil/water separator
OSHA	Occupational Safety and Health Administration

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

+PEL	permissible exposure limit
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
PVC	polyvinyl chloride
RCO	Responsible Corporate Officer
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SSO	Site Safety Officer
SWMU	solid waste management unit
TLV	threshold limit value
UEL	upper explosive limit
WP	Work Plan

FINAL
HEALTH AND SAFETY PLAN
LIMITED RCRA FACILITY INVESTIGATION OF
SWMUs 45, 54, AND 55 AT
NAS FORT WORTH JRB, TEXAS

1.0 INTRODUCTION

1.1 PURPOSE

This Health and Safety Plan (HSP) is designed to assign responsibilities, establish personnel protection standards, specify mandatory operating procedures, and provide for emergency contingencies with respect to health and safety issues that may arise while HydroGeoLogic, Inc. (HydroGeoLogic) personnel and subcontractor personnel are engaged in Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) activities at the following solid waste management units (SWMUs):

- SWMU 45 (Building 1027 Waste Oil Tank Vault)
- SWMU 54 (Storm Water Interceptors)
- SWMU 55 (East Gate Oil/Water Separator)

All of the sites are located within the former Carswell Air Force Base (AFB), now referred to as Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), located in Fort Worth, Texas. The RFI activities at SWMUs 45, 54, and 55 were requested through statements of work dated December 22, 1999 under the authorization of U.S. Air Force Center for Environmental Excellence (AFCEE) Contract Number F41624-95-D-8005, Delivery Order Numbers 0033.

This HSP conforms to the requirements of Occupational Safety and Health Administration (OSHA) Standard 29 Code of Federal Regulations (CFR) 1910 and 1926. Detailed OSHA requirements for hazardous waste operations are contained in OSHA Standard 29 CFR 1910.120 and OSHA Standard 29 CFR 1926.65, "Hazardous Waste Operations and Emergency Response." Additional guidance for hazardous waste operations may be found in the U. S. Environmental Protection Agency (EPA) publication "Standard Operating Safety Guides" (June 1992), the National Institute of Occupational Safety and Health (NIOSH)/OSHA/U.S. Coast Guard (USCG)/EPA publication "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" (October 1985), and Federal Acquisition Regulation (FAR) clause 52.236-13, Accident Prevention.

This HSP is based on available background information regarding possible chemical, physical, and biological hazards that may exist at each of the sites. If more information concerning the nature and/or concentrations of contaminants becomes available, this HSP will be amended accordingly.

1.2 APPLICABILITY

The provisions of the HSP are mandatory for all official visitors, HydroGeoLogic employees, and subcontractors while investigations are being conducted at NAS Fort Worth JRB. These investigations will include a geophysical survey, the completion and sampling of approximately seven soil borings, and the installation of possibly five monitoring wells to evaluate the nature and extent of the potential contamination associated with each of the SWMUs. Inadequate health and safety precautions on the part of visitors or subcontractors, or the belief that personnel on the site are or may be exposed to an immediate health hazard, can be cause for HydroGeoLogic to suspend on-site activities and require all personnel to evacuate the area.

1.3 PROJECT ORGANIZATION, PERSONNEL, AND RESPONSIBILITIES

This section outlines HydroGeoLogic's personnel organization for this project as presented in Figure 4.1 of the Field Sampling Plan (FSP) and establishes the roles and responsibilities of various project personnel regarding site health and safety. The authority and responsibilities of each HydroGeoLogic individual utilized for this project are presented in the following sections.

1.3.1 Responsible Corporate Officer

The Responsible Corporate Officer (RCO) for this project will be Jim Costello, P.G. The RCO has authority to direct changes to the Corporate Health and Safety Program and determines and implements personnel disciplinary actions, as required. The RCO's responsibilities for this project include the following:

- Direct and monitor the implementation of the Corporate Health and Safety Program
- Advise on health and safety matters
- Issue directives, advisories, and information to the Health and Safety Officer (HSO)

1.3.2 Health and Safety Officer

The HSO for this project will be Ken Rapuano. The HSO has the authority to:

- Suspend work or otherwise limit exposure to personnel if health and safety plans appear to be unsuitable or inadequate
- Direct personnel to change work practices if existing practices are deemed to be hazardous to their health and safety

- Remove personnel from projects if their actions or conditions endanger their health and safety or the health and safety of coworkers

- Approve the qualifications of employees to work at hazardous waste sites

- Approve health and safety plans

The HSO responsibilities for this project will include the following:

- Interfacing with the Project Manager (PM) in matters of health and safety

- Keeping the RCO and PM informed on the status of the site health and safety plan

- Developing or reviewing and approving project health and safety plans prior to submittal

- Conducting staff training and orientation on health and safety-related activities

- Appointing or approving the Site Safety Officer (SSO)

- Monitoring compliance with health and safety plans and conducting site audits

- Assisting in obtaining required health and safety equipment

- Approving personnel to work on hazardous waste management projects with regard to medical examinations and health and safety training

- Maintaining records pertaining to medical surveillance, training, fit testing, chemical exposure, and accidents/incidents

- Providing industrial hygiene/chemical safety guidance

1.3.3 Project Manager

The PM for this project will be Miquette Rochford. The PM has the authority to

- Coordinate with the HSO on health and safety matters

- Assign an HSO-approved SSO to the project and, if necessary, assign a suitably qualified replacement

- Temporarily suspend field activities if health and safety of personnel are endangered, pending an evaluation by the HSO

- Temporarily suspend an individual from field activities for infractions of the health and safety plan, pending an evaluation by the HSO

The PM responsibilities for this project will include the following:

- Ensuring that the project is performed in a manner consistent with the health and safety program
- Ensuring that the project health and safety plan is prepared, approved, and properly implemented
- Providing the HSO with the information needed to develop health and safety plans
- Ensuring that adequate funds are allocated to fully implement project health and safety plans

1.3.4 Site Safety Officer

The SSO will direct all on-site health and safety training and daily safety inspections. A qualified HydroGeoLogic employee who has performed these functions previously will be the designated SSO. The SSO has the authority to temporarily suspend field activities if the health and safety of personnel are endangered, pending further consideration by the HSO, and to temporarily suspend an individual from field activities for infractions of the health and safety plan, pending an evaluation by the HSO.

The SSO will report any problems or concerns to the HydroGeoLogic HSO and PM. The HSO will also review accident reports and air monitoring data sheets; however, because these reviews are necessarily conducted after the fact, the SSO remains the person responsible for on-site safety. At the facilities, the SSO has primary responsibility for

- Directing health and safety activities on the site
- Ensuring that appropriate personal protective equipment (PPE) is available and properly utilized by HydroGeoLogic personnel, visitors, and subcontractor personnel
- Ensuring that personnel are aware of the provisions of this plan, are instructed in the work practices necessary to ensure safety, and are aware of planned procedures for dealing with emergencies
- Ensuring that personnel are aware of the potential hazards associated with investigation activities
- Monitoring the safety performance of all personnel to ensure that required work practices are followed

- Monitoring the physical condition of site workers for heat and cold stress

- Correcting any work practices or conditions that may result in injury or exposure to hazardous substances

- Ensuring the completion of the site-specific HSP forms presented in Section 14.1 (e.g., Compliance Agreement, Accident/Incident Reports, Site Safety Briefing Form, etc.)

- Ensuring that a copy of the HSP is maintained on the site during all investigation activities

- Ensuring that all air monitoring and equipment calibrations required by the HSP are performed and recorded, and that logs/forms that include these activities are maintained (Section 14.1)

- Ensuring that the subcontractor's medical monitoring program is adequate per OSHA Standard 29 CFR 1910.120 and this HSP

- Verifying OSHA 40-hour health and safety training before admitting official site visitors (e.g., Air Force and regulatory representatives) in an exclusion zone and verifying medical certification and fit-testing for respirator use for visitors requesting admittance into a Level C PPE exclusion zone (per OSHA Standard 29 CFR 1910.120).

1.3.5 Project Field Personnel

Personnel working on this project will be approved by the PM and the HSO and will meet the qualifications outlined in OSHA Standard 29 CFR 1910.120, and this HSP. The project personnel involved in on-site investigations and operations are responsible for

- Taking all reasonable precautions to prevent injury to themselves and to their fellow employees

- Implementing the HSP and reporting any deviations from the anticipated conditions described in the plans to the SSO

- Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the SSO

1.3.6 Subcontractor Responsibilities

It is the responsibility of each HydroGeoLogic subcontractor to ensure compliance with all applicable Federal and state regulations, including OSHA Standard 29 CFR, Parts 1900 through 1910, and Part 1926, and the contents of this HSP. Specifically contained within these

OSHA regulations is OSHA Standard 29 CFR 1910.120, which includes requirements for training and medical surveillance for employees engaged in certain hazardous waste operations.

2.0 SITE DESCRIPTION INFORMATION

NAS Fort Worth JRB is located on 2,555 acres of land in Tarrant County, Texas, 8 miles west of downtown Fort Worth. The sites are covered by this HSP are three SWMUs located throughout NAS Fort Worth JRB. These SWMUs are identified as follows:

- SWMU 45 (Building 1027 Waste Oil Tank Vault)
- SWMU 54 (Storm Water Interceptors)
- SWMU 55 (East Gate Oil/Water Separator)

The locations of the SWMUs in relation to the Base are presented on Figure 1.3 in the Work Plan (WP). A detailed description of the sites to be investigated (i.e., SWMUs 45, 54, and 55) is provided in the WP. Please refer to the WP for project site description.

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3.0 RCRA FACILITY INVESTIGATION ACTIVITIES

RFI activities to be conducted at the NAS Fort Worth JRB will include the following:

- A geophysical survey will be performed at SWMU 45 to determine the location of a possible waste oil tank vault.
- Visual inspection of SWMU 55. If present, water, sediment, and other residue will be removed from each basin and sampled.
- Soil borings will be completed to the top of the water table at each unit and the soil will be sampled to determine if a release has occurred.
- Based on the initial analytical results additional borings may be advanced and sampled, as necessary, to ensure that the horizontal extent of any potential contamination is evaluated.
- Piezometers may be installed at selected sites in order to determine groundwater flow directions.
- Based on the analytical results from soil sampling, monitoring wells may be installed at selected sites and the groundwater will be sampled to further characterize the extent of any contamination encountered Additional sampling will be conducted, as necessary, using additional soil borings and/or monitoring wells.

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4.0 HAZARD ASSESSMENT

This section identifies and evaluates potential site hazards that may be encountered during RFI activities. Control measures to protect site personnel from these potential hazards are incorporated throughout this HSP, but are located primarily in the following sections:

- Section 6.0, Air Monitoring
- Section 7.0, Personal Protective Equipment
- Section 11.0, Standard Work Practices

4.1 CHEMICAL HAZARDS

The primary concerns from a chemical exposure standpoint are inhalation, ingestion, and absorption by direct skin contact with contaminants in locations expected to be source areas. Based upon the information obtained from previous site investigations (groundwater and soil), the primary chemicals of concern at NAS Fort Worth JRB have been identified and are listed in Table 4.1, along with their exposure limits and recognition properties. The acute and chronic symptoms of overexposure to these chemical contaminants and first aid procedures are presented in Table 4.2. If additional contaminants are identified during project activities, this HSP will be amended accordingly.

4.2 DECONTAMINATION SOLUTIONS AND PRESERVATIVES

Chemicals used to decontaminate sampling equipment and to preserve environmental samples also present hazards to the project personnel who use them. The chemicals likely to be brought to the site for use in this manner include the following:

- Nitric Acid
- Hydrochloric Acid
- Sulfuric Acid
- Methanol
- Hexane
- Liquid Tide™
- Alconox™

Although overexposure to these chemicals is unlikely, the acute and chronic symptoms and first aid procedures are also presented in Table 4.2.

In order to communicate the hazards of these chemicals to site personnel, Material Safety Data Sheets (MSDSs) for each of these chemicals will be maintained on-site and presented as part of the site-specific training (Section 10.2).

4.3 PHYSICAL HAZARDS

The following section titles identify physical hazards that may be encountered. They include, but are not limited to:

- Hot or Cold Work Environments (Stress)
- Noise Hazards
- Materials Handling
- Utility Hazards
- Ship, Trip, and Fall Hazards (Section 11.0)
- Flammable/Explosive Atmospheres (Section 6.0)
- Heavy Equipment/Vehicular Activity (Section 11.0)
- Confined Space Entry (Section 11.0)

Control measures to help protect site personnel from these potential hazards are incorporated in the following subsections and throughout this HSP.

4.3.1 Heat Stress

Heat stress can be a problem, especially if personnel must perform site activities while wearing PPE in warm, humid weather conditions. The four types of heat illness in increasing order of severity include heat rash, heat cramps, heat exhaustion, and heat stroke.

- Heat rash may result from continuous exposure to heat or humid air.

- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet, and abdomen.

- Heat exhaustion occurs from increased stress on various body organs, including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include pale, cool, and moist skin; heavy sweating; dizziness, fainting, and nausea.

- Heat stroke is the most serious form of heat stress. Temperature regulation fails and body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occurs. When heat stroke is suspected, professional medical help must be obtained immediately. Signs and symptoms include red, hot, and unusually dry skin; lack of or reduced perspiration; dizziness and confusion; strong, rapid pulse; and coma.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important, because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional injuries. To avoid heat stress, the following steps should be taken:

- Work schedules should be adjusted. The following guidelines of rest and cooling of the body will be followed to minimize the effects of heat stress:

  - If oral temperature exceeds 99.6 Fahrenheit (°F) (37.6 degrees Celsius [°C]), shorten the next work cycle by one-third without changing the rest period.

  - If oral temperature still exceeds 99.6 °F (37.6 °C) at the beginning of the next rest period, shorten the following work cycle by one-third.

  - Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6 °F (38.1 °C).

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (See Table 4.3). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

- Shelter (equipped with air conditioners and other cooling devices, if possible) or shaded areas should be provided to protect personnel during rest periods.

- Workers' body fluids should be maintained at normal levels to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water perspired, which will vary from day to day. The normal thirst mechanism is not sensitive enough to ensure that water intake is sufficient to replace water lost through perspiration. When heavy sweating occurs, workers should be encouraged to drink more. Have workers drink fluid (preferably water or diluted drinks) before beginning work. Urge workers to drink a cup or two at each scheduled break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but will depend on actual fluid replacement needs, which will vary depending on the sweat rate.

- The drinking water temperature should be maintained at 50 °F to 60 °F (10 °C to 15.6 C).

- Disposable cups that hold about 16 ounces should be provided.

- Workers should be encouraged to maintain an optimal level of physical fitness. Where indicated, acclimatize workers to site work conditions.

- Workers should be trained to recognize, identify, and treat heat stress.

When heat stress is suspected, the following steps should be taken:

- Move the victim out of the heat.

- Loosen tight clothing.
- Remove perspiration-soaked clothing.
- Apply cool, wet cloths to the skin.
- Fan the victim.
- If the victim is conscious, give cool water to drink. Do not give electrolyte solutions (i.e., those containing salt) to victims of heat stress because it can cause nausea and vomiting. Only small sips of cool water should be administered to heat stress victims.
- Call for an ambulance if the victim refuses water, vomits, or starts to lose consciousness.

4.3.2 Cold Stress

If site work is to be conducted during the winter, cold stress is a concern to the health and safety of personnel. Special concern must be taken with regard to the wearing of Tyvek™ suits in cold weather. Such disposable clothing does not "breathe," perspiration does not evaporate, and the suits can become wet. Wet clothes combined with cold temperatures can lead to hypothermia. If the air temperature is less than 40 °F and an employee perspires, the employee must change to dry clothes.

The following are the five degrees of cold stress in increasing order of severity:

- Incipient frostbite is a mild form of cold stress characterized by sudden blanching or whitening of the skin.
- Chilblain is an inflammation of the hands and feet caused by exposure to cold moisture. It is characterized by a recurrent localized itching, swelling, and painful inflammation of the fingers, toes, or ears. Such a sequence produces severe spasms, accompanied by pain.
- Second-degree frostbite is manifested by skin with a white, waxy appearance that is firm to the touch. Individuals with this condition are generally not aware of its seriousness because the underlying nerves are frozen and unable to transmit signals to the body. Immediate first aid and medical treatment are required.
- Third-degree frostbite will appear as blue, blotchy skin. The tissue is cold, pale, and solid. Immediate medical attention is required.
- Hypothermia develops when body temperature falls below a critical level. In extreme cases, cardiac failure and death may occur. Immediate medical attention is warranted

when the following symptoms are observed: involuntary shivering, irrational behavior, slurred speech, and sluggishness.

To care for any frostbite, handle the area gently. Never rub an affected area because rubbing causes further damage to soft tissues. Warm the affected area gently by soaking the affected part in water no warmer than 105° F. Keep the frostbitten part in the water until it looks red and feels warm. Loosely bandage the affected area with a dry, sterile dressing. If fingers or toes are frostbitten, place cotton or gauze between them. Do not break any blisters caused by frostbite. Obtain professional medical attention as soon as possible.

To treat hypothermia, start by caring for any life-threatening problems and call for emergency medical assistance. Remove any wet clothing and dry the victim. Warm the body gradually by wrapping the victim in blankets or putting on dry clothing and moving him or her to a warm place. If available, apply heat pads or other heat sources to the body, but be sure to keep a barrier such as a blanket, towel, or clothing between the heat source and the victim to avoid burning the victim. If the victim is alert, give warm liquids to drink. Do not warm the victim too quickly, such as by immersing the victim in warm water, because rapid rewarming can cause dangerous heart problems. In cases of severe hypothermia, the victim may be unconscious. Should the victim stop breathing, give rescue breathing and be prepared to administer cardiopulmonary resuscitation (CPR).

4.3.3 Noise Hazards

The SSO or designee will monitor high noise levels when equipment or machinery (e.g. backhoe, drill rig, etc.) is being used on-site. Field personnel working in areas where noise levels can be expected to reach or exceed 85 decibels on the decibel A-weighted scale (dB(A)) will be issued hearing protection to reduce the level below the 85 dB(A) threshold. Compliance standards for occupational noise exposure are found in 20 CFR 1910.95.

4.3.4 Materials Handling

The most common type of materials handling accident involves fingers or toes of field personnel being caught between two objects. Special precautions must be implemented during the moving, shifting, or rolling of materials; and these activities should never be attempted by a single individual. Workers are required to use proper lifting techniques for handling materials, and oversized or heavy loads require "team lift" procedures.

4.3.5 Utility Hazards

The locations of all underground utilities must be identified and marked prior to initiating any subsurface investigations. In addition, drilling within 20 feet in any direction of overhead power lines will not be permitted.

4.4 BIOLOGICAL HAZARDS

The biological hazards that could be encountered by site personnel include, but are not limited to, the following:

- Poisonous Animals
- Ticks
- Animal-Borne Diseases
- Poisonous Plants (e.g., poison sumac, poison ivy, poison oak)

Control measures to protect site personnel from these biological hazards are included in the following sections.

4.4.1 Poisonous Animals

Poisonous animals that pose a potential threat at NAS Fort Worth JRB include snakes, insects (ants, bees, wasps), and spiders. Rattlesnakes are the most common poisonous snake in the area. Reactions from a snakebite are aggravated by acute fear and anxiety. Other factors that affect the severity of local and general reaction from a poisonous snakebite include the amount of venom injected and the speed of absorption of venom into the victim's circulation; the size of the victim; protection provided by clothing, including shoes and gloves; quick anti-venom therapy; and location of the bite. Poisoning can occur from injection or absorption of venom through cuts or scratches. Personnel should avoid walking in grass or underbrush at night and not climb rocky ledges without prior visual inspection. Field personnel should wear high-top boots and heavy pants since more than half of all snakebites are on the lower parts of the legs. Workers should not attempt to kill snakes unnecessarily as many people are bitten in such attempts.

Biting and stinging insects, such as ants, bees, and wasps, are very common. Generally, the bite and stings from these insects, although painful, are not dangerous; however, if bitten or stung by a large number of these insects, an individual may experience serious injury or even death. This is especially true of individuals who are particularly sensitive or allergic to insect toxins. Most of these insects live in easily recognizable nests, but many are encountered far from their nest. Care should be taken when entering little-used structures (sheds, utility buildings) and when opening monitoring well covers.

Spiders in the United States are generally harmless, with two notable exceptions: the black widow spider (Latrodectus mactans) and the brown recluse or violin spider (Lox osceles reclusa). The symptoms of a black widow spider bite are slight local reaction, severe pain produced by nerve toxin, profuse sweating, nausea, painful cramps in abdominal muscles, and difficulty in breathing and speaking. The symptoms of a brown recluse spider bite can be mild to severe. In the mildest form, the bite can cause pain and swelling like a bee sting or ant bite. If the reaction is severe, the bite area may become swollen, painful, and weep fluid. Swelling and reddening may spread to an entire limb, and if left untreated, the bite may cause necrosis of surrounding tissue and infection. Diarrhea, stomach cramps, and hot/cold flashes may also occur. Victims of poisonous spider bites recover in almost all cases, but an occasional death is reported.

Field personnel should exercise caution when lifting items such as logs, rocks, covers to manholes, and sump covers where poisonous animals could be encountered.

4.4.1.1 First Aid Procedures (Snakebite)

The objective of first aid is to reduce the circulation of blood through the bite area, to delay absorption of venom, to prevent aggravation of the local wound, and to sustain respiration. Several steps are listed to properly care for a snakebite victim. The most important step is to get the snakebite victim to the hospital quickly. In addition, take the following first aid measures:

- Keep the victim from moving around.

- Keep the victim as calm as possible and preferably in a lying position.

- Immobilize the bitten extremity and keep it at or below heart level. If the victim can reach a hospital within 4 to 5 hours, and if no symptoms develop, no further first aid measures need to be applied.

- If mild-to-moderate symptoms develop, apply a constricting band 2 to 4 inches above the bite, but not around a joint (the elbow, knee, wrist, or ankle) and not around the head, neck, or trunk. The band should be ¾ to 1½ inches wide, not thin like a rubber band. The band should be snug but loose enough for a finger to be slipped underneath. Watch for swelling and loosen the band if it becomes too tight, but do not remove it. Periodically check the pulse in the extremity beyond the bite to insure that the blood flow has not completely stopped.

Several other factors must be considered in cases of snakebite:

- Shock. Keep the victim lying down and comfortable, and maintain his or her body temperature.

- Breathing and heartbeat. If breathing stops, give mouth-to-mouth resuscitation. If breathing stops and there is no pulse, perform CPR if you have been trained to do so.

- Identifying the snake. If you can kill the snake without risk or delay, bring it to the hospital for identification, but exercise extreme caution in handling the snake.

- Cleaning the bitten area. You may wash the bitten area with soap and water and blot it dry with sterile gauze. You may apply dressings and bandages, but only for a short period of time.

- Medicine to relieve pain. Do not give the victim alcohol, sedatives, aspirin, or any medicine containing aspirin. Consult a doctor or other medical personnel for specific medications that may be used.

- Snakebite kits. Keep a kit accessible for all outings in primitive areas or areas known or suspected to be snake infested.

It is not recommended that cold compresses, ice, dry ice, chemical ice packs, spray refrigerants, or other methods of cold therapy be used in the first aid treatment of a snakebite.

4.4.1.2 General First Aid for Poisonous Insect Bites/Stings

For minor bites and stings use cold applications and soothing lotions, such as calamine. For more severe reactions, take the following first aid measures,

- Apply a constricting band above the injection site on the victim's arm or leg (between the site and the heart). Do not apply tightly. You should be able to slip your index finger under the band when it is in place. Give artificial respiration if necessary.

- Keep the affected part below the level of the victim's heart.

- If medical care is ready available, leave the band in place; otherwise, remove it after 30 minutes.

- Apply ice contained in a towel or plastic bag, or cold cloths, to the site of the sting or bite.

- Give home medicine, such as aspirin, for pain.

- If the victim has a history of allergic reactions to insect bites/stings or is subject to attacks of hay fever or asthma, or if he or she is not promptly relieved of symptoms, call a physician or take the victim immediately to the nearest location where medical treatment is available. **In a highly sensitive person, do not wait for symptoms to appear, since delay can be fatal.**

- In case of a bee sting, use tweezers to remove and discard the stinger and venom sac.

Workers who have had severe allergic reactions to bee/wasp stings in the past must inform the SSO when they arrive at the site for the first time.

4.4.2 Ticks

Field personnel should be aware of the presence of ticks at the site. When in an area suspected of harboring ticks (e.g., grassy, bushy, or woodland area) the following precautions can minimize the chances of being bitten by a tick:

- Wear long pants and long-sleeved shirts that fit tightly at the ankles and wrists.
- Wear light colored clothing so ticks can be easily spotted.
- Wear tick repellents.
- Inspect clothing frequently while in tick habitat.
- Inspect your head and body thoroughly when you return from the field.

Removal of ticks is best accomplished using small tweezers. Do not squeeze the tick's body. Grasp it where the mouth parts enter the skin and tug gently, not firmly, until it releases its hold on the skin. Save the tick in a jar labeled with the date, body location of the bite, and the place where it may have been acquired. Wipe the bite thoroughly with an antiseptic. Seek medical attention in the event tick-related disease symptoms develop.

Lyme disease is an illness caused by a bacterium that may be transmitted by the bite of a tick (Ixodes dammini), commonly referred to as the deer tick. Not all ticks are infected with the bacterium, however. When an infected tick bites, the bacterium is passed into the bloodstream of the host, where it multiplies. The various stages and symptoms of the disease are well recognized and, if detected early, can be treated with antibiotics.

The illness typically occurs in the summer and is characterized by a slowly expanding red rash, which develops a few days to a few weeks after the bite of an infected tick. This may be accompanied by flu-like symptoms along with headache, stiff neck, fever, muscle aches, and/or general malaise. At this stage treatment by a physician is usually effective, but, if left too long, these early symptoms may disappear and more serious problems may follow. The most common late symptom of the untreated disease is arthritis. Other problems that may occur include meningitis and neurological and cardiac abnormalities. It is important to note that some people do not get the characteristic rash but progress directly to the later manifestations. Treatment of later symptoms is more difficult than early symptoms and is not always successful.

4.4.3 Animal-Borne Diseases

There are three principal diseases that can be transmitted by contact with rodents and other animals: rabies, bubonic plague, and hantavirus pulmonary syndrome (HPS). For this reason, field personnel will avoid all contact with rodents and other animals (alive or dead), rodent droppings, and rodent nests. All of these should be considered to be potentially contaminated with life-threatening pathogens.

Rabies is a disease that is transmitted through the saliva of rodents, as well as other mammals, such as dogs, cats, raccoons, foxes, bats, and cattle. An animal infected with the disease may act strangely (e.g., not afraid of humans, out at the wrong time of day or night), drool, or appear partially paralyzed. **If left untreated, rabies is a fatal disease.** If someone is bitten by an animal, treat the wound first, especially if the bleeding is serious, then get the person immediate medical attention. Do not attempt to kill or capture the animal, as further injuries could result. Call the local animal control authorities, and provide them with a description of the animal and the location of the incident.

Bubonic plague is the disease that was the cause of the plague known as the Black Death, which decimated the populations of Europe in the Middle Ages and Renaissance. The disease is caused by a bacterium carried by the oriental rat flea, Xenopsylla cheopis, which is found on rats, mice, and jackrabbits. Epidemics of the disease do not occur in the U.S., but isolated cases have occurred in the southwestern states. The symptoms of the disease are a dark, pimple-like inflammation at the site of the bite, followed by a swelling of the lymph node closest to the bite area. The victim will develop an extremely high fever and dark splotching due to subcutaneous hemorrhaging. Untreated bubonic plague has a mortality rate of approximately 60%; however, the disease responds well when treated promptly with antibiotics (though not penicillin).

HPS is an infectious respiratory disease caused by exposure to the hantavirus. While cases of HPS are rare (generally less than 50 per year), HPS is fatal in approximately half the reported cases. This virus is present throughout the southwestern U.S. and is carried by rodents, especially mice. The virus enters the human body by the inhalation of particles, such as dust, which has become contaminated by the virus by exposure to rodent saliva, urine, or droppings. If personnel are exposed to rodents, droppings, or rodent nests, get immediate medical attention. HPS can be diagnosed using an antibody test. The symptoms of HPS are initially flu-like; after three to five days, the victim will develop coughing and shortness of breath, which will rapidly become more serious At this point, it is imperative that the victim receive medical attention. If treated in time, there is an excellent chance of surviving the disease; however, untreated HPS is very often fatal.

Armadillos are common in the Fort Worth area. These animals are nocturnal and avoid humans, but are often found dead, especially along roads. It is estimated that 5 percent of these animals carry the bacillus that causes leprosy, Mycobacterium leprae. This disease is not very contagious (it is believed that up to 95 percent of all humans are naturally immune); however, all dead armadillos encountered at the site should be treated as potentially infectious and avoided.

4.4.4 Poisonous Plants

The majority of skin reactions following contact with offending plants are allergic in nature and are characterized by general symptoms of headache and fever, itching, redness, and rash.

Some of the most common and most severe allergic reactions result from contact with plants of the poison ivy group including poison ivy, poison oak, and poison sumac. The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each. Both plants also have greenish-white flowers and berries that grow in clusters. Such plants produce a severe rash characterized by redness, blistering, swelling, and intense burning and itching. The victim can also develop a high fever and become very ill. Ordinarily, the rash begins within a few hours after exposure, but it may be delayed for 24 to 48 hours.

4.4.4.1 First Aid Procedure

- Remove contaminated clothing.
- Wash all exposed areas thoroughly with soap and cold water, followed by rubbing alcohol.
- Apply calamine or other soothing skin lotion if the rash is mild.
- Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity.

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5.0 HAZARD COMMUNICATION

The HydroGeoLogic Hazard Communication Program complies with the OSHA hazard communication standard (HCS) found in OSHA Standard 29 CFR 1910.120 and 1926.59, which applies to any chemical present in the workplace in such a manner that employees may be exposed to under normal conditions of use in a foreseeable emergency. Although waste materials are excluded from the OSHA requirements, decontamination chemicals for sampling equipment or protective clothing and calibration standards require MSDSs.

The principle of communicating the hazards of materials used in the workplace applies to company-wide activities, from informational programs on the conduct of hazardous waste activities to the company's insistence upon adequate health and safety training. It is also important for personnel to have an awareness of client concern for hazard communication due to Federal, state, and local regulations directly affecting certain client activities.

In order to comply with the HCS, HydroGeoLogic has made the following determinations:

- All containers of hazardous chemicals must be appropriately labeled or tagged to identify the hazard and provide information on effects and appropriate protective measures.

- Labels, tags, or signs must be properly affixed and visible at all times while a hazard is present and removed promptly when the hazard no longer exists.

- Written information (i.e., MSDSs) on hazardous chemicals in the workplace must be available to employees working with the substances.

- Appropriate MSDSs will be available to any contractor or subcontractor employee working on projects under HydroGeoLogic's control.

When investigation results indicate potential imminent health risks to contracted or Federal personnel, or the public at large, the contracting officer's representative (COR) and the base point of contact (POC) will be notified as soon as practicable. Written notification and supporting documentation will be provided within 3 days of finding potential imminent health risks during investigation activities.

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6.0 AIR MONITORING

This section presents requirements for the use of real-time air monitoring instruments during site activities involving potential for exposure to site contaminants. It establishes the types of instruments to be used, the frequency of their use, the techniques for their use, the action levels for upgrading/downgrading levels of protection, and the methods for instrument maintenance and calibration.

6.1 INSTRUMENTS AND USE

A photoionization detector (PID) equipped with an appropriate lamp will be utilized for detecting the presence of emissions from chemicals of concern. A Dräger pump and colorimetric tubes will be used to confirm any detections observed with the PID in accordance with Table 6.1. Additionally, lower explosive limit/oxygen (LEL/O_2) detectors will be used during all drilling and excavation activities to detect the presence of flammable/explosive atmospheres. Visual observation will be used to detect the presence of airborne particulate.

The PID/Dräger pump will be used throughout the execution of these activities:

- Soil boring installation
- Soil sampling
- Sampling equipment decontamination/heavy equipment decontamination
- Waste characterization and disposal

6.2 AIR MONITORING REQUIREMENTS

6.2.1 Photoionization Detector

Air monitoring with the PID will be initiated at potential sources of vapor emissions (source monitoring) at specified frequencies. The frequencies will be increased where concentrations of constituents are measured. The following potential sources and monitoring frequencies are anticipated:

- The PID will be used to monitor each sample location during environmental sampling.
- The PID will be used to monitor each 5-foot interval during surface and subsurface soil sampling.
- The PID will be used to monitor each container sampled during RFI waste characterization.

If source monitoring indicates the presence of airborne emissions, air monitoring will then be initiated in the breathing zones of those workers who could be affected by the emissions. Air monitoring will also occur upon the request of site workers who notice unusual site odors or an increase in their intensity. If work is to be performed downwind of a site, air monitoring will be conducted to determine what type of PPE, if any, is required to protect workers and to determine the potential for an imminent threat to public health.

The presence of elevated readings in the worker's breathing zone as identified in Table 6.1 requires amendments to the HSP before workers are allowed to enter the exclusion zone. Depending on the air monitoring readings, air-purifying respirators may not be acceptable because some contaminants of concern have poor warning properties and/or cannot be filtered from inspired air with chemical cartridges (Table 6.1). Elevated readings will be based on confirmation sampling using a Dräger pump and colorimetric tubes in accordance with Table 6.1.

6.2.2 Dräger Pump and Tubes

A hand-operated Dräger pump with colorimetric tubes will be used to confirm the results of PID testing. If the results of the PID tests show concentrations greater than 0.5 parts per million (ppm) above background concentrations in the breathing zone, then the colorimetric tubes will be used to identify the contaminants in the breathing zone. Colorimetric tubes to be utilized in the event of elevated PID readings will include vinyl chloride, benzene, tetrachloroethene, or trichloroethene in accordance with Table 6.1. The colorimetric tube utilized will depend on the chemical anticipated to be present at the site.

6.2.3 LEL/O_2 Detectors

Air monitoring with the LEL/O_2 detectors will be conducted during all drilling and excavation activities within boreholes, and immediately over drill cuttings at every 5-foot depth interval. If elevated (above background) LEL readings are observed, personnel must be advised of the potential explosive nature and must initiate the use of spark proof tools in accordance with Table 6.1. LEL readings in excess of 10 percent requires cessation of drilling and abandonment of the drilling location until readings subside.

6.2.4 Visual Observations

If airborne particulate are observed and air monitoring results (as indicated in Table 6.1) warrant, personnel must don air-purifying respirators equipped with organic vapor cartridges and high efficiency particulate air (HEPA) filters. If airborne particulate are observed due to intrusive activities at these sites, dust control measures will be implemented.

6.3 MODIFICATION OF AIR MONITORING REQUIREMENTS

The action levels and protection measures presented in Table 6.1 are based upon the assumption that the contaminants listed in Table 4.1 are the only contaminants that pose a reasonable health risk to site workers. In the event that this assumption is found to be invalid through analysis of samples collected, or by some other means, the action levels will be modified as necessary.

6.4 INSTRUMENT MAINTENANCE AND CALIBRATION

Air and noise monitoring instruments are maintained and prefield-calibrated at the HydroGeoLogic office in Herndon, Virginia. Field maintenance will consist of daily cleaning of the instruments using a damp towel or rag to wipe off the instrument's outer casing, overnight battery recharging, and cleaning or replacing of the lamp whenever calibration cannot be attained. Procedures for accomplishing instrument maintenance is contained in the PID user's manual provided with each instrument. The user's manual provided with each instrument will be followed to field calibrate the instrument prior to each day of use under the environmental conditions (temperature and humidity) that sampling will occur. Field equipment will also be calibrated at the end of each day to account for instrument drift and reliability.

6.5 RECORD KEEPING

Instrument calibrations and readings will be recorded on the Air Monitoring Log Sheet provided in Section 14.1 of this HSP. Copies of these log sheets will be maintained on-site until field activities covered by this HSP have been completed. The log sheets will be transmitted to the HydroGeoLogic HSO and to the project file at the completion of the field work.

LEL/O_2 readings will not be recorded unless flammable/explosive or oxygen deficient/enriched atmospheres are detected, in which case entries will be made in the field log book.

LEL/O_2, detector, and the PID will undergo daily operational checks. These checks will be recorded in the field log book and Equipment Calibration Log (Section 14.1).

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7.0 PERSONAL PROTECTIVE EQUIPMENT

This section presents requirements for the use of PPE for each of the activities being conducted. This section includes anticipated levels of protection for each of the activities, the criteria used for selecting various levels of protection, and criteria for modifying levels of protection based on monitoring instrument readings, and personal observations.

7.1 ANTICIPATED LEVELS OF PROTECTION

All work is anticipated to be performed in Level D protection, as defined in Appendix B of OSHA Standard 29 CFR 1910.120. Many activities may require the use of chemical resistant coveralls, gloves, and boot covers as presented in Table 7.1.

The items of PPE anticipated to be used for each activity are presented in Table 7.1. Where overlap in activities occurs, the more protective requirement will apply.

7.2 PPE SELECTION CRITERIA

Respiratory protection is not anticipated for use during the initial stages of work until detectability of site contaminants with air monitoring instruments warrants the donning of respirator protection in accordance with Table 6.1. See Section 7.3 for modification criteria of respiratory protection. Basic requirements for field personnel using respiratory protection include the following:

- All field personnel will be medically certified to wear a full-face respirator and have the proper fit test documentation within the past 12 months prior to assignment.

- Only NIOSH-approved respirators are to be used on-site. The respirators are to be properly cleaned, inspected, and maintained prior to and at the conclusion of the work day.

- Cartridges to air-purifying respirators will be disposed of at the end of each work day and when load-up or breakthrough occurs.

- Field personnel will be clean shaven in areas that might prevent the seal of the respirator to the face, and contact lenses will not be permitted while wearing a respirator.

Hard hats, safety glasses, and steel-toe work boots will be used as minimum protection to reduce the potential for injury resulting from exposure to the physical hazards associated with on-site investigations.

Boot covers, disposable nitrile gloves, and Tyvek™ coveralls will be used to minimize contamination of work clothes and to prevent direct skin contact with low level contamination.

Nitrile gloves of 11 mil thickness or greater will be worn for activities that may involve direct contact with appreciable concentrations of contaminants thought to be present as site contaminants.

Polyvinyl chloride (PVC) or Saranex™ coveralls, hoods, and/or splash shields will be worn to prevent saturation of work clothes during activities involving large volumes of liquids and/or saturated soils/equipment.

7.3 PPE MODIFICATION CRITERIA

This section presents criteria for upgrading and downgrading chemical protective clothing (CPC) and/or respiratory protection. When uncertainties arise, the more protective requirement will apply.

7.3.1 CPC Modification Criteria

Tyvek™ coveralls and boot covers must be worn anytime there is a reasonable potential for contamination of street clothes.

Disposable nitrile gloves must be worn anytime there is a reasonable potential for contact with unsaturated soils or equipment that may contain trace contamination.

Nitrile gloves (11 mil or greater) must be worn anytime there is a reasonable potential for contact with groundwater, saturated soils, and/or soils producing elevated PID readings.

PVC or Saranex™ coveralls must be worn anytime there is a reasonable potential for saturation of work clothes.

8.0 DECONTAMINATION

This section describes the steps site personnel will follow to prevent the spread of site contaminants into areas that may affect unprotected, unsuspecting site personnel or the public. It includes requirements for decontamination of personnel, sampling equipment, and augering/drilling equipment.

8.1 PERSONNEL DECONTAMINATION

The decontamination of personnel and their protective clothing will be performed within the decontamination zone. Table 8.1 presents the six stages for decontamination for Modified Level D protection.

Wash tubs containing an appropriate decontamination solution and soft-bristle brushes will be used to wash reusable PPE and boots. Clean water will be used for the final rinse. The choice of decontamination solution is dependent upon the type of materials that must be removed from reusable protective equipment. Based on the current understanding of potential site contaminants, a detergent and water solution is recommended for general purpose decontamination. Acceptable detergents include laboratory-grade cleaners (e.g., Alconox™ or equivalent), or a high strength consumer detergent such as Liquid Tide™.

Alternative decontamination solutions may be called for if the contaminants encountered are different or in a more concentrated state than anticipated. Alternative solutions include the following:

- Dilute acids for removal of basic (caustic) compounds, amines, and hydrazines
- Dilute bases (soaps and detergents) for removal of acidic compounds, phenols, thiols and some nitro and sulfonic compounds
- Organic solvents for removal of nonpolar compounds (organic)

Gloves and other PPE should be inspected frequently for integrity, and manufacturers' data for breakthrough times should be considered if concentrated contaminants are encountered.

The decontamination of personnel and their protective clothing will be performed in 18 stages for Level C protection, if necessary. The 18 stages are presented in Table 8.2.

All decontamination fluids generated will be contained and disposed of as specified in the WP. The decontamination area will be physically identified with rope or flagging and will be sufficiently equipped to be conducive for completion of the stages listed above.

8.1.1 Closure of the Personnel Decontamination Station

All disposable clothing and plastic sheeting used during the operation will be double-bagged and contained on-site prior to removal to an approved off-site disposal facility as identified in the WP. Decontamination and rinse solution will be contained on-site prior to disposal. Reusable rubber clothing will be dried and prepared for future use. If contamination of non-disposable clothing has occurred, the item will be discarded. All wash tubs, pail containers, etc., will be thoroughly washed, rinsed, and dried prior to removal from the site.

8.1.2 Disposal of Decontamination and Other Wastes

All PPE, polyethylene sheeting, and sampling support materials (e.g., paper towers, Ziplock bags) will be collected at the end of each work day, placed in plastic trash bags, and left at the site overnight. The following day, the air within the plastic trash bag will be tested using a PID. If the air within the bag does not show significant concentrations of organic vapors (greater than 10 ppm above background), the plastic trash bag will be double-bagged and placed in the municipal waste dumpster for disposal.

All other wastes generated during decontamination other than decontamination fluids will be placed into 55-gallon drums; each drum will have a removable top cover fitted with a top cover bung (type 17E/H) as identified in the FSP. The drums will be filled partially or completely, depending upon the difficulty of transporting them from the work site. All containers will be numbered and clearly labeled with the boring/well number and date of filling. The mixing of solid and liquid wastes will be avoided. The containers will be stored at a predesignated site until the analytical results from each boring/well can be reviewed in order to determine the waste classification for handling, transportation, and disposal.

8.2 EQUIPMENT DECONTAMINATION

All sampling equipment will be decontaminated prior to use, between sampling locations, and at the end of sampling activities to avoid cross-contamination, to decrease contact between personnel and contaminated materials, and to reduce the probability of removing contamination from the site. The procedures for decontaminating equipment are presented in Section 5.8 of the FSP.

9.0 MEDICAL SURVEILLANCE

9.1 REQUIREMENTS FOR HYDROGEOLOGIC PERSONNEL

All employees involved in field activities will be active participants in the HydroGeoLogic medical surveillance program. All medical examinations and procedures will be performed by or under the supervision of a licensed occupational physician. The examination will include the tests, procedures, and frequencies that comply with the requirements of OSHA Standard 29 CFR 1910.120 (f) and American National Standards Institute (ANSI) Z-88.2, and will be medically qualified to perform hazardous waste site work under respiratory protection. Medical surveillance documents confirming the worker's fitness to perform hazardous waste operations on this project are on file at HydroGeoLogic's headquarters in Herndon, Virginia, and can be made available upon request.

9.2 REQUIREMENTS FOR SUBCONTRACTORS

Subcontractors are also required to obtain a certificate of their ability to perform hazardous waste operations work and to wear respiratory protection. Subcontractors, that have a company medical surveillance program meeting the requirements of OSHA Standard 29 CFR 1910.120 (f) will be required to submit a letter, on company letterhead, confirming that all on-site workers to be utilized for this project are medically qualified to perform the investigation activities. In addition, medical surveillance documents for personnel assigned to this project must be made available upon request.

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10.0 TRAINING REQUIREMENTS

10.1 INITIAL TRAINING

10.1.1 Requirements for HydroGeoLogic Personnel

All investigation personnel to be utilized are currently enrolled in HydroGeoLogic's continuous training program in accordance with OSHA Standard 29 CFR 1910.120. Individuals working on a site have successfully completed an approved 40-hour Hazardous Waste Site Operations (HAZWOPER) course including 24-hours of actual field experience under the direction of a trained supervisor, and any subsequent annual 8-hour refresher courses. In addition, the on-site field leader will have completed an 8-hour supervisory course, and a majority of HydroGeoLogic's field investigation personnel are also current in first aid/CPR training requirements. HydroGeoLogic employee records are on file in the company's home office in Herndon, Virginia.

10.1.2 Requirements for Subcontractors

All HydroGeoLogic subcontractor personnel must also have completed a 40-hour HAZWOPER training course or the equivalent work experience as defined in OSHA Standard 29 CFR 1910.120(e) prior to performing work at the site. In addition, subcontractor personnel must also have successfully completed any subsequent annual 8-hour refresher training.

HydroGeoLogic subcontractors must certify that each subcontractor employee who will perform work at the site has had training meeting the requirements of OSHA Standard 29 CFR 1910.120(e). This certification can be accomplished by submitting a letter to HydroGeoLogic, on company letterhead, containing such information.

10.1.3 Requirements for Site Visitors

No person will be allowed in the work zones (exclusion and decontamination) unless they have completed the necessary health and safety training as required by OSHA Standard 29 CFR 1910.120(e) and are wearing the necessary protective equipment as required by this HSP.

10.2 SITE-SPECIFIC TRAINING

HydroGeoLogic will provide site-specific training to all HydroGeoLogic employees and subcontractor personnel who will perform work at the site. Daily health and safety meetings will be held prior to beginning field activities to discuss each day's activities, potential hazards, and any new health and safety issues not previously discussed. Personnel who do not participate in training will not be permitted to perform work at the site. Site-specific training will include the following:

- Contents of the HSP
- Names of personnel and alternates responsible for site health and safety
- Safety, health, and other hazards present on the site
- Use of PPE
- Work practices by which the employees can minimize risks from hazards
- Safe use of engineering controls and equipment on the site
- Medical surveillance requirements, including recognition of symptoms and signs that might indicate overexposure to hazards
- Decontamination procedures
- Emergency response procedures

HydroGeoLogic and subcontractor personnel will be required to sign a statement indicating receipt of site-specific training and understanding of site hazards and control measures. This form is presented in Section 14.1.

11.0 STANDARD WORK PRACTICES

All site investigation activities will follow these appropriate health and safety standard work practices.

11.1 GENERAL REQUIREMENTS/PROHIBITIONS

- A copy of this HSP will be available on-site for all field personnel, including visitors, to reference during investigation activities.
- No running or horseplay will be permitted.
- Eating, drinking, chewing gum or tobacco, taking medication, applying cosmetics, and/or smoking are prohibited in the exclusion and decontamination zones, or any location where a possibility for contact with site contaminants exists.
- The minimum required level of PPE to be worn by all on-site personnel will include steel-toed safety boots, safety glasses, and hard hat, if necessary.
- Upon leaving the exclusion zone, each worker's hands and face must be thoroughly washed. Any protective outer clothing is to be decontaminated and removed as specified in this HSP and left at a designated area prior to entering the clean area.
- Contact with potentially contaminated substances must be avoided. Contact with the ground or with contaminated equipment must also be avoided. Air monitoring equipment must not be placed on potentially contaminated surfaces.
- Facial hair that interferes with a satisfactory fit of the mask-to-face seal is not permitted on personnel required to wear respiratory protective equipment.
- All personnel must satisfy medical monitoring procedures.
- No flames or open fires will be permitted on-site.
- All personnel must be aware of and follow the action levels presented in this HSP for upgrading respiratory protection.
- Any new analytical data must be promptly conveyed via telephone to the project HSO by the laboratory technician or field leader.
- Personnel must develop hand signals with users of heavy equipment (e.g , drillers, Geoprobe operators, etc.). Standard hand signals to be used by personnel for nonverbal communication include:

- Stop — With arm extended to the side and palm down, hold position rigidly.
- Hoist — With forearm and forefinger pointing up, move hand in small horizontal circle.
- Lower — With forearm extended and forefinger pointing down, move hand in a small horizontal circle.
- Travel — With palm up, fingers closed, and thumb pointing in the direction of motion, jerk hand horizontally.
- Slow Move — Use one hand to give any motion signal, and place the other hand motionless next to the hand giving the motion signal.
- Emergency — With arm extended to the side and palm down, move hand rapidly right and left.

Standard hand signals will be discussed during each daily health and safety meeting when the use of heavy equipment is anticipated.

- A copy of the OSHA "Job Safety and Health Protection" poster must be prominently posted at each site.

- Only equipment that has been approved by the manufacturer may be used in conjunction with site equipment.

- Medicine and alcohol can potentiate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverage intake will not be allowed at any time, including during breaks.

- No person will enter the exclusion zone alone.

- Safety devices on equipment must be left intact and used as designed.

- Equipment and tools will be kept clean and in good repair and used only for their intended purpose.

- Eye protection must be worn when any hammering or pounding is performed that may produce flying particles or slivers.

- Field personnel are not allowed to lift more than 60 pounds. Rules to remember when attempting to lift heavy objects include:

  - Size up the load before trying to lift it, test the weight, and get help if needed.
  - Bend the knees and look up to keep the neck and back straight.
  - Do not twist or turn your body once you have made the lift.
  - Make sure you can carry the load where you need to go before lifting it.

- Set the load down properly, lower slowly by bending the knees.
- Always push, not pull, the object when possible.

- Heavy lifting (more than 60 pounds per worker) must be accomplished using mechanical lifting equipment. Mechanical lifting equipment that will be available on-site will include forklifts, hoists, dollies, backhoe/trackhoe, and other types of equipment that can be easily rented from an off-site location.

- Leather gloves must be worn when handling objects that may produce slivers or create a cutting or pinching hazard (e.g., driving wood stakes, handling drill rods/augers).

- No person shall climb the drill mast without the use of ANSI-approved fall protection (i.e., approved belts, lanyards, and a fall protection slide rail) or a portable ladder that meets the requirements of OSHA standards.

- The SSO must make an entry into the site field logbook at least daily to include the following:

    - Weather conditions
    - Site personnel
    - New arrivals and their clearance for site work
    - Air monitoring data summary
    - Monitoring instrument calibration
    - Indications of inhalation exposure
    - PPE used per task
    - Deviations from HSP
    - Inspection and cleaning of respiratory equipment
    - General health and safety problems/corrective actions

- If personnel note any warning properties of chemicals (irritation, odors, symptoms, etc.) or even remotely suspect the occurrence of exposure, they must immediately notify the SSO for further direction.

11.2 DRILLING ACTIVITIES

Prior to the commencement of drilling activities, all locations will be surveyed and marked for underground utilities. In addition, a hand auger or probe will be used to a depth of 3 feet to ensure the absence of underground utilities at the location of interest. If any uncertainties exist, the location will be moved to an adjacent area.

The following general drilling practices must be adhered to during investigation activities:

- All drilling equipment (i.e., rigging, derrick, hoists, augers, etc.) must be inspected by the drilling crew and SSO prior to starting work. Defective equipment will be removed from service and replaced.

- No drilling within 20 feet in any direction of overhead power lines will be permitted. The locations of all underground utilities must be identified and marked prior to initiating any subsurface activities.

- All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and geologists must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter. The driller and helper shall not simultaneously handle moving augers or flights unless there is a standby person to activate the emergency stop.

- Prior to raising the mast, the drill rig operator shall ensure that the proper stabilization measures have been taken. The drill rig shall not be moved while the mast is in the raised position.

- The driller must never leave the controls while the tools are rotating unless all personnel are clear of the rotating equipment.

- Drillers must wear hearing protection unless the employer can provide documentation that noise exposures are less than a dose of 50 percent as required by OSHA Standard 29 CFR 1910.95.

- Drilling activities shall immediately cease when inclement weather (e.g., heavy rains, lightning) or high winds occur at the site. All site personnel should immediately seek shelter.

- To maintain a clean operation, drill cuttings shall be promptly containerized as they are generated. A long-handled shovel or equivalent must be used to clear drill cuttings away from the hole and from rotating tools. Hands and/or feet are not to be used for this purpose.

- A remote sampling device must be used to sample drill cuttings if the tools are rotating. Samplers must not reach into or near the rotating equipment. If personnel must work near any tools, that could rotate, the driller must shut down the rig prior to initiating such work.

- Drillers, helpers, and samplers must secure all loose clothing when in the vicinity of drilling operations.

- Only equipment that has been approved by the manufacturer may be used in conjunction with site equipment. Pins that protrude from augers will not be allowed.

A variety of additional work practices (i.e., hoisting, cat line, pipe and auger handling, etc.) are to be adhered to by the drilling crew, but will not be addressed in this HSP. If the on-site field team leader or site supervisor observes any operations or actions that are perceived as threatening to the health and safety of site personnel, drilling operations will be temporarily suspended until a mutual understand of the action(s) in question are addressed and/or corrected.

Soil borings have the potential for releases to the environment and exposure to personnel. Gases and vapors that have a vapor density of less than 1.0 are lighter-than-air and tend to migrate upward in the atmosphere and disperse (e.g., methane). Heavier-than-air gases and vapors tend to stay close to the ground and may migrate to low-lying areas (e.g., hydrogen sulfide). In general, the only containment for a release to the air is termination of the release at the source (e.g., plug the boring). Depending on the contaminant encountered, it may be necessary to evacuate persons who are downwind of the area of the release. Emergency response personnel should be notified (Section 13.6) if air concentrations at the perimeter of the exclusion zone exceed threshold limit values (TLVs) or permissible exposure limits (PELs).

11.3 HOUSEKEEPING

Housekeeping is a very important aspect of an investigation program and will be strongly stressed in all aspects of field work. Good housekeeping plays a key role in occupational health protection and is a way of preventing dispersion of dangerous contaminants. All work areas will be kept as clean as possible at all times and spills will be cleaned up immediately. Housekeeping will be the responsibility of all employees.

HydroGeoLogic will implement a housekeeping program for the field activities to minimize the spread of contamination beyond the work site. The program will include the following:

- Daily scheduling to police the area of debris including paper products, cans, and other materials brought on-site
- Changing of wash and rinse water for hands, face, and equipment as needed
- Periodic (daily minimum) removal of all garbage bags and containers used to dispose of food products, plastic inner gloves, and contaminated disposable clothing

11.4 WORK LIMITATIONS

All investigation activities will be performed during normal daylight hours.

11.5 CONFINED SPACE ENTRY

Although very unlikely, certain tasks required under this project (such as the structural inspection of SWMU 55) may require entry into a confined space. A confined space is defined as an enclosure that is large enough for an employee to enter, but which has limited means of access and egress and is not designed for continuous employee occupancy.

A permit-required confined space is a confined space as defined above which also contains one or more health and/or safety hazards. This can include chemical, mechanical, electrical, or other hazards. All confined spaces on this project are to be considered **Permit Required Confined Spaces**.

Access to the OWS and all work within it must be conducted in accordance with HydroGeoLogic Inc. Policy 6-1 "Confined Spaces." Key provisions of this policy include:

- Combustible gas and oxygen levels shall be measured at the confined space opening and inside the confined space prior to entry and continuously during occupancy. The person conducting the monitoring must have completed Entry Supervisor training.
- Oxygen levels must be between 20 and 23½ percent at all times during occupancy.
- Combustible gas readings must not exceed 10 percent of the LEL at any time during occupancy.
- A confined space entry permit must be completed, reviewed, and approved by the SSO and posted outside the confined space entrance prior to entry.
- Two entrants are required for this entry. The entrants must have successfully completed Confined Space Entry training.
- For this entry Level B protection must be worn by all confined space entrants. The Self Contained Breathing Apparatus is to be high pressure tank with 1 hour rating. Training in level B work is required for entry. In addition, the entrants must wear full body (i.e., parachute) harness with at least 1600 feet of rescue line attached.
- An attendant trained in Confined Space Entry shall be posted outside the manhole entrance at all times during occupancy and shall remain in contact with the entrant. A second attendant must be nearby.
- Communications signals shall be established prior to entry. Radio communication is preferred if feasible.
- All confined space entry must be supervised by a Entry Supervisor on site.

- All appropriate lockout/tagout procedures must be implemented prior to entry and must remain in effect until operations inside the space have been completed.

11.6 SPILL CONTAINMENT

The procedures defined in this section comprise the spill containment activities in place at the site.

- All drums and containers used during the cleanup will meet appropriate United Nations, OSHA, and EPA regulations for the waste that they will contain.

- Drums and containers will be inspected and their integrity ensured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions will be positioned in an accessible location and inspected prior to further handling.

- Operations on-site will be organized so as to minimize the amount of drum or container movement

- Employees involved in the drum or container operations will be warned of the hazards associated with the containers.

- Where spills, leaks, or ruptures may occur, adequate quantities of spill containment equipment (absorbent, pillows, etc.) will be stationed in the immediate area. The spill containment program must be sufficient to contain and isolate the entire volume of hazardous substances being transferred.

- Drums or containers that cannot be moved without failure will be emptied into a sound container.

- Fire extinguishing equipment meeting 29 CFR Part 1910, Subpart L shall be on hand and ready for use to control fires.

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12.0 SITE CONTROL

12.1 WORK ZONES

Each investigation location will be physically barricaded with rope flagging or caution tape to control entry to and exit from the area. These barricaded areas will be referred to as the exclusion zones. The exclusion zone will be identified by the site supervisor and consist of a 20-foot radius surrounding the drilling location Each person leaving an exclusion zone will proceed directly to the decontamination zone, which will be located adjacent to the exclusion zone and identified by physical barriers. The decontamination zone will consist of a low-lying area covered with a plastic sheeting. At the completion of decontamination procedures at each location, the debris will be enclosed in the plastic sheeting and deposited into 55-gallon type 17 E/H drums for later disposal as identified in the WP and FSP. Only personnel who are cleared by the HydroGeoLogic field leader and SSO will be permitted in the exclusion zones and/or decontamination zones. Clearance for accessing these areas will only be given to personnel who meet the training and medical surveillance requirements of OSHA Standard 29 CFR 1910.120 and are wearing the appropriate PPE required for the work activity.

The support zone, where the administrative, communications, and other support services will be based, will be in a controlled area off the site or on the far end upwind of potential site contamination or areas of potential exposure. Only persons and equipment that are free of contamination will be permitted in the support zone.

12.2 ON-SITE/OFF-SITE COMMUNICATIONS

Communications will consist of a centrally located telephone within the designated support zone (i.e., trailer, office) in addition to a mobile phone stationed within the on-site vehicle utilized for transportation. Field personnel may also utilize telephones located at NAS Fort Worth JRB in emergency situations.

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13.0 EMERGENCY RESPONSE

This HSP has been developed in an attempt to prevent the occurrence of situations that may jeopardize the health and safety of on-site personnel. However, supplemental emergency procedures must be identified in the event that an unforeseen health and safety accident or incident occurs. In general, HydroGeoLogic will evacuate their employees and subcontractors from the workplace if an emergency involving chemical spills, chemical fires, chemical exposure, and/or chemical emissions occurs. For this reason, emergency response planning will be in accordance with OSHA Standard 29 CFR 1910.38(a).

13.1 PREPLANNING

Upon initial arrival at the site, the HydroGeoLogic field leader and SSO will visit the base's fire department to determine the status of emergency response services. This meeting will include a determination as to the need for further coordination with local rescue and police services.

Another aspect of preplanning for emergencies includes completion of the Medical Data Sheet (Section 14.1). This sheet must be completed by all HydroGeoLogic personnel and subcontractors so that, in the event of personal injury or illness, the examining physician has background information readily available on the injured/ill party.

13.2 EMERGENCY PROCEDURES AND ASSIGNMENTS

Upon notification of a site emergency requiring evacuation, all HydroGeoLogic personnel and subcontractors will proceed directly to the support zone (i.e., trailer, office). If personnel cannot reach the support zone without endangering life or health, an alternate meeting point will be specified by the HydroGeoLogic SSO. Emergency egress routes and meeting points will be discussed at each daily health and safety briefing.

In the event of an emergency, the following procedures will be implemented:

- The site supervisor will evaluate the incident, assess the need for assistance, and call the appropriate contacts, if necessary.
- The site supervisor will act as the point of contact for outside emergency personnel and on-site personnel.
- The site supervisor will advise emergency response and emergency room personnel as to the types of contamination potentially contacted by injured workers receiving emergency care.
- The site supervisor will ensure that the SSO promptly notifies the HydroGeoLogic PM and HSO of the incident.

13.2.1 Chemical Inhalation

It is not anticipated that chemicals of concern will be present at the site in concentrations to cause immediate danger to life and health. However, any field personnel exhibiting or complaining of symptoms of chemical exposure as described in Section 4.1 will be removed from the work zone and transported to the designated medical facility for examination and treatment.

13.2.2 Eye and Skin Contact

Field personnel who have come into contact with contaminants while in the exclusion zone will proceed immediately to the decontamination zone, where an eye wash station will be located. At the eyewash station the following procedures will be followed:

- Do not decontaminate prior to using the eye wash
- Remove necessary PPE to perform the eye wash procedures
- Flush the eye with the clean water for at least 15 minutes
- Arrange for prompt transport to the designated medical facility

Unless skin contact with contaminants is severe, personnel should proceed through the decontamination zone. Field personnel should remove any contaminated PPE and wash the affected area for at least 15 minutes. If the personnel show signs of skin irritation, they will be transported to the designated medical facility.

13.3 PROCEDURES FOR PERSONNEL REMAINING ON-SITE

No HydroGeoLogic or subcontractor personnel will remain on-site to operate critical site emergency operations.

13.4 PROCEDURES TO ACCOUNT FOR SITE PERSONNEL

The HydroGeoLogic and subcontractor work force will be small enough so that accounting for site personnel will not be a problem. The HydroGeoLogic field leader and SSO will ensure that the whereabouts of all personnel are known.

13.5 RESCUE AND MEDICAL DUTIES

Only those persons who have been trained by the American Red Cross, or equivalent, will be permitted to perform rescue, first aid, and/or CPR treatment. Outside emergency services and medical facilities will be the primary providers of such services. At least one person who is currently certified in first aid and CPR will be on-site at all times during field activities. A "physicians-approved" first aid kit, an ANSI-approved eye wash station with 15 minutes of free-flowing freshwater, and a Class ABC fire extinguisher will be readily available on-site.

Any HydroGeoLogic employee who shows signs or symptoms of overexposure must immediately be examined by a licensed physician. Subcontractor personnel who show signs or symptoms of overexposure will be encouraged to visit a licensed physician as well. Figure 13.1 describes the directions to the nearest medical facility.

13.6 EMERGENCY COMMUNICATION PROCEDURES, CONTACTS, AND PHONE NUMBERS

Persons who observe an emergency situation must immediately notify the HydroGeoLogic field leader and/or SSO. The field leader or SSO will then immediately assess the emergency and appoint someone to telephone appropriate outside emergency services and will coordinate site evacuation. Emergency telephone numbers and directions to the nearest medical facility are included as Table 13.1, a copy of which will be posted at the nearest telephone. In addition, Figure 13.1 illustrates the directions to the nearest medical facility.

13.7 ACCIDENT/INCIDENT FOLLOW-UP AND REPORTING

Upon receiving a report of an incident (or near-incident), the SSO shall immediately investigate the circumstances and make appropriate recommendations to prevent recurrence. The HSO shall also be immediately notified by telephone on occurrence of a serious accident or incident. The HSO, at their individual discretion, may also participate in the investigation.

Details of the incident shall be documented on the Accident/Incident/Near Miss Investigation form (Section 14.1) within 24 hours of the incident and shall be distributed to the PM, HSO, and COR. A copy of this report shall also be sent to the appropriate administrative contact for inclusion into the OSHA Form 101 and 200 log. Incident report forms will be available at site support facilities.

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14.0 DOCUMENTATION AND EQUIPMENT

This section summarizes the documentation and equipment needs for the project as specified in the HSP. Its purpose is to serve as a partial checklist to help ensure all of the necessary resources are available to carry out the requirements of the HSP.

14.1 DOCUMENTATION AND FORMS

The following documents are presented in the following pages for use during site operations:

- Site Safety Briefing Form
- HSP Compliance Agreement Form
- HSP Amendments Form
- Accident/Incident/Near Miss Investigation Form
- Medical Data Sheet
- Daily Equipment Calibration Log
- Air Monitoring Log

In addition, the following documentation will be present on-site during site operations:

- Approved HSP (signed copy)
- OSHA poster
- MSDSs
- Employee training and medical surveillance certificates
- Subcontractor training and medical surveillance certificates

14.2 EMERGENCY HEALTH AND SAFETY EQUIPMENT

- First aid kit
- Eye wash
- Inner latex or vinyl gloves
- Outer nitrile gloves (disposable and 11 mil thick)
- Boot covers
- Hard hats and safety glasses
- Tyvek™ suits
- PVC and/or Saranex™ suits (with hoods)
- Ear defenders/plugs
- Decontamination kit
- Fire extinguisher
- Fall protection devices (body harness and lanyard)
- Duct tape
- LEL/O_2 meter
- PID

The site supervisor and/or SSO shall be responsible for maintaining first aid kits and fire extinguishers at each site where field activities are taking place. The location of first aid kits and fire extinguishers will be discussed during each daily health and safety meeting.

15.0 REFERENCES

A.T. Kearney, 1989, RCRA Facility Assessment, Preliminary Review/Visual Site Inspection.

CH2M HILL, 1996, Site Characterization Summary-Informal Technical Information Report, NAS Fort Worth JRB, Carswell Field, Texas.

CH2M HILL, 1984, Installation Restoration Program Records Search, Carswell Air Force Base, Texas.

Dräger Aktiengesellschaft (Kurt Leichnitz), July 1989, Detector Tube Handbook, 7th Edition.

Federal Acquisition Regulation, FAR Clause 52.236-13, Accident Prevention.

NIOSH/OSHA/USCG/EPA, October 1985, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, (DHHS (NIOSH) Publication No. 85-115); EPA, June 1992, Standard Operating Safety Guides, (NTIS Publication No. 9285.1-03).

Occupational Safety and Health Administration (OSHA) General Industry Standards, 29 CFR 1910, and Construction Industry Standards, 29 CFR 1926; especially 29 CFR 1910.120/29 CFR 1926.65, Hazardous Waste Site Operations and Emergency Response.

U.S. Air Force Occupational and Environmental Health Laboratory Human Systems Division, 1989, Hazardous Waste Technical Assistance Survey, Carswell AFB, Texas.

U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health (NIOSH), June 1997, Pocket Guide to Chemical Hazards.

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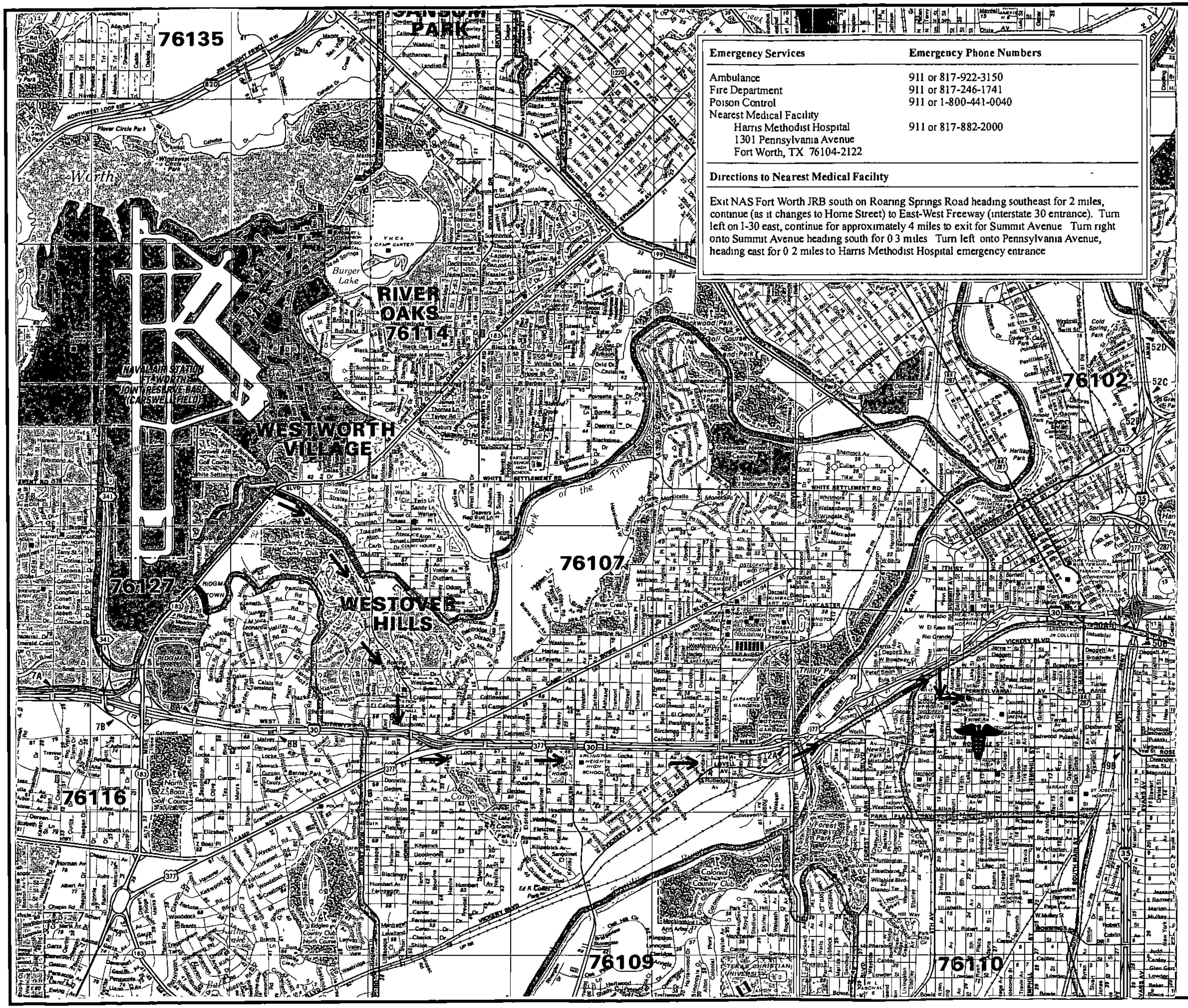
FIGURES

Figure 13.1

Nearest Medical Facility to NAS Fort Worth JRB, Texas

U.S. Air Force Center for Environmental Excellence



Emergency Services	Emergency Phone Numbers
Ambulance	911 or 817-922-3150
Fire Department	911 or 817-246-1741
Poison Control	911 or 1-800-441-0040
Nearest Medical Facility	
Harris Methodist Hospital 1301 Pennsylvania Avenue Fort Worth, TX 76104-2122	911 or 817-882-2000

Directions to Nearest Medical Facility

Exit NAS Fort Worth JRB south on Roaring Springs Road heading southeast for 2 miles, continue (as it changes to Home Street) to East-West Freeway (interstate 30 entrance). Turn left on I-30 east, continue for approximately 4 miles to exit for Summit Avenue Turn right onto Summit Avenue heading south for 0 3 miles Turn left onto Pennsylvania Avenue, heading east for 0 2 miles to Harris Methodist Hospital emergency entrance

Legend

Hospital

Route to Hospital

N

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Project AFC001-33BAA
Revised 06/29/00 ap
Source Rand McNally, 1996

HYDRO GeoLogic INC.

TABLES

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Table 4.1
Exposure Limits and Recognition Qualities

Compound	Permissible Exposure Limit (PEL)[A]	IDLH[f] Level[b]	Recognition Qualities			Odor Warning Concentration (ppm)	LEL[c] (%)	UEL[d] (%)	Ionization Potential (eV)
			Color	Odor	State[e]				
Anthracene	See coal tar pitch volatiles								
Arsenic Compounds	0.010 mg/m^3	5 mg/m^3[e]	Silver gray to tin-white	Odorless	Solid	NA	NA	NA	NA
Benzene	1.0 ppm[f]	500 ppm[e]	Colorless to light yellow	Aromatic	Liquid	1.5 - 5.0	1.2	7.8	9.24
Benzo[a]anthracene	See coal tar pitch volatiles								
Benzo[b]fluoranthene	See coal tar pitch volatiles								
Benzo[k]fluoranthene	See coal tar pitch volatiles								
Benzo[ghi]perylene	See coal tar pitch volatiles								
Benzo[a]pyrene	See coal tar pitch volatiles								
bis(2-Ethylhexyl)phthalate	5 mg/m^3	5,000 mg/m^3[e]	Colorless	Slight	Liquid	NA	0.3	NA	NA
2-Butanone (MEK)	200 ppm	3,000 ppm	Colorless	Sharp, mint-like	Liquid	ND	1.4	11.4	9.54
Cadmium	0.005 mg/m^3	9 mg/m^3[e]	Bluish-silver	N/A	Metal	NA	NA	N/A	NA
Chloroethane	1,000 ppm	3,800 ppm	Colorless	Ether-like	Liquid or gas	NA	3.8	15.4	10.97
Chrysene	See coal tar pitch volatiles								

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Table 4.1 (continued)
Exposure Limits and Recognition Qualities

Compound	Permissible Exposure Limit (PEL)[A]	IDLH Level[b]	Recognition Qualities			Odor Warning Concentration (ppm)	LEL[c] (%)	UEL[d] (%)	Ionization Potential (eV)
			Color	Odor	State				
Coal tar pitch volatiles	0 2 mg/m^3	80 mg/m[3e]	Black or brown	None	Solid	NA	NA	NA	NA
1,1-Dichloroethane	100 ppm	3,000 ppm	Colorless	Chloroform-like	Liquid	NA	5 4	11 4	11.06
1,1-Dichloroethene	ND	ND[e]	Colorless	Chloroform-like	Liquid or gas	50	6 5	15 5	10 00
1,2-Dichloroethene	200 ppm	1000 ppm	Colorless	Slightly acrid, chloroform-like	Liquid	17 0	5 6	12 8	9 65
Ethylbenzene	100 ppm	800 ppm	Colorless	aromatic	Liquid	4.7 - 5.0	0.8	6 7	8.76
Ethylene dibromide	20 ppm	100 ppm	Colorless	Sweet	Liquid	ND	NA	NA	9.45
Fluoranthene	See coal tar pitch volatiles								
Freon 113	1,000 ppm	2,000 ppm	Colorless to water-white	Ether-like	Liquid or gas	ND	NA	NA	11 99
Gasoline	ND	ND[e]	Clear	Gasoline	Liquid	ND	1 4	7.6	ND
Hexane	500 ppm	1,100 ppm	Colorless	Gasoline-like	Liquid	NA	1.1	7 5	10.18
Hydrochloric Acid	C 5 ppm	50 ppm	Colorless to light yellow	Irritating	Gas	NA	NA	NA	12.74
Indeno[1,2,3-cd]pyrene	See coal tar pitch volatiles								

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Table 4.1 (continued)
Exposure Limits and Recognition Qualities

Compound	Permissible Exposure Limit (PEL)[A]	IDLH Level[b]	Recognition Qualities: Color	Recognition Qualities: Odor	Recognition Qualities: State	Odor Warning Concentration (ppm)	LEL[c] (%)	UEL[d] (%)	Ionization Potential (eV)
Jet Fuel (JP-4)	ND	ND	Tea-brown	Gasoline	Liquid	ND	ND (flammable)	ND (flammable)	ND
Lead	0 050 mg/m³	100 mg/m³	Gray	Odorless	Solid	NA	NA	NA	NA
Mercury	0.100 mg/m³	10 mg/m³	Silver-white	Odorless	Liquid	NA	NA	NA	NA
Methanol	200 ppm	6,000 ppm	Colorless	Pungent	Liquid	100	6 0	36 0	10.84
Naphthalene	10 ppm	250 ppm	Colorless to brown	Mothballs	Solid	ND	0 9	5 9	8.12
Nitric Acid	2 ppm	25 ppm	Colorless red or yellow	Acrid, suffocating	Liquid	NA	NA	NA	11 95
Phenanthrene	See coal tar pitch volatiles								
Pyrene	See coal tar pitch volatiles								
Sulfuric Acid	1 mg/m³	15 mg/m³	Colorless, yellow, or brown	Odorless	Solution	NA	NA	NA	ND
1,1,1,2-Tetrachloroethane	ND	ND	Yellowish-red	None	Liquid	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	1ppm [skin]	100 ppm[e]	Colorless to pale yellow	Pungent, chloroform-like	Liquid	ND	NA	NA	11 10
Tetrachloroethene	100 ppm[f]	150 ppm[e]	Colorless	Chloroform-like	Liquid	27.0	NA	NA	9.32
Toluene	200 ppm	500 ppm	Colorless	Aromatic	Liquid	0.17 - 40	1.1	7.1	8.82

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Table 4.1 (continued)
Exposure Limits and Recognition Qualities

Compound	Permissible Exposure Limit (PEL)[A]	IDLH Level[b]	Recognition Qualities			Odor Warning Concentration (ppm)	LEL[c] (%)	UEL[d] (%)	Ionization Potential (eV)
			Color	Odor	State				
1,1,1-Trichloroethane	350 ppm	700 ppm	Colorless	Mild, chloroform-like	Liquid	ND	7.5%	12.5%	11.00
1,1,2-Trichloroethane	10 ppm	100 ppm[e]	Colorless	Sweet, chloroform-like	Liquid	ND	6	15 5	11.00
Trichloroethene	100 ppm[f]	1,000 ppm[e]	Colorless	Chloroform-like	Liquid	28 0	8.0	10.5	9 45
Vinyl Chloride	1 ppm	ND[e]	Colorless	Pleasant	Liquid or gas	3,000	3.6	33	9.99
Xylenes (total)	100 ppm	900 ppm	Colorless	Aromatic	Liquid	1.0 - 1 5	1.1	7 0	8.56

[a] OSHA permissible exposure limit or the American Conference of Governmental Industrial Hygienists' threshold limit value (both 8-hour time weighted averages)
[b] Immediately dangerous to life or health.
[c] Lower explosive limit
[d] Upper explosive limit
[e] To be treated as a carcinogen.
[f] The value presented is the OSHA PEL, which is not necessarily the most conservative of the available exposure limits. The air monitoring screening levels in Table 6 1 are based upon the most conservative values

C Ceiling value, a 15-minute Time Weighted Average that shall not be exceeded at any time during the work day
eV Electron volts
mg/m^3 Milligrams per cubic meter
NA Not applicable.
ND Not determined
ppm Parts per million.

Sources NIOSH, 1997
Drager, 1989

Table 4.2
Acute and Chronic Effects
Symptoms of Overexposure and First Aid Treatment

Compound	Symptoms Of Overexposure	First Aid Treatment
Anthracene	See coal tar pitch volatiles	
Arsenic	Ulceration of nasal septum; dermatitis, gastrointestinal disturbances; peripheral neuropathy; respiratory irritation, hyperpigmentation of skin; carcinogen	Eye: Irrigate immediately (15 min) Skin: Soap wash immediately Inhalation: Not an inhalation hazard Ingestion: Medial attention immediately
Benzene	Irritation to eyes, nose, respiratory systems, giddiness, headache, nausea, staggered gait; fatigue, anorexia, lassitude, dermatitis, bone marrow depressant/depression; carcinogenic	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Artificial respiration Ingestion: Medical attention immediately DO NOT INDUCE VOMITING
Benzo[a]anthracene	See coal tar pitch volatiles	
Benzo[b]fluoranthene	See coal tar pitch volatiles	
Benzo[k]fluoranthene	See coal tar pitch volatiles	
Benzo[ghi]perylene	See coal tar pitch volatiles	
Benzo[a]pyrene	See coal tar pitch volatiles	
bis(2-Ethylhexyl)phthalate	Irritation of eyes, mucous membranes; carcinogen	Eye: Irrigate immediately Skin: Not a dermal hazard Inhalation: Respiratory support Ingestion: Medical attention immediately
2-Butanone (MEK)	Irritating to eyes and nose; headache, dizziness; vomiting	Eye: Irrigate immediately Skin: Water wash immediately Inhalation: Move to fresh air; respiratory support Ingestion: Medical attention immediately
Cadmium	Pulmonary edema, dyspnea, coughing, chest tightness, substernal pain, headache; chills, muscle pain; nausea, vomiting , diarrhea, anosmia, emphysema, proteinuria, mild anemia, carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Inhalation: Move to fresh air; respiratory support Ingestion: Medical attention immediately

Table 4.2 (continued)
Acute and Chronic Effects
Symptoms of Overexposure and First Aid Treatment

Compound	Symptoms Of Overexposure	First Aid Treatment
Chloroethane	Incoordination, inebriate, abdominal cramps; cardiac arrhythmias, cardiac arrest, liver and kidney damage	Eye: Irrigate immediately Skin Water flush promptly Inhalation: Respiratory support Ingestion Medical attention immediately
Chrysene	See coal tar pitch volatiles	
Coal tar pitch volatiles	Dermatitis, bronchitis, carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Inhalation Move to fresh air; respiratory support Ingestion: Medical attention immediately
1,1-Dichloroethane	Central nervous system depressant; skin irritant, liver and kidney damage	Eye: Irrigate immediately Skin: Soap flush promptly Inhalation· Respiratory support Ingestion Medical attention immediately
1,1-Dichloroethene	Irritation to eyes, skin, and throat, dizziness, headache, and nausea; breathing difficulty, liver and kidney dysfunction; pneumonitis; carcinogen	Eye Irrigate immediately Skin· Water flush immediately Inhalation: Move to fresh air, respiratory support Ingestion: Medical attention immediately
1,2-Dichloroethene	Irritation of eyes and respiratory system; central nervous system depressant/depression	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation· Respiratory support Ingestion: Medical attention immediately
Ethylbenzene	Irritation to eyes, mucous membranes; headache; dermatitis, narcosis; coma	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation· Artificial respiration Ingestion· Medical attention immediately
Ethylene dibromide	Irritation to eyes, skin, respiratory system, dermatitis with vesiculation, liver, heart, spleen, kidney damage; reproductive effects; carcinogen	Eye: Irrigate immediately Skin: Soap wash immediately Inhalation. Move to fresh air; respiratory support Ingestion: Medical attention immediately

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Table 4.2 (continued)
Acute and Chronic Effects
Symptoms of Overexposure and First Aid Treatment

Compound	Symptoms Of Overexposure	First Aid Treatment
Fluoranthene	See coal tar pitch volatiles	
Freon 113	Irritation of skin, throat; drowsiness, dermatitis, central nervous system depression	Eye Irrigate immediately Skin: Soap wash promptly Inhalation: Respiratory support Ingestion: Medical attention immediately
Gasoline	Irritation to eyes, skin, mucous membranes; dermatitis, headaches, fatigue, blurred vision, dizziness, slurred speech, confusion, convulsions, chemical pneumonia (aspiration); possible liver, kidney damage; carcinogen	Eye: Irrigate immediately Skin: Soap flush immediately Inhalation Respiratory support Ingestion Medical attention immediately
Hexane	Light-headedness, nausea, headaches, numbness in extremities, weak muscles, eye irritation, nose irritation, dermatitis, chemical pneumonia, giddiness	Eye: Irrigate immediately Skin: Soap, wash immediately Inhalation Respiratory support Ingestion: Medical attention immediately
Hydrochloric Acid	Inflammation of the nose, throat, laryngeal; cough, burns throat, choking; burns eyes, skin, dermatitis	Eye: Irrigate immediately Skin: Water flush immediately Inhalation: Respiratory support Ingestion: Medical attention immediately
Indeno(1,2,3-cd)pyrene	See coal tar pitch volatiles	
Jet fuel (JP-4)	Irritation to eyes, skin, and mucous membranes; dermatitis; headaches, narcosis, coma	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation Move to fresh air; respiratory support Ingestion: Medical attention immediately
Lead	Weak, lassitude, insomnia; facial pallor; pal eye, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic; anemia; gingival lead line; tremors, paralysis of wrist and ankles; encephalaopathy; nephropathy; irritation to eyes; hypotension	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation. Respiratory support Ingestion: Medical attention immediately
Mercury	Cough, chest pain, dyspnea, bronchitis pneumonitis; tremors, insomnia; irritability, indecision; headache, fatigue, weak; stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria; irritation of the eyes, skin	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation. Respiratory support Ingestion: Medical attention immediately

Table 4.2 (continued)
Acute and Chronic Effects
Symptoms of Overexposure and First Aid Treatment

Compound	Symptoms Of Overexposure	First Aid Treatment
Methanol	Eye irritant, headache, drowsiness; lightheadedness, nausea, vomiting; visual disturbances, blindness	Eye: Irrigate immediately Skin: Water flush immediately Inhalation: Respiratory support Ingestion: Medical attention immediately
Napthalene	Eye irritation; headache, confusion, excitement, malaise; nausea, vomiting, abdominal pain; irritated bladder; profuse sweating, jaundice, blood in urine; hemoglobinuria; renal shutdown, dermatitis; optical neuritis; cornea damage	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Move to fresh air, respiratory support Ingestion: Medical attention immediately
Nitric Acid	Irritation of eyes, mucous membranes, and skin; delayed pulmonary edema, pneuitis, bronchitis; dental erosion	Eye: Irrigate immediately Skin Water flush immediately Inhalation: Respiratory support Ingestion: Medical attention immediately
Phenanthrene	See coal tar pitch volatiles	
Pyrene	See coal tar pitch volatiles	
Sulfuric Acid	Irritation to eyes, nose, and throat; pulmonary edema, bronchitis, emphysema, conjunctivitis; stomitis; dental erosion; thracheobronchitis; eye and skin burns; dermatitis	Eye: Irrigate immediately Skin: Water flush immediately Inhalation Move to fresh air, respiratory support Ingestion: Medical attention immediately
1,1,1,2-Tetrachloroethane	Irritated eyes, skin, weakness, restlessness, irregular respiration, muscle incoordination	Eye: Irrigate immediately Skin: Soap wash immediately Inhalation: Respiratory support Ingestion: Medical attention immediately
1,1,2,2-Tetrachloroethane	Nausea, vomiting, abdominal pain; tremor fingers; jaundice, hepatitis, liver tenderness, dermatitis; monocytosis, kidney damage; carcinogen	Eye: Irrigate immediately Skin Soap wash promptly Inhalation: Respiratory support Ingestion: Medical attention immediately
Tetrachloroethene	Irritation of the eyes, nose, throat; nausea; flush face, neck; vertigo, dizziness, in coordination; headache, somnolence; skin erythema; liver damage; carcinogen	Eye: Irrigate immediately Skin: Soap wash promptly Inhalation: Respiratory support Ingestion: Medical attention immediately

Table 4.2 (continued)
Acute and Chronic Effects
Symptoms of Overexposure and First Aid Treatment

Compound	Symptoms Of Overexposure	First Aid Treatment	
Toluene	Fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, lacrimation; nervousness, muscle fatigue, insomnia, paresis; dermatitis	Eye Skin Inhalation: Ingestion:	Irrigate immediately Soap wash promptly Move to fresh air Medical attention immediately, DO NOT INDUCE VOMITING
1,1,1-Trichloroethane	Irritation to eyes, skin; head, weakness, exhaustion, central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmia, liver damage	Eye Skin Inhalation: Ingestion:	Irrigate immediately Soap wash promptly Respiratory support Medical attention immediately
1,1,2-Trichloroethane	Irritation to eyes and nose, central nervous system depression; liver and kidney damage, dermatitis, carcinogenic	Eye Skin Inhalation: Ingestion:	Irrigate immediately Soap wash promptly Move to fresh air; respiratory support Medical attention immediately
Trichloroethene	Headache, vertigo; visual disturbance, tremors, somnolence, nausea, vomiting; irritation of the eyes; dermatitis; cardia arrhythmias, paresthesia; carcinogen	Eye. Skin. Inhalation: Ingestion:	Irrigate immediately Soap wash promptly Respiratory support Medical attention immediately
Vinyl Chloride	Weakness; abdominal pain, gastrointestinal bleeding, hepatomegaly; pallor or cyan of extremities; carcinogen	Inhalation:	Respiratory support
Xylenes (total)	Dizziness, excitement, drowsiness, in coordination, staggering gait, irritation of eyes, nose, throat; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain, dermatitis	Eye Skin Inhalation: Ingestion:	Irrigate immediately Soap wash promptly Move to fresh air Medical attention immediately, DO NOT INDUCE VOMITING

Source NIOSH, 1997

Table 4.3
Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers

Adjusted Temperature[1]	Normal Work Ensemble2	Impermeable Ensemble
90 °F or above	After each 45 minutes of work	After each 15 minutes of work
87.5 °F - 90 °F	After each 60 minutes of work	After each 30 minutes of work
82.5 °F - 87.5 °F	After each 90 minutes of work	After each 60 minutes of work
77.5 °F - 82.5 °F	After each 120 minutes of work	After each 90 minutes of work
72 5 °F - 77.5 °F	After each 150 minutes of work	After each 120 minutes of work

[1]Calculate the adjusted air temperature (T_{aj}) by using the equation T_{aj} (°F) = T (°F) + (13 x % sunshine) Measure air temperature (T) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow (100 percent sunshine = no cloud cover and a sharp, distinct shadow, 0 percent sunshine = no shadows)

[2] A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

Source NIOSH/OSHA/USCG/EPA, 1985

Table 6.1
Hazard Monitoring Methods, Action Levels, and Protection Measures

Hazard	Monitoring Method	Action Level	Protective Measures	Monitoring Schedule
Toxic Vapors (as identified in Table 4.1)	PID	0 0 to <0.5 ppm above background based on judgment of SSO	Level D (see Table 7.1)	-continue with regular monitoring of breathing zone
		0 5 ppm above background based on judgment of SSO	Level D (see Table 7.1)	-confirm/deny reading with vinyl chloride and benzene colorimetric tubes -if confirmed as vinyl chloride and/or benzene, then see vinyl chloride/benzene hazard identified below -if denied as vinyl chloride and benzene, then continue with regular monitoring of breathing zone
		≥0.5 ppm to <25 ppm above background based on judgment of SSO (if denied as vinyl chloride and benzene)	Level D (see Table 7 1)	-confirm/deny reading with vinyl chloride and benzene colorimetric tubes -if confirmed as vinyl chloride and/or benzene, then see vinyl chloride/benzene hazard identified below -if denied as vinyl chloride and benzene, then continue with regular monitoring of breathing zone -confirm/deny reading with tetrachloroethene and TCE colorimetric tubes -if confirmed , then see hazard identified below -if denied as tetrachloroethene or TCE, then continue with regular monitoring of breathing zone
		≥25 to <250 ppm above background based on judgment of SSO (if denied as vinyl chloride, benzene, and tetrachloroethene)	Level C (see Table 7.1)	-continue with regular monitoring of breathing zone - contact HSO and Project Manager - continue use of tubes, attempt to identify unknown air contaminants

Table 6.1 (continued)
Hazard Monitoring Methods, Action Levels, and Protection Measures

Hazard	Monitoring Method	Action Level	Protective Measures	Monitoring Schedule
Vinyl Chloride	Colorimetric Tubes	confirmed 1 0 ppm to 10 ppm above background based on judgment of SSO	Level C (See Table 7.1)	-continue regular monitoring of breathing zone
Benzene	Colorimetric Tubes	confirmed 0.5 ppm to 5 ppm above background based on judgment of SSO	Level C (See Table 7.1)	-continue regular monitoring of breathing zone
Tetrachloroethene	Colorimetric Tubes	confirmed 25 ppm to 250 ppm above background based on judgment of SSO	Level C (See Table 7.1)	-continue regular monitoring of breathing zone
Trichloroethene	Colorimetric Tubes	confirmed 50 ppm to 500 ppm above background based on judgment of SSO	Level C (See Table 7 1)	-continue regular monitoring of breathing zone
Flammable/Explosive Gases and/or Vapors	LEL/O_2 Detector	0 0 to 5.0 percent LEL	-notify sampling team of readings	-prior to and during sampling activities, monitor all areas suspected of containing flammable/explosive gases and/or vapors -continue with regular monitoring of breathing zone
		5.0 to < 10.0 percent LEL	-use spark proof equipment/tools	-continue with regular monitoring of breathing zone - notify HSO and Project Manager
		> 10.0 percent LEL	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	-requires HSP amendments unless readings subside
Toxic Vapors (as identified in Table 4 1)	PID	≥250 above background based on judgment of SSO (if denied as all chemicals listed above)	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	-requires identification of new chemical hazard and HSP amendments

Table 6.1 (continued)
Hazard Monitoring Methods, Action Levels, and Protection Measures

Hazard	Monitoring Method	Action Level	Protective Measures	Monitoring Schedule
Vinyl Chloride	Colorimetric Tubes	confirmed 10 ppm or greater above background based on judgment of SSO	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	- requires HSP amendments
Benzene	Colorimetric Tubes	confirmed 5 ppm or greater above background based on judgment of SSO	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	-requires HSP amendments
Tetrachloroethene	Colorimetric Tubes	confirmed 250 ppm or greater above background based on judgment of SSO	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	-requires HSP amendments
Trichloroethene	Colorimetric Tubes	confirmed 500 ppm or greater above background based on judgment of SSO	STOP WORK, EVACUATE AREA, NOTIFY PROJECT MANAGER	- requires HSP amendments

Table 7.1
Protective Equipment for On-site Activities

Activity	Level	Protective Equipment
Surface Soil Sampling Subsurface Soil Sampling Groundwater Sampling	D	• Street clothes or overalls (long sleeves) • Impermeable safety boots/shoes (steel-toed) • Safety glasses/goggles (if hazard to eyes exists) • Hard hat (if hazard to head exists) • Gloves (nitrile, neoprene) • Ear plugs/defenders (if hazard exists)
	D (modified)	• Rubber boots; chemically-resistant with steel toe • Gloves (nitrile, neoprene) • Tape for sealing ankle and wrist openings • Hard hat (if hazard to head exists) • Safety glasses/goggles (if hazard to eyes exists) • Unbolted Tyvek™ or equivalent • Ear plugs/defenders (if hazard exists)
	C	• Coated Tyvek™ or equivalent • Rubber boots, chemically resistant with steel toe • Rubber boot covers • Latex inner gloves • Tape for sealing ankle and wrist openings • Chemical resistant outer gloves (nitrile, neoprene) • Full-face respirator (organic vapor cartridges) • Additional items may be required (site-specific) • Ear plugs/defenders (if hazard exists)

Table 8.1
Six Stages for Decontamination in Modified Level D Protection

Stage	Procedure
Stage 1. Segregated Equipment Drop	Deposit equipment used on-site on plastic drop cloths or in assigned containers with plastic liners
Stage 2 Boot Cover and Glove Wash	Scrub outer boot covers and gloves with decontamination solution, and rinse with water
Stage 3: Tape Removal	Remove tape around boots and gloves and deposit in container with plastic liner
Stage 4: Remove boots, gloves, and disposable clothing	Deposit in appropriate plastic-lined container Discard disposable clothing.
Stage 5· Field wash	Wash hands and face with soap and water
Stage 6: Redress	Put on clean clothes

Table 8.2
Eighteen Stages for Decontamination in Level C Protection

Stage	Procedure
Stage 1: Segregated Equipment Drop	Deposit equipment used on-site on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, a cool-down station may be set up within this area.
Stage 2 Boot Cover and Glove Wash	Scrub outer boot covers and gloves with decon solution of detergent and water
Stage 3. Boot Cover and Glove Rinse	Rinse off decon solution from Stage 2 using copious amounts of water
Stage 4: Tape Removal	Remove tape around boots and gloves and deposit in container with plastic liner.
Stage 5 Boot Cover Removal	Remove boot covers and deposit in container with plastic liner.
Stage 6 Outer Glove Removal	Remove outer gloves and deposit in container with plastic liner.
Stage 7: Suit, Glove, and Boot Wash	Wash splash suit, gloves, and safety boots Scrub with long-handle scrub brush and decon solution
Stage 8· Suit, Glove and Boot Rinse	Rinse off decon solution using water Repeat as many times as necessary.
Stage 9: Canister or Mask Change	Perform last step in the decontamination procedure (if worker is leaving exclusion zone to change canister or mask). Worker's canister is exchanged, new outer gloves and boot covers donned, and joints taped, worker returns to duty.
Stage 10: Safety Boot Removal	Remove safety boots and deposit in container with plastic liner.
Stage 11: Splash Suit Removal	Remove splash suit with assistance of helper. Deposit in container with plastic liner.
Stage 12 Inner Glove Wash	Wash inner gloves with decon solution.
Stage 13 Inner Glove Rinse	Rinse inner gloves with water.

Table 8.2 (continued)
Eighteen Stages for Decontamination in Level C Protection

Stage	Procedure
Stage 14: Face Piece Removal	Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers Note. Certain parts of contaminated respirators, such as the harness assembly and leather or cloth components are difficult to decontaminate. If grossly contaminated, they may need to be discarded Rubber components can be soaked in soap and water and scrubbed with a brush. Use a final rinse of water and allow to air dry before using again. Inspect the respirator for damage and signs of wear before and after each use.
Stage 15 Inner Glove Removal	Remove inner gloves and deposit in lined container.
Stage 16: Inner Clothing Removal	Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off the site since there is a possibility that small amounts of contaminants might have been transferred when removing the disposal coveralls.
Stage 17 Field Wash	Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present Wash hands and face if shower is not available.
Stage 18: Redress	Put on clean clothes

Table 13.1
Emergency Telephone Numbers, Contacts, and Directions to Nearest Medical Facility

Key Personnel	Number
Miquette Rochford - Project Manager Ken Rapuano - Health and Safety Officer Jim Costello - Program Manager Michael Dodyk - Base Point of Contact (AFCEE/ERD) Don Ficklen - AFCEE/ERD Contracting Officer's Representative	(703) 736-4511 (703) 736-4546 (703) 736-4507 (817) 732-7167 (210) 536-5290
Emergency Phones Numbers	
Ambulance Fire Department Poison Control Hospital - Harris Methodist - Fort Worth 1301 Pennsylvania Avenue Note: When using a cellular phone call (817) 782-6330 for ambulance and fire response. If this number is busy or not available - 911 should be dialed and an operator will transfer the call to the Naval Air Station's emergency phone line.	911 or (817) 782-6330 911 or (817) 782-6330 911 or (800) 441-0040 911 or (817) 882-2000
Directions to Nearest Medical Facility (Figure 13 1)	
Exit NAS Fort Worth JRB on Pumphrey Rd. heading south. Turn left on Roaring Springs Rd heading southeast for 2 0 miles. Roaring Springs Rd turns into Horne St prior to I-30. Turn left on I-30 heading east for 4.0 miles. Turn right on Summit Ave heading south for 0.3 miles. Turn left on Pennsylvania Ave heading east for 0.2 miles Turn right on South Lake St heading south to 1301 Pennsylvania Ave. Emergency entrance is located on the right	

TAB

Appendix A

APPENDIX A

CARSWELL AFB HAZARDOUS WASTE PERMIT NO. HW-50289; TNRCC LETTER DATED APRIL 22, 1994; and TNRCC LETTER DATED MARCH 2, 1995

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TEXAS WATER COMMISSION

B. J. Wynne, III, Chairman
John E. Birdwell, Commissioner
Cliff Johnson, Commissioner

John J. Vay, General Counsel
Michael E. Field, Chief Hearings Examiner
Brenda W. Foster, Chief Clerk

February 13, 1991

Allen Beinke, Executive Director

Dear Permittee: RE: U.S. DEPT OF AIR FORCE - CARSWELL AFB; Permit HW50289

Enclosed is a copy of:

( ) 1. Permit for a wastewater treatment facility issued pursuant to Chapter 26 of the Texas Water Code. In order that you may comply with monitoring requirements of your permit, self-reporting forms and instructions will be forwarded to you from the Water Quality Division at an early date. If your facility is not yet operating, please use the attached Notification of Completion of Facilities form to advise this agency and our district office of the completion or placement in operation of proposed facilities in accordance with the special provision incorporated into the permit.

( ) 2. Amended permit for a wastewater treatment facility issued pursuant to Chapter 26 of the Texas Water Code. Please continue using the self-reporting forms you have on hand until new forms are forwarded by the Water Quality Division. If your facility is not yet operating, please use the attached Notification of Completion of Facilities form to advise this agency and our district office of the completion or placement in operation of proposed facilities in accordance with the special provision incorporated into the permit.

( ) 3. Renewal of a permit for a wastewater treatment facility issued pursuant to Chapter 26 of the Texas Water Code. If your facility is not yet operating, please use the attached Notification of Completion of Facilities form to advise this agency and our district office of the completion or placement in operation of proposed facilities in accordance with the special provision incorporated into the permit.

(✓) 4. Permit for a hazardous or solid waste facility issued pursuant to Art. 4477-7, Texas Revised Civil Statutes. Your attention is directed to Commission Rule 335.5 which may be applicable to your facility.

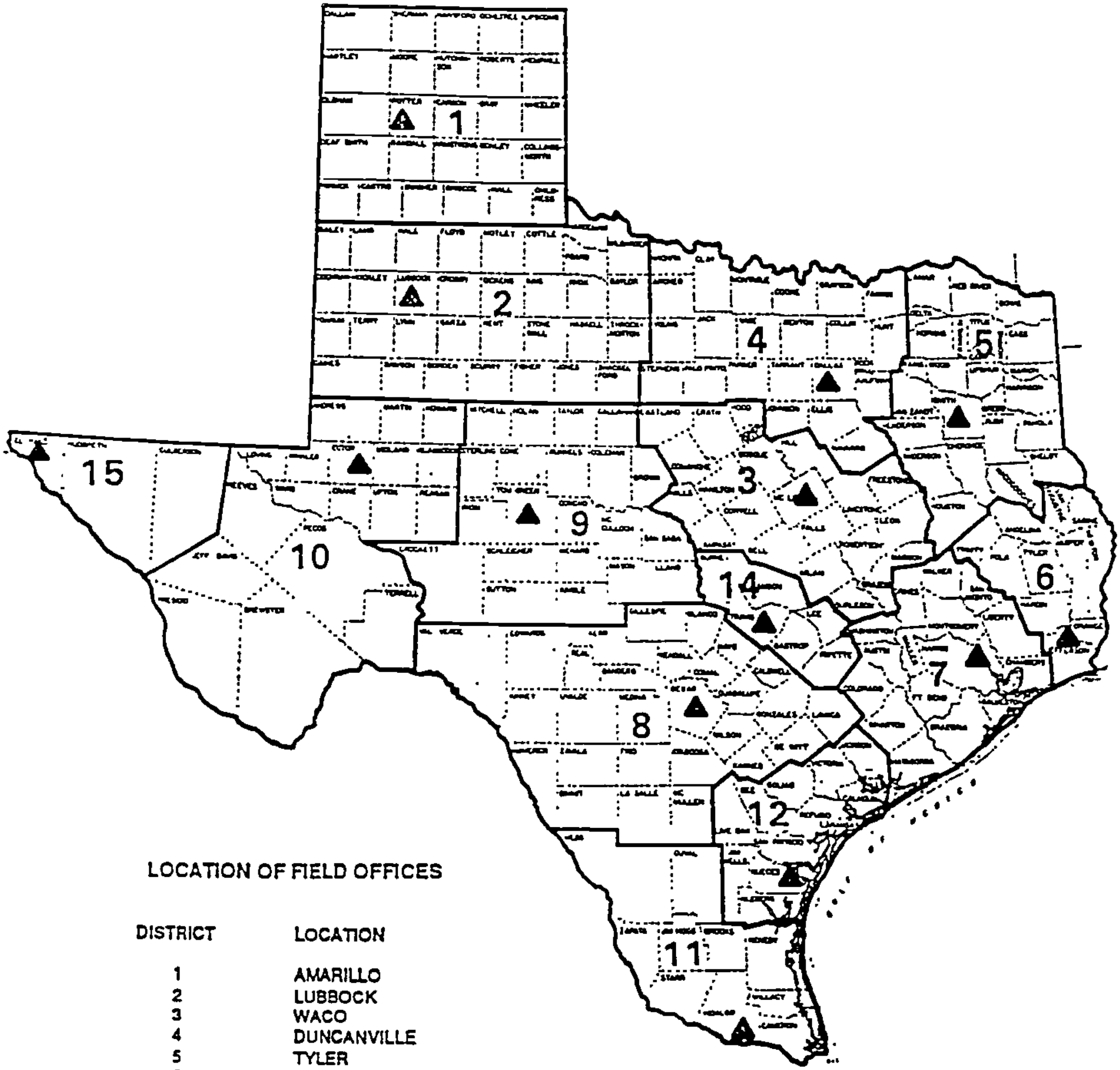
( ) 5. Permit or amended permit for a waste disposal well or an injection well issued pursuant to Chapter 27 of the Texas Water Code. In accordance with the Texas Water Code, you must file a copy of the permit with the city and county health authorities.

If there are any questions concerning this permit, please let us know.

Gloria A. Vasquez

Gloria A. Vasquez, Chief Clerk
cc w/enclosures:
All Parties
TWC District Office 4

15 FEB 1991



LOCATION OF FIELD OFFICES

DISTRICT	LOCATION
1	AMARILLO
2	LUBBOCK
3	WACO
4	DUNCANVILLE
5	TYLER
6	BEAUMONT
7	HOUSTON
8	SAN ANTONIO
9	SAN ANGELO
10	ODESSA
11	WESLACO
12	CORPUS CHRISTI
14	AUSTIN
15	EL PASO
TWC LAB	HOUSTON

PERMIT NO. HW-50289
EPA I.D. No. 0571924042
NAME: U.S. Air Force/Carswell Air Force Base

I. Size and Location of Facility

A. Carswell Air Force Base occupies 2751 acres of land in urban Tarrant County, Texas. The Base is positioned along the south shore of Lake Worth and is bordered by the following entities: Fort Worth and Westworth on the east; Fort Worth and White Settlement on the south; White Settlement on the southwest; and Fort Worth and Air Force Plant 4 on the northwest. the location is further described as being in Segment 0806 of the Trinity River Basin (North Latitude 32°45'53", West Longitude 97°25'44").

B. The site plan and accompanying field notes describing the waste management sites which were submitted in the application for Permit No. HW-50289 are hereby made part of this permit as "Attachments A and B", respectively.

II. Units and Operations Authorized

A. Wastes Authorized:

1. The permittee is authorized to manage hazardous industrial solid waste listed in the application and described herein, subject to the limitations provided herein. Authorized wastes may be received from off-site federal facilities.

2. Hazardous wastes authorized to be managed under this permit are limited as follows:

a. Hazard Code Groups (as prescribed by the U.S. Environmental Protection Agency regulations in effect upon the date of permit approval):

x	Ignitable Waste (I)	x	Acute Hazardous Waste (H)
x	Toxic Waste (T)	x	Toxicity Characteristic (TC)
x	Corrosive Waste (C)	x	Reactive Waste (R)

b.

Waste Descriptions	TWC Waste Class	Hazard Code
(1) Acetic Acid	IH	C
(2) Acetone	IH	I
(3) Alcohol, Denatured	IH	I
(4) Amyl Alcohol	IH	I
(5) Aniline	IH	T
(6) Aqueous Liquids w/pH < 2	IH	C
(7) Aqueous Liquids w/pH > 12.5	IH	C
(8) Arsenic Acid	IH	C,H
(9) Battery Electrolyte	IH	C

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PERMIT NO. HW-50289
EPA I.D. No. 0571924042
NAME: U.S. Air Force/Carswell Air Force Base

[II.A.2.b.]

Waste Descriptions	TWC Waste Class	Hazard Code
(59) Nickel-Cadmium Batteries	IH	TC
(60) Nitric Acid	IH	C
(61) 2-Nitropropane	IH	I,T
(62) Non-halogenated Solvents	IH	T
(63) Oil, Metal-Contaminated	IH	TC
(64) Oxalic Acid Powder	IH	C
(65) Paint Filters	IH	I,T
(66) Paint-related Material	IH	I
(67) Paint Thinner	IH	I,T
(68) PD-680	IH	I,T
(69) Pentane	IH	I
(70) Pesticides	IH	C,T
(71) Petroleum-derived Fuel-Waste	IH	I,TC
(72) Phosphoric Acid	IH	C
(73) Photographic Chemicals	IH	T
(74) Potassium Cyanide	IH	R,H
(75) Pyridine	IH	T
(76) Reactive Waste	IH	R
(77) Rifle Bore Cleaner	IH	I
(78) Silver Nitrate	IH	TC
(79) Sodium Hyroxide	IH	C
(80) Sodium Nitrite	IH	R
(81) Stoddard Solvent	IH	I
(82) Sulfuric Acid	IH	C
(83) Tetrachloroethane	IH	T,C
(84) Tetrachloroethylene	IH	T
(85) Tetrachloromethane	IH	T
(86) Toluene	IH	T,I
(87) Trichloroethane-1,1,1	IH	T
(88) Trichloroethylene	IH	T
(89) Trichlorofluoromethane	IH	T
(90) Trichloromethane	IH	T
(91) Trichlorotrifluoroethane	IH	T
(92) Turpentine	IH	I
(93) Vinyl Chloride	IH	I
(94) Xylene	IH	I

B. Unit Authorized:

The permittee is authorized to operate the following unit for storage subject to the limitations contained herein. All waste management activities subject to permitting are to be confined to the following unit:

1. Container Storage Area, enclosed, capacity 29,700 gallons (NOR 02), identified as conforming storage unit in the application, for storage of the wastes described in <u>Provision II.A.2.b.(1)-(94).</u>

[III.]

B. General Operational Requirements:

1. The permittee shall comply with the requirements of Title 40, Code of Federal Regulations (40 CFR) §264.17.

2. The permittee shall within 24 hours remove any spilled hazardous waste and waste residues and shall take steps necessary to prevent surface-water contamination as a result of spills.

3. The permittee shall manage all wastes within the facility unit in a manner in which particulate emissions of waste to the air meet TACB and TWC requirements.

4. All contaminated water as identified by Provisions III.B.5., IV.B 2. and IV.B.3. shall be disposed of by the following method(s):

   a. Removal to an on-site, authorized industrial solid waste unit;

   b. Removal off-site to an authorized industrial solid waste management facility; and/or

   c. Removal to an authorized wastewater treatment system.

5. The permittee shall ensure that any equipment which has come in contact with hazardous waste has been decontaminated prior to exiting the unit. At a minimum, all contaminated equipment shall be washed sufficiently to remove waste residues. All wash water generated shall be collected and disposed of in accordance with Provision III.B.4.

6. The annual site activity report required by Provision V.F. shall be submitted to the TWC Central Office and the TWC District 4 Office by January 25 of each year for the preceding year's activities. This annual report shall include, at a minimum, the following information:

   a. All information and records required by 31 Texas Administrative Code (TAC) §335.154; and

   b. Volume of all wastes stored at the facility unit authorized in Provision II.B.; and

   c. A description of waste processing capabilities and capacities corresponding to each type of waste managed on-site.

[III.]

D. The entire waste management facility shall be designed, constructed, operated, and maintained to prevent inundation of and discharges from the areas surrounding the facility components authorized by Provision II.B., subject to the following requirements:

1. Each receipt, storage, and processing area, including unloading areas, shall be provided with a drainage control system which will collect spills and incident precipitation in such a manner as to

a. Preclude the release from the system of any collected spills, leaks, or precipitation, except as provided in Provision III.D.2. This requirement shall be met by, at a minimum, providing a base and sides which are free of cracks or gaps and are sufficiently impervious to contain leaks, spills, or precipitation until the collected material is removed, and providing curbs or sides designed to withstand a full hydrostatic head;

b. Minimize the amount of rainfall that is collected by the system;

c. Prevent run-on into the system from non-storage and processing areas; and

d. Have sufficient capacity to contain the volume of the largest tank or 10% of the total tank and/or container capacity, whichever is greater, plus (for unenclosed areas) the volume of rainwater which would be collected by the 25-year, 24-hour rainfall event (7.5 in.).

2. Collected spills, leaks, clean-up residues, and contaminated rainfall runoff including stormwater from all waste management containment areas shall be removed promptly after the spillage and/or rainfall event in as timely a manner as is necessary to prevent overflow of the collection system, by the following method(s):

a. Removal to an on-site authorized industrial solid waste unit;

b. Removal off-site to an authorized industrial solid waste management facility; and/or

c. Removal to an authorized wastewater treatment system.

IV. Closure

A. General Closure Requirements:

1. Facility closure shall commence whenever any of the following conditions exist:

[IV.A.]

4. The permittee shall notify the Executive Director in writing at least 45 days prior to the date on which final closure of the facility is expected to begin. A copy of the notice shall be submitted to the TWC District 4 Office.

5. Within 60 days of the completion of final closure, the permittee shall submit to the Executive Director by registered mail, with a copy to the TWC District 4 Office, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan and the terms of this permit. The certification shall be signed by the permittee and by an independent registered professional engineer. Additional documentation supporting the independent registered professional engineer's certification shall be furnished to the Executive Director upon request.

B. Hazardous Waste Management Unit Area Closure Requirements:

1. All tanks, pumps, piping, and any other equipment or structures which have come in contact with waste shall either be decontaminated by removing all waste or disposed of at an authorized facility.

2. All wash water generated during decontamination activities shall be collected and disposed of in accordance with <u>Provision III.B.4.</u>

3. All hard-surfaced areas within the hazardous waste management unit areas shall be decontaminated and the wash water generated shall be collected and disposed of in accordance with <u>Provision III.B.4.</u>

4. Verification of decontamination shall be performed by analyzing wash water for the waste constituents which have been in contact with the particular item being decontaminated.

V. <u>Standard Permit Conditions</u>.

The permittee has a duty to comply with the Standard Permit Conditions under 31 TAC §305.125. Moreover, the permittee has a duty to comply with the following permit conditions:

A. In order to continue a permitted activity after the expiration date of the permit the permittee shall submit a new permit application at least 180 days before the expiration date of the effective permit, unless permission for a later date has been granted by the Executive Director. Authorization to continue such activity will terminate upon the effective denial of said application.

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[V.D.2.]

a. name, address, and telephone number of the owner or operator;

b. name, address, and telephone number of the facility;

c. date, time, and type of incident;

d. name and quantity of material(s) involved;

e. the extent of injuries, if any;

f. an assessment of actual or potential hazards to the environment and human health outside the facility, where this is applicable; and

g. estimated quantity and disposition of recovered material that resulted from the incident.

E. The Executive Director may waive the five-day written notice requirement as specified in 31 TAC §305.125(9) in favor of a written report submitted to the TWC within 15 days of the time the permittee becomes aware of the noncompliance or condition.

F. An annual report must be submitted covering facility activities during the previous calendar year.

G. Emissions from this facility must not cause or contribute to a condition of "air pollution" as defined in §382.003 of the Texas Clean Air Act or violate §382.085 of the Texas Clean Air Act. If the Executive Director of the TACB determines that such a condition or violation occurs, the permittee shall implement additional abatement measures as necessary to control or prevent the condition or violation.

H. The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

I. The permittee shall notify the TWC in writing within 10 days of the discovery of any release of hazardous waste or hazardous constituents that may have occurred from any solid waste management unit at the facility regardless of when the release occurred or may have occurred and regardless of when waste was placed in any unit. Release of hazardous waste or hazardous waste constituents from any solid waste management unit regardless of when waste was placed in that unit or when the release occurred, will constitute grounds for (1) a major permit amendment or modification pursuant to the Texas Solid Waste Disposal Act, TEXAS HEALTH AND SAFETY CODE, Chapter 361 (Vernon Supp 1990), as necessary to incorporate into the permit appropriate corrective action; (2) the adoption by the TWC of a ground-water compliance plan; or (3) other action deemed necessary

[V.J.3.]

b. If any WMP has been deleted from the list previously submitted, the reason for such deletion; and

c. A listing of any new or changed WMP that permittee's review program has developed since the last annual report.

The Executive Director may require the permittee to submit a more detailed status report for a specific WMP if it is unclear to the Executive Director the reasons the permittee has taken a particular action in regard to such WMP.

K. The permittee shall comply with 40 CFR §266.23(b).

L. The permittee is required to meet all performance standards in this permit, regardless of whether the permit also contains a specific design or other requirement relating to the performance standard.

*M. The permittee shall comply with the land disposal restrictions as found in 40 CFR Part 268 (Fed. Reg. November 7, 1986; June 4, 1987; July 8, 1987; August 17, 1988; June 23, 1989 and any subsequent applicable promulgations). Requirements include modifying the permittee's waste analysis plan, as necessary, to include analyses to determine compliance with applicable treatment standards or prohibition levels, pursuant to 40 CFR §§268.7(c) and 264.13(a).

VI. Incorporated Regulatory Requirements

A. The following TWC regulations are hereby made provisions and conditions of this permit. Issuance of this permit with incorporated rules in no way exempts the permittee from compliance with any other applicable state statute and/or TWC Rule.

1. 31 TAC Chapter 335 Subchapter A:

2. 31 TAC Chapter 335 Subchapter B;

3. 31 TAC §335.152;

4. 31 TAC §§335.153-335.155; and

5. 31 TAC §335.177.

B. To the extent applicable to the activities authorized by this permit, the following provisions of 40 CFR Part 264, adopted by reference by 31 TAC §335.152, are hereby made provisions and conditions of this permit:

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PERMIT NO. HW-50289 CONTINUATION SHEET 16 OF 20
EPA I.D. No. 0571924042
NAME: U.S. Air Force/Carswell Air Force Base

[VII.]

D. Waste Analysis Plan

The permittee shall follow the waste analysis plan developed in accordance with 40 CFR §264.13, dated August 21, 1990, which is hereby approved subject to the terms of this permit and any other orders of the TWC. The waste analysis plan is hereby incorporated into this permit by reference as if set out fully herein. Any and all revisions to the plan shall become provisions and conditions of this permit upon the date of approval by the TWC.

VIII. RCRA Facility Investigation

The permittee shall conduct a RCRA Facility Investigation in order to determine whether hazardous constituents listed in 40 CFR Part 264, Appendix IX have been released into the environment from the following SWMUs:

Carswell# Unit No.	Description
-16	Building 1060 - Waste Accumulation Area
~~18~~	Fire Training Area No. 1
19	Fire Training Area No. 2
20	Waste Fuel Storage Tank
21	Waste Oil Tank
22	Landfill No. 4
23	Landfill No. 5
24	Waste Burial Area
28	Landfill No. 1
-32	Building 1410 - Waste Accumulation Area
-35	Oil/Water Separation System
-36	Building 1191 - Waste Accumulation Area
53	Storm Water Drainage System
-61	Building 1320 - Power Production Maintenance Facility Waste Accumulation Area
62	Landfill No. 6
63	Entomology Dry Well
64	French Underdrain System
65	Weapons Storage Area Disposal Site
67	Building 1340 - Oil/Water Separator
68	POL Tank Farm

#Unit numbers correspond to the nomenclature used in the RFA document for Carswell AFB.

A. As a part of the facility investigation, the permittee shall submit three copies of a workplan to the Executive Director of the TWC for approval and/or modification, and one copy to the Executive Director, Hazardous Waste Management Division, U.S.E.P.A. Region VI, within 90 days from the issuance date of this permit by the TWC, which will address in detail the following items:

[VIII.A.2.b.(1)]

all Appendix IX constituents, unless a shorter list can be justified. If a shorter list is proposed the justification for same must be presented in the workplan.

(2) Plans for installation of a ground-water monitoring system, based upon the results of the soil boring program, consisting of a minimum of one background well located hydraulically upgradient of the unit, removed a sufficient distance so as not to be affected by the unit, and at least three wells located on the downgradient perimeter of the unit. Exploratory boreholes which are developed may be converted to monitor wells if they are appropriately drilled and located. The plan should include procedures for determining the ground-water gradient. More than three downgradient perimeter wells may be required to effectively sample the uppermost aquifer for hazardous constituents and additional background wells are recommended in order to provide an adequate sample population for determining if background values have been exceeded. Procedures for installation of monitor wells which include detailed completion methods shall be submitted in the workplan. The upper 20 feet of the upper flow zone of the uppermost aquifer must be sampled by wells. No monitor well screen length shall exceed 20 feet. Well construction and sampling materials shall be selected to avoid sample analysis interference. Monitor wells shall be logged during installation according to approved procedures which are outlined in the workplan. If existing wells are utilized as part of the ground-water monitoring system, the permittee shall provide sufficient boring data or conduct additional soil borings to provide the information which will characterize the wells.

(3) Well development methods. Methods of well development shall be described to ensure that any fluids introduced by drilling are removed and samples are not influenced by drilling activities.

(4) Exact procedures for sampling and analysis of soil and water samples. The workplan shall include provisions for sample collection, sample preservation and shipment, analytical procedures, and chain of custody control. Statistical methods must be submitted that will be used to determine if a statistically significant

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[VIII.A.]

4. A time schedule including significant accomplishments for conducting the RCRA Facility Investigation activities not to exceed twelve months in duration.

5. A sample plan including sample locations, sampling methods, sampling equipment, sample handling procedures, analytical procedures, detection limits for each procedure, and sample quality assurance and quality control.

6. A safety plan describing the known hazards and risks identifying levels of protective clothing to be worn, describing decontamination procedures and identifying any special requirement or training needs.

B. The permittee shall immediately implement the approved work plan upon receipt of written approval from the Executive Director of the TWC.

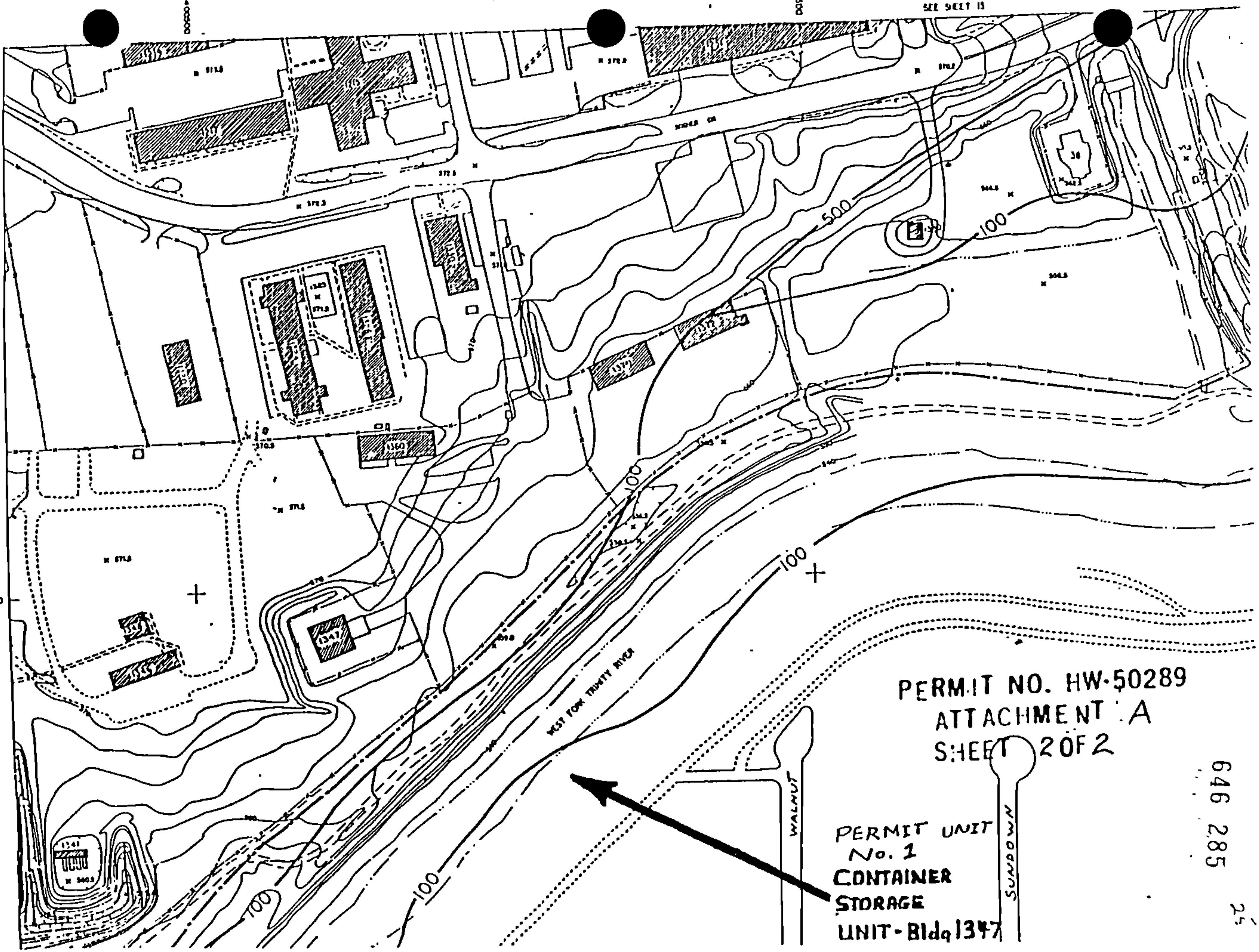
C. The permittee shall notify the TWC District 4 Office in Duncanville, Texas at least 10 days prior to any sampling activity in order to afford District personnel the opportunity to observe sampling procedures and split samples.

D. The permittee shall submit three copies of an RCRA Facility Investigation report to the Executive Director, and one copy to the Director, Hazardous Waste Management Division, U.S.E.P.A. Region VI, within 60 days after the completion of the Facility Investigation. This report shall contain the results of all inspections, observations, evaluations and sampling events conducted as a part of the Facility Investigation along with all maps, drawings and cross-sections.

E. If it is determined by the TWC that there has been a release to the environment of hazardous constituents listed in 40 CFR Part 264, Appendix IX, the permittee shall apply to the Executive Director of the TWC for an amendment or modification to this permit in order to initiate a further investigation and/or corrective action. If there is evidence of off-site contamination, the permittee shall also apply for a modification to this permit to the Director of the Hazardous Waste Management Division, U.S.E.P.A., Region VI.

Attachments

A -- Legal Description
B -- Site Plan



PERMIT NO. HW-50289
ATTACHMENT A
SHEET 2 OF 2

PERMIT UNIT
No. 1
CONTAINER
STORAGE
UNIT - Bldg 1347

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PERMIT NO. HW-50289
ATTACHMENT B
SHEET 2 OF 11

CARSWELL AIR FORCE BASE
FORT WORTH, TARRANT COUNTY, TEXAS

one m
in

ORIGINAL TRACT

ACREAGE: 9

Tract I

A tract of land situated about 6 miles N. 80 W. from the Court in Tarrant County, Texas and embracing portions of the Jos B. Farmer D. V. Farmer, Cornelius Connelly, B. L. Samuel, Daniel McVean, J. M. Shreeve, and E. S. Terrell Surveys.

Beginning at a stake in the most southerly south line of the s S. Terrell Survey 103 feet from its south southwest corner, a City monument bears west 128 feet.

Thence north no degrees 07 minutes west 4225-82/100 feet to a
Thence north 31 degrees 15 minutes east 389-1/10 feet to a st
Thence north no degrees 5-1/2 minutes east 1807-9/10 feet to in the north line of the said E. S. Terrell Survey; thence north 89 degrees 37 minutes east 4-3/4 feet to a monument.
Thence south 45 degrees 27 minutes east 212-7/10 feet to a La Worth monument.
Thence north 89 degrees 43 minutes east 150 feet to a Lake Wo monument.
Thence north 44 degrees 30 minutes east 212-8/10 feet to Worth monument, in the said north line of said Terrell Survey.
Thence north 89 degrees 36 minutes east along said line, 1449 feet to a Lake Worth monument at the northeast corner of said Terr Survey in the west line of the Daniel McVean Survey.
Thence north along said line 834-4/10 feet to a Lake Worth m
Thence north 19 degrees 43 minutes east 437-8/10 feet to a L Worth monument.
Thence north 87 degrees 25 minutes east 95-3/10 feet to a La monument.
Thence south 66 degrees 13 minutes east 137-7/10 feet to a L Worth monument.
Thence south 54 degrees 05 minutes east 415-8/10 feet to a L Worth monument.
Thence south 24 degrees 56 minutes east 561-1/10 feet to a L Worth monument.
Thence south 60 degrees east 277-8/10 feet to a Lake Worth m
Thence north 82 degrees 03 minutes east 1387 feet to a Lake monument in the east line of the said McVean Survey, the west line said D. V. Farmer Survey.
Thence north 61 degrees 54 minutes east 1384-8/10 feet to a Worth monument in the north line of the said D. V. Farmer Survey.
Thence along said line north 89 degrees 35 minutes east 178 feet to a stake from which a City monument bears south 15 feet, s monument numbered 218.
Thence south 7501-55/100 feet to a stake from which a Ci number 190 bears north 15 feet.

CARSWELL AIR FORCE BASE
FORT WORTH, TARRANT COUNTY, TEXAS

TRACT NO. A-102 ACREAGE: 22.9

Three waste sites, known as "Landfill 5," "Landfill 7," and "waste burial area" respectively, as approximately located on a tract of land, being 22.9 acres, more or less, being part of the J. M. SHREEVE SURVEY (A-1456), recorded in Vol 2576 at Page 233 of the Deed Records of said Tarrant County, and being more particularly described as follows:

From the intersection of the north right-of-way line for White Settlement Road, with the west boundary line of said J. M. SHREEVE SURVEY, east 1640 feet to the point of beginning, said point being the southwest corner of the Gatlin Mitchell property; thence along the common line between the property of Gatlin Mitchell and the existing U.S. Government property and Noel R. Bailey, et ux, property on the left, east 874.2 feet to the northeast corner of said Gatlin Mitchell property; thence along the common line between the Gatlin Mitchell and the Mrs. Patricia Harris properties south, 1145.8 feet to the southeast corner of said Gatlin Mitchell property, said point being in the north right-of-way line for White Settlement Road; thence along said north right-of-way line for White Settlement Raid west, 874.2 feet to the point of beginning, containing 22.9 acres, more or less,

and being substantially the same land conveyed to Gatlin Mitchell by Jesse E. Martin by deed dated 19 September 1946 and recorded in Vol 1837 at Page 455 of the Deed Records of said Tarrant County.

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PERMIT NO. HW-50289 31
ATTACHMENT B
SHEET 6 OF 11

CARSWELL AIR FORCE BASE
FORT WORTH, TARRANT COUNTY, TEXAS

TRACT NO. E-501 ACREAGE: 54.8

A tract of land situated in the County of Tarrant, State of Texas, being part of the John M. Shreeve Survey (A-1456) and part of the John Collett Survey (A-262), and being more particularly described as follows:

From the southeast corner of the JOHN M. SHREEVE SURVEY south 67 deg. 27' west, 1081 feet to the point of beginning, said point being the southernmost southeast corner of said W. Coulsting property and the southwest corner of the White Settlement Common Consolidated School District No. 37 property, and being also in a north line of the Wherry Housing Project property; thence along the common line between said Coulsting and the Wherry Housing Project property north 89 deg. 22' west, 432 feet to the southwest corner of the W. Coulsting property, the same being also in the existing military reservation boundary line for Carswell Air Force Base; thence along the common line between the said W. Coulsting property and the said military reservation boundary line north 00 deg. 10' west, 2170.3 feet to a point in the southerly right-of-way line of White Settlement Road; thence along said southerly right-of-way line south 89 deg. 35' east, 1427 feet to a point, same being the northeast corner of said Coulsting property and the northwest corner of the Rhea J. Vernon property; thence along the common line between said Coulsting property on the right and the Rhea J. Vernon and the Wherry Housing project properties on the left south 00 deg. 10' east, 1165 feet, more or less, to a point, same being the easternmost southeast corner of said Coulsting property and the northernmost corner of the White Settlement Common Consolidated School District No. 37; thence along the common line between said Coulsting and the White Settlement School properties as follows:

south 74 deg. 15; west, 40.1 feet to a point of curve; thence along the arc of a curve to the left in a southwesterly direction 176.5 feet to point of tangency; thence south 13 deg. 20; west, 63.7 feet to point of curve; thence along the arc of a curve to the right in a southwesterly direction 146.5 feet to a point; thence north 89 deg. 22; west, 788.7 feet to a point, same being a reentrant corner for said Coulsting property and the northwest corner of said White Settlement School property and the northwest corner of said White Settlement School property; thence south 00 deg. 38; west, 696.4 feet to the point of beginning and containing 54.8 acres, more or less,

and being a part of the same land conveyed to W. Coulsting by Mrs. Mary E. Farmer by deed dated 15 October 1921 and recorded on Vol 723 at Page 354 of the Deed Records of Tarrant County, Texas.

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PERMIT NO. HW-50289

ATTACHMENT B

SHEET 8 OF 11

CARSWELL AIR FORCE BASE
FORT WORTH, TARRANT COUNTY, TEXAS

TRACT NO. E-530 ACREAGE: 13.54

A tract of land situated in the County of Tarrant, State of Texas, being part of the Cornelius Connelly Survey (A-319), and being more particularly described as follows:

From the southeast corner of the J. B. Farmer Survey (A-514) south 30 deg. 11' west, 590 feet to the point of beginning, said point being the northeast corner of the Mrs Kate M. Hyde property, and being also in the west line of the Sidney T. Oates property and the existing boundary line of Carswell Air Force Base property; thence along the common line between said Mrs Kate M. Hyde and the Sidney T. Oates properties south, 930 feet to a point, same being the southeast corner of said Mrs Kate M. Hyde property and the northeast corner of the Homer Priddy property; thence along the common line between said Mrs Kate M. Hyde and the Homer Priddy properties west, 710.2 feet to the southwest corner of the Mrs Kate Hyde property and northwest corner of the Homer Priddy property, the same being in the east right-of-way line of River Lake Road as widened by the United States of America, Bureau of Public Roads, the said east right-of-way line being the east line of that certain tract acquired by the United States of America, Bureau of Public Roads from Mrs Kate M. Hyde in Civil Action No. 2537 in the Federal District Court for the Northern District of Texas; thence along the east right-of-way line of the widened River Lake road as follows: north 06 deg. 00' east, 179.26 feet to a point; thence north 20 deg. 02' (east, 103.1 feet to a point; thence north 05 deg. 20' west, 152.97 feet to a point; thence north 06 deg. 00' east, 92, 6 feet to a point; thence north 11 deg. 50' east, 108.64 feet to a point; thence north 23 deg. 31' east, 108.64 feet to a point; thence north 29 deg. 22' east, 233.72 feet to a point in the existing boundary line for said Carswell Air Force Base Property, same being the northwest corner of said Mrs Kate M. Hyde property; thence departing from said right-of-way line and along said boundary line, same being the common line between said Mrs Kate M. Hyde and Carswell Air Force Base properties, east, 474.18 feet to the point of beginning, containing 13.54 acres, more or less,

and being a part of the same land conveyed to Mrs Kate M. Hyde by Sidney T. Oates by deed dated 10 April 1945 and recorded in Vol 1876 at Page 293; to Mrs Kate Hyde by Betty Gordon chosen by deed dated 1 April 1935 and recorded in Vol 1449 at Page 245; and to Mrs Kate Hyde by E. G. Rosen, et al by deed dated 22 May 1945 and recorded in Vol 1876 at Page 292 of the Deed Records of Tarrant County, Texas.

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PERMIT NO. HW-50289

ATTACHMENT B

CARSWELL AIR FORCE BASE
FORT WORTH, TARRANT COUNTY, TEXAS SHEET 10 OF 11

TRACT NO. E-537 ACREAGE: 22.75

A tract of land situated in the County of Tarrant, State of Texas, being part of the Nathaniel H. Carroll Survey (A-264), and part of the Cornelius Connelly Survey (A-319), and being more particularly described as follows:

From the southeast corner of the J. B. Farmer Survey (A-514) and along the east line of said survey north, 416.6 feet to the point of beginning, said point being the northwest corner of the Grace Cozby property, and being also in the existing boundary line of Carswell Air Force Base; thence along said boundary line, same being the common line between said Grace Cozby and the Carswell Air Force Base properties east, 590 feet to a point, same being the northeast corner of said Grace Cozby property and the northwest corner of the Mattie Belle McNaughton property; thence along the east line of said Grace Cozby property as follows: south, 1616 feet to a point, same being the easternmost southeast corner of said Cozby property; thence west, 25 feet to a point; thence south, 69.7 feet to a point, same being the southernmost southeast corner of said Cozby property and the northeast corner of the Winding Brook Addition according to a plat and dedication recorded Vol. 388-K, Page 219; thence departing from said east line and along the common line between said Grace Cozby property on the right and the Garland B. Franklin, et ux, and the Lois Trigg properties on the left west 540.4 feet to a point, same being the southwest corner of said Cozby property and the northwest corner of said Lois Trigg property, and being also in the east line of the Sidney T. Oates, et ux, property; thence along the common line between said Grace Cozby property on the right and the Sidney T. Oates, et ux, and the Carswell Air Force Base properties on the left north, 1680.8 feet to the point of beginning and containing 22.75 acres, more or less,

and being substantially the same land conveyed to Grace Cozby by Lois Trig by deed dated 5 November 1951 and recorded in Vol 2369 at Page 543 of the Deed Records of Tarrant County, Texas.

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TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

April 22, 1994

Mr. Ohlen Long
Site Manager
Headquarters, Air Force Base Disposal Agency
Location H, Bldg 1215
Carswell Air Force Base, Texas 76127-5000

RE: Carswell Air Force Base,
Texas Natural Resource Conservation Commission Hazardous Waste Permit No.HW50289,
Solid Waste Registration No. 65004,
EPA ID NO. TX0571924042,
Identification of additional Solid Waste Management Units requiring investigation under part VIII of the Resource Conservation and Recovery Act (RCRA) permit.

Request for Additional Investigation

Dear Mr. Long:

The Texas Natural Resource Conservation Commission (TNRCC), formerly the Texas Water Commission (TWC), Corrective Action Staff, has identified 21 SWMU's that require investigation and are not listed in the RCRA permit. Part V. I. of the permit allows the TNRCC to require investigation of units where a release may have occurred. Also, 30 Texas Administrative Code (TAC) §305.62 (d) states that "If good cause exists, the executive director may initiate and the Commission may order an amendment to a permit and the executive director may request an updated application if necessary".

In order to expedite the investigative process the TNRCC will not require a permit amendment for the additional SWMU's until after the first phase of the investigation is completed. The investigation must follow the RFI procedures listed in part VIII of the permit. After the first phase of the investigation, Carswell AFB may be required to amend the permit to add those SWMU's that are shown to have released industrial solid waste or municipal hazardous waste to the environment. The SWMU's that require additional investigation are listed below with SWMU numbers that correspond to the nomenclature used in the RCRA Facility Assessment (RFA) document for Carswell AFB:

Jonn Hall, *Chairman*
Pam Reed, *Commissioner*
Peggy Garner, *Commissioner*
Dan Pearson *Executive Director*

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File:
A.F. 17A72

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

March 2, 1995

Mr. Ohlen Long
Site Manager
Headquarters, Air Force Base Disposal Agency
Location H, Bldg. 1215
Carswell Air Force Base, Texas 76127-5000

RE: Carswell Air Force Base,
Texas Natural Resource Conservation Commission Hazardous Waste Permit No.HW50289,
Solid Waste Registration No. 65004,
EPA ID NO. TX0571924042,
Designation of Solid Waste Management Units and Areas of Concern for Investigation and/or Corrective Measures

Determination of a Need for an RFI and Current Condition Report

Dear Mr. Long:

The TNRCC has recently completed its review of the 68 RCRA Solid Waste Management Units (SWMU) and 15 Areas of Concern (AOC) identified to date on Naval Air Station Fort Worth, also known as Carswell Air Force Base. Our review included the RCRA Facility Assessment (RFA) conducted in 1989; Hazardous Waste Permit No. 50289 issued in 1991; TNRCC's letter dated April 22, 1994; and the decisions resulting from the TNRCC's inspections of June 15, 1994, July 29, 1994, and February 13, 1995. Part V. I. of the permit allows the TNRCC to require investigation of units where a release may have occurred. Also, 30 Texas Administrative Code (TAC) §305.62 (d) states that "If good cause exists, the executive director may initiate and the Commission may order an amendment to a permit and the executive director may request an updated application if necessary".

Based on the above mentioned documents and inspections, the TNRCC has determined that a total of 50 SWMU's and 14 AOC's require investigations and/or corrective measures. The 18 remaining SWMU's and one AOC are designated for No Further Action (NFA) at this time. The NFA designation will remain so long as there is no further evidence of a release to the environment from these units.

The TNRCC looks forward to assisting the Air Force and Navy in developing the scope of work necessary to economically and adequately characterize releases to the environment. If you have any questions or need further assistance with this matter, please contact Mr. Geoffrey Meyer in my section at (512) 239-2577.

Sincerely,

Paul S. Lewis

Paul Lewis, Manager
Corrective Action Section
Industrial and Hazardous Waste Division

Enclosure

PL:gm

cc w/ enclosure
David Neleigh, EPA Region 6
Don C. Eubank, TNRCC Region 4
Charles Mauk, TNRCC Permits
Wade Wheatley, TNRCC Permits

cc: Tennie Larson, IHW Corrective Action Section (CA070/103)

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Attachment

SWMU and AOC Designation
Carswell Air Force Base /
Naval Air Station Ft. Worth
February 16, 1995

SWMU No./ AOC	Unit Description	Designation
22	Landfill No. 4	RFI
23	Landfill No. 5	RFI
24	Waste Bunal Area	RFI
25	Landfill No. 8	RFI
26	Landfill No. 3	RFI
27	Landfill No. 10	RFI
28	Landfill No. 1	RFI
29	Landfill No. 2	RFI
30	Landfill No. 9	RFI
31	Bldg. 1050 Waste Accumulation Area	RFI
32	Bldg. 1410 Waste Accumulation Area	RFI
33	Bldg. 1420 Waste Accumulation Area	RFI
34	Bldg. 1194 Waste Accumulation Area	RFI
35	Bldg. 1194 Vehicle Refueling Shop Oil/Water Separation System	RFI
36	Bldg. 1191 Waste Accumulation Area	RFI
37	Bldg. 1191 Vehicle Maintenance Shop Oil/Water Separator	RFI
38	Bldg. 1269 PCB Transformers Building	NFA
39	Bldg. 1643 Waste Accumulation Area	RFI
40	Bldg. 1643 Oil/Water Separation System	RFI
41	Bldg 1414 Oil/Water Separation System Field Maintenance Squadron Aerospace Ground Equipment	RFI
42	Bldg. 1414 Waste Accumulation Area	RFI
43	Bldg. 1414 Non-Destructive Inspection (NDI) Waste Accumulation Area	NFA

Attachment

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SWMU and AOC Designation
Carswell Air Force Base /
Naval Air Station Ft. Worth
February 16, 1995

SWMU No./ AOC	Unit Description	Designation
66	Sanitary Sewer System	RFI
67	Bldg. 1340 Oil/Water Separator	RFI
68	POL Tank Farm	RFI
AOC	ST-16, Bldg. 1518 Service Station	RFI
AOC	OT-18, Airfield TCE Plume	RFI
AOC	DP-17, Waste Oil Dump	NFA
AOC	Fuel Hydrant System	RFI
AOC	Grounds Maintenance Yard	RFI
AOC	RV Parking Area	RFI
AOC	Base Refueling Area	RFI
AOC	SW Aerospace Museum	RFI
AOC	Golf Course Maintenence Area	RFI
AOC	Bldg. 1064 Oil/Water Separator	RFI
AOC	Bldg. 1060 Oil/Water Separator	RFI
AOC	Bldg. 4210 Oil/Water Separator	RFI
AOC	Bldg. 1145 Oil/Water Separator	RFI
AOC	Unnamed Stream	RFI
AOC	Bldg. 1190 Storage Shed	RFI

TAB

Appendix B

APPENDIX B

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Table B.1
Preliminary Identified ARARs
NAS Fort Worth JRB, Texas

ARAR Category	Federal Act	Regulation/ Standard/Code	Description	Comments
Location Specific	National Environmental Policy Act (NEPA)	40 CFR 1500	Council on environmental quality regulations	Evaluates impacts of remediation on the environment
		40 CFR 6	EPA NEPA regulations	Regulations specific to EPA actions
		32 CFR 989 32 CFR 265	DOD-Air Force NEPA regulations DOD-Natural Resources Programs	Regulations specific to DOD-Air Force actions; the Air Force must evaluate and disclose impacts that will occur as a result of remediation
	National Historic Preservation Act (1966)	36 CFR 60, 62, 63, 65, 800	Culture resources regulations	Regulations pertaining to the protection of cultural resources. Includes Executive Order 11593
	Archaeological Resources Protection Act (1979)	36 CFR 296	Cultural resources regulations	Regulations pertaining to the protection of cultural resources. Includes Executive Order 11593
	Archaeological and Historical Preservation Act (1974)	40 CFR 6.301	Cultural resources regulations	Provides for data collection/ preservation listing on the National Registry of National Landmarks, etc. If any building and/or other landmarks/ resources are considered eligible, compliance must be accomplished prior to remediation.
	Floodplains/Wetlands	E.O. 11988 E.O. 11990	Floodplain Management Protection of Wetlands	Executive orders adopted to avoid long and short term impacts associated with wetlands destruction and occupancy and modification of floodplains.

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Table B.1 (continued)
Preliminary Identified ARARs
NAS Fort Worth JRB, Texas

ARAR Category	Federal Act	Regulation/ Standard/Code	Description	Comments
Action Specific (continued)	Clean Water Act (CWA)	33 CFR 322	Structures or work within navigable waters of the United States	May be applicable to Farmers Branch Creek.
		33 CFR 323 33 CFR 328 33 CFR 329	Discharges of dredge or fill material to waters of the United States	May be applicable to Farmers Branch Creek.
		40 CFR 109	Criteria for state, local, and regional oil removal contingency plans	Applicable if oil may be managed or used during remediation due to proximity to Farmers Branch Creek.
		40 CFR 110	Oil discharge	May be applicable if determined that oil has contaminated or may contaminate adjacent water bodies.
		40 CFR 112	Oil pollution prevention	Applicable to prevent oil spills into adjacent water bodies. Requires that persons who may discharge oil in harmful quantities must prepare a Spill Prevention Control and Countermeasure (SPCC) plan (40 CFR 112.1, [b]).
		Texas Administrative Code (TAC), Title 31, Chapter 343	Oil and hazardous substances	Provides for immediate cleanup of hazardous substances without obtaining a permit (Texas Water Code, Chapter 26).
		Texas Water Code, Title 2, Chapter 26, Subchapter G	Oil and hazardous substances spill prevention and control	Also known as Texas Hazardous Substances Spill Prevention and Control Act. Establishes policy to prevent the spill or discharge of hazardous substances into waters of the state of Texas.

Table B.1 (continued)
Preliminary Identified ARARs
NAS Fort Worth JRB, Texas

ARAR Category	Federal Act	Regulation/ Standard/Code	Description	Comments
Action Specific (continued)	CWA (continued)	TAC, Title 31, Part IX, Chapter 319	General regulations incorporated into permit	Established allowable concentrations of hazardous metals to inland waters. Includes toxic pollutant quality control (319.26) and groundwater protection (319.27).
		TAC, Title 31, Part IX, Chapter 323	Waste disposal approvals	Applies to the collection of waste in floodplains, and groundwater protection requirements.
		TAC, Title 31, Chapter 331	Underground injection control	Applies to the injection of chemicals into non-potable aquifers to facilitate remediation.
	Hazardous Materials Transportation Act (HMTA)	49 CFR 107	Hazardous materials program procedures	
		49 CFR 171, 172, 173, 174, 177	Hazardous materials regulations	Includes general information communication requirements, emergency response information, and carriage by rail and public highway. Carriage by vessel or aircraft is not anticipated.
	Resource Conservation and Recovery Act (RCRA)	40 CFR 241	Land disposal of solid waste	May be applicable to four SWMUs if excavation is required.
		40 CFR 256	State solid waste management plans	May be applicable if excavation of the four SWMUs reclassifies the sites as an "open dump".

Table B.1 (continued)
Preliminary Identified ARARs
NAS Fort Worth JRB, Texas

ARAR Category	Federal Act	Regulation/ Standard/Code	Description	Comments
Action Specific (continued)	RCRA (continued)	Texas Solid Waste Disposal Act	Texas civil statutes Public Article 4477-7	Includes implementation of the Federal Resource Conservation and Recovery Act.
		Texas Underground Storage Tanks Act	Texas water code, Title 2, Chapter 26	Includes underground and aboveground storage tanks. Aboveground tanks pertain only to petroleum products.
		TAC, Title 31, Part IX, Chapter 334	Underground Storage Tank Rules	Applicable to underground storage tanks storing hazardous or petroleum products, and aboveground storage tanks containing petroleum.
		TAC, Title 31, Part IX, Chapter 330	Solid waste management regulations	Includes regulation of both hazardous and non-hazardous waste; however, targets municipal solid waste disposal.
		TAC, Title 31, Chapter 335	Texas industrial waste management regulations	Regulates the management and control of municipal hazardous waste and industrial wastes. Includes generators, transporters, and owners/operators of TSD facilities.
		TAC, Title 31, Chapter 330	Disposal of lead acid batteries	May be applicable if batteries are disposed in any of the four SWMUs.
	Occupational Safety and Health Act (OSHA)	29 CFR 1900	Implementation of OSHA	Address standard safety practices including personal protective equipment.
Chemical Specific	CWA	40 CFR 129	Toxic pollutant effluent standards	Applicable if any toxic pollutants listed at 129.4 (including PCBs) are discovered.
		TAC, Title 31, Chapter 314	Texas toxic pollutant effluent standards	Adopts 40 CFR 129, by reference.

Table B.1 (continued)
Preliminary Identified ARARs
NAS Fort Worth JRB, Texas

ARAR Category	Federal Act	Regulation/ Standard/Code	Description	Comments
Chemical Specific (continued)	CAA (continued)	Texas CAA	Abatement of air pollution and contaminants	Includes dust, smoke, particulate matter, fumes, gas, vapor, odor produced by processes other than natural.
		TAC, Title 31, Part III, Chapter 101	Texas Air Pollution control regulations: General Provisions	Implements the Texas CAA.
			Section 101.4 Nuisance	Requires that air pollutants can not be discharged that may be adverse to, or may be injurious to humans, animals, vegetation, and property.
			Section 101.20 and 101.21	Compliance with National Standards
		TAC, Title 31, Part III, Chapter 111	Visible emissions and particulate matter	Includes incineration of hazardous waste.
			Section 111.145	Dust control required for land clearing, construction, etc., if more than one area.
		40 CFR 61	National Emission Standards for Hazardous Air Pollutants (NESHAPS)	Possible applicable due to trichloroethane.
		TAC, Title 31, Part III, Chapter 115	Control of air pollution for volatile organic compounds	a.k.a. "Texas Regulation V"; regulates synthetic organic chemicals including benzene, methylene chloride, and vinyl chloride which are contaminants of concern.

TAB

Appendix C

APPENDIX C

SUMMARY OF BACKGROUND VALUES
(JACOBS, 1998)

646 305

TABLE 4-1
Summary of Background Values for Surface Soil (Horizon A)
Naval Air Station Fort Worth

Analyte	% Non-detects	Detects / Total	W (crit)	W (log)	W (raw)	Min	Max	Mean	Standard Deviation	$UTL_{95,95}$	Outlier?
Aluminum	0 0%	30 / 30	0 927	0 896 Reject	0 960 Accept	1790	19900	10775	5072	22035	No
Antimony	80 0%	6 / 30	——	—— ——	—— ——	< 0 215	0 56	nc	nc	0 56	——
Arsenic	0 0%	30 / 30	0 927	0 851 Reject	0 959 Accept	1 23	5 88	3 50	1 06	5 85	No
Barium	0 0%	30 / 30	0 927	0 810 Reject	0 281 Reject	24 9	1980	145 3	349 3	233	Yes
Beryllium	0 0%	30 / 30	0 927	0 808 Reject	0 911 Reject	0 164	1 02	0 655	0 243	1 02	No
Calcium	0 0%	30 / 30	0 927	0 969 Accept	0 687 Reject	418	111000	20991	28270	167788	No
Cadmium	6 7%	28 / 30	0 927	0 928 Accept	0 809 Reject	0 054	0 625	0 212	0 112	0 556	No
Chromium	0 0%	30 / 30	0 927	0 952 Accept	0 965 Accept	5 06	20 1	11 73	4 20	25 86	No
Cobalt	0 0%	30 / 30	0 927	0 961 Accept	0 953 Accept	1 54	10 2	4 75	1 85	11 05	No
Copper	0 0%	30 / 30	0 927	0 909 Reject	0 964 Accept	4 44	16 7	10 77	2 97	17 37	No
Iron	0 0%	30 / 30	0 927	0 879 Reject	0 946 Accept	3460	15500	10199	3386	17717	No
Lead	0 0%	30 / 30	0 927	0 927 Reject	0 750 Reject	6 08	40 5	14 59	6 63	30 97	Yes
Magnesium	0 0%	30 / 30	0 927	0 830 Reject	0 968 Accept	112	2830	1369	736	3003	No
Manganese	0 0%	30 / 30	0 927	0 923 Reject	0 624 Reject	132	1420	337	238	849	Yes
Mercury	93 3%	2 / 30	——	—— ——	—— ——	< 0 031	0 14	nc	nc	0 14	——
Molybdenum	80 0%	6 / 30	——	—— ——	—— ——	< 0 657	1 460	nc	nc	1 460	——
Nickel	0 0%	30 / 30	0 927	0 856 Reject	0 918 Reject	3 74	14 6	9 75	3 28	14 6	No
Potassium	0 0%	30 / 30	0 927	0 963 Accept	0 950 Accept	434	2790	1253	489	2895	No
Selenium	40 0%	18 / 30	0 927	0 857 Reject	0 840 Reject	0 059	0 637	0 212	0.161	0 907	No
Silver	3 3%	29 / 30	0 927	0 918 Reject	0 821 Reject	< 0 025	0 213	0 070	0 035	0 213	No
Sodium	3 3%	29 / 30	0 927	0 723 Reject	0 467 Reject	< 2 57	37300	3482	8804	37300	No
Thallium	73 3%	8 / 30	——	—— ——	—— ——	< 1 10	2 43	nc	nc	2 43	——
Vanadium	0 0%	30 / 30	0 927	0 884 Reject	0 966 Accept	5 82	48 5	23 89	10 08	46 3	No
Zinc	0 0%	30 / 30	0 927	0 819 Reject	0 488 Reject	13 3	124	29 3	19 0	38 8	Yes

Notes:

Units for Min , Max., Mean, and $UTL_{95,95}$ are in milligrams per kilogram (mg/kg).

—— = not applicable
nc = not calculated
ND = not detected

$UTL_{95,95}$ = Upper Tolerance Level (95% confidence and 95% coverage)
Outlier? = Result of test to determine if the maximum value is a potential outlier
W (crit) = Shapiro-Wilk critical value
W (log) = calculated W using log-transformed data and result when compared to W (crit)
W (raw) = calculated W using raw data and result when compared to W (crit)

TABLE 4-2
Summary of Background Values for Subsurface Soil (Horizon B)
Naval Air Station Fort Worth

Analyte	% Non-detects	Detects / Total	W (crit)	W (log)	W (raw)	Minimum	Maximum	Mean	Standard Deviation	$UTL_{95,95}$	Outlier?
Aluminum	0 0%	30 / 30	0 927	0 960 Accept	0 955 Accept	3780	17700	9905	3277	20260	No
Antimony	80 0%	6 / 30	—	— —	— —	< 0 21	0 712	nc	nc	0 712	—
Arsenic	0 0%	30 / 30	0 927	0 963 Accept	0 942 Accept	1 42	5 31	3 03	1 13	6 58	No
Barium	0 0%	30 / 30	0 927	0 922 Reject	0 974 Accept	16 4	127	65 8	28 0	128 1	No
Beryllium	0 0%	30 / 30	0 927	0 966 Accept	0 969 Accept	0 208	1 07	0 56	0 18	1 13	No
Calcium	0 0%	30 / 30	0 927	0 733 Reject	0 853 Reject	751	347000	91395	76216	272000	Yes
Cadmium	33 3%	20 / 30	0 927	0 829 Reject	0 390 Reject	0 055	1 48	0 18	0 25	0 59	Yes
Chromium	0 0%	30 / 30	0 927	0 937 Accept	0 847 Reject	5 77	17 90	9 49	2.77	16 31	No
Cobalt	10 0%	27 / 30	0 927	0 762 Reject	0 954 Accept	0 4395	5 5	3 18	1 36	6 19	No
Copper	0 0%	30 / 30	0 927	0 848 Reject	0 952 Accept	2 61	13 30	8 12	2 52	13 72	No
Iron	0 0%	30 / 30	0 927	0 936 Accept	0 941 Accept	3840	16900	9185	2720	17469	No
Lead	6.7%	28 / 30	0 927	0 746 Reject	0 949 Accept	0 073	14 3	5 28	3 33	12 66	No
Magnesium	0 0%	30 / 30	0 927	0 697 Reject	0 843 Reject	292	2420	1569	582	2420	No
Manganese	0 0%	30 / 30	0 927	0 904 Reject	0 964 Accept	28 7	317	169.6	82 0	351.7	No
Mercury	100 0%	0 / 30	—	— —	— —	< 0 03	< 0 035	nc	nc	ND at 0 035	—
Molybdenum	80 0%	6 / 30	—	— —	— —	< 0 638	1 930	nc	nc	1 93	—
Nickel	0.0%	30 / 30	0 927	0 959 Accept	0.837 Reject	4 17	22 1	9 17	3 86	19 76	No
Potassium	0 0%	30 / 30	0 927	0 909 Reject	0 977 Accept	271	1900	1000	323	1717	No
Selenium	80.0%	6 / 30	—	— —	— —	< 0 12	0 3130	nc	nc	0 313	—
Silver	33 3%	20 / 30	0 927	0 862 Reject	0 847 Reject	<0 021	0 0928	0 035	0 027	0 128	No
Sodium	10 0%	27 / 30	0 927	0 898 Reject	0.426 Reject	1 1	53200	4225	11762	53200	No
Thallium	76 7%	7 / 30	—	— —	— —	< 1 09	1 5	nc	nc	1 5	—
Vanadium	0 0%	30 / 30	0 927	0 980 Accept	0 926 Reject	9 7	37 8	20 3	6 2	37 4	No
Zinc	0 0%	30 / 30	0 927	0 851 Reject	0 963 Accept	5 9	31	18 7	5 7	31 3	No

Notes:

Units for Min , Max , Mean, and $UTL_{95,95}$ are in milligrams per kilogram (mg/kg)

—— = not applicable
nc = not calculated
ND = not detected

$UTL_{95,95}$ = Upper Tolerance Level (95% confidence and 95% coverage)
Outlier? = Result of test to determine if the maximum value is a potential outlier.
W (crit) = Shapiro-Wilk critical value
W (log) = calculated W using log-transformed data and result when compared to W (crit)
W (raw) = calculated W using raw data and result when compared to W (crit)

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TABLE 4-3
Summary of Background Values for Low-Stress Groundwater Samples
Naval Air Station Fort Worth

Analyte	% Non-detects	Detects / Total	W (crit)	W (log)	W (raw)	Minimum	Maximum	Mean	Standard Deviation	$UTL_{95,95}$	Outlier?
Aluminum	25 0%	9 / 12	0 859	0 930 Accept	0 505 Reject	0 052	0 472	0 075	0 191	1 332	No
Antimony	100 0%	0 / 12	——	—— ——	—— ——	< 0 002	< 0 002	nc	nc	ND at 0 002	——
Arsenic	100 0%	0 / 12	0 859	—— ——	—— ——	< 0 0049	< 0 0049	nc	nc	ND at 0 0049	——
Barium	0 0%	12 / 12	0 859	0 887 Accept	0 647 Reject	0 052	0 472	0 135	0 114	0 587	Yes
Beryllium	91 7%	1 / 12	——	—— ——	—— ——	< 0 0003	0 0003	nc	nc	0 0003	——
Calcium	0 0%	12 / 12	0 859	0 855 Reject	0 905 Accept	56 5	193	141 7	45 5	266 3	No
Cadmium	100 0%	0 / 12	——	—— ——	—— ——	< 0 0005	< 0 0005	nc	nc	ND at 0 0005	——
Chromium	91 7%	1 / 12	——	—— ——	—— ——	< 0 0053	0 0064	nc	nc	0 006	——
Cobalt	100 0%	0 / 12	——	—— ——	—— ——	< 0 0089	< 0 0089	nc	nc	ND at 0 0089	——
Copper	91.7%	1 / 12	——	—— ——	—— ——	< 0 0008	0 0028	nc	nc	0 0028	——
Iron	0 0%	12 / 12	0 859	0 874 Accept	0 872 Accept	0 0049	0 072	0 0253	0 0194	0 224	No
Lead	100 0%	0 / 12	——	—— ——	—— ——	< 0 0016	< 0 0016	nc	nc	ND at 0 0016	——
Magnesium	0 0%	12 / 12	0 859	0 839 Reject	0 639 Reject	2 76	37 8	10 32	10 49	37 80	No
Manganese	0 0%	12 / 12	0 859	0 820 Reject	0 376 Reject	0 0019	2 86	0 2713	0 8177	0 175	Yes
Mercury	100 0%	0 / 12	——	—— ——	—— ——	< 0 0001	< 0 0001	nc	nc	ND at 0 0001	——
Molybdenum	100 0%	0 / 12	——	—— ——	—— ——	< 0 0144	< 0 0144	nc	nc	ND at 0 0144	——
Nickel	75 0%	3 / 12	——	—— ——	—— ——	< 0 002	0 0204	nc	nc	0 0204	——
Potassium	33 3%	8 / 12	0 859	0 890 Accept	0 665 Reject	0 233	5 55	1 28	2 08	15 03	No
Selenium	25 0%	9 / 12	0 859	0 823 Reject	0 882 Accept	0 00055	0 0046	0 0021	0 0012	0 0077	No
Silver	91 7%	1 / 12	——	—— ——	—— ——	< 0 0002	0 0002	nc	nc	0 0002	——
Sodium	0 0%	12 / 12	0 859	0 885 Accept	0 519 Reject	6 17	144	28 8	37.1	167	Yes
Thallium	100 0%	0 / 12	——	—— ——	—— ——	< 0 0632	< 0 0632	nc	nc	ND at 0 0632	——
Vanadium	18 2%	9 / 11	0 850	0 893 Accept	0 863 Accept	< 0 0029	0 0074	0 0034	0 0018	0 012	No
Zinc	36.4%	7 / 11	0 850	0 877 Accept	0 622 Reject	0 00195	0 0487	0 0101	0 0170	0 118	No

Notes:

Units for Min., Max , Mean, and $UTL_{95,95}$ are in milligrams per liter (mg/L)

—— = not applicable
nc = not calculated
ND = not detected
$UTL_{95,95}$ = Upper Tolerance Level - (95% confidence and 95% coverage)
Outlier? = Result of test to determine if the maximum value is a potential outlier

W (crit) = Shapiro-Wilk critical value
W (log) = calculated W using log-transformed data and result when compared to W (crit)
W (raw) = calculated W using raw data and result when compared to W (crit)

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TABLE 4-4
Summary of Background Values for Bailer-Collected Groundwater Samples
Naval Air Station Fort Worth

Analyte	% Non-detects	Detects / Total	W (crit)	W (log)	W (raw)	Minimum	Maximum	Mean	Standard Deviation	$UTL_{95,95}$	Outlier?
Aluminum	0 0%	12 / 12	0 859	0 950 Accept	0 779 Reject	0 0699	2 45	0 807	0 859	11 07	No
Antimony	91 7%	1 / 12	——	—— ——	—— ——	< 0 002	0 0024	nc	nc	0 0024	——
Arsenic	91 7%	1 / 12	——	—— ——	—— ——	< 0 0049	0 0067	nc	nc	0 0067	——
Barium	0 0%	12 / 12	0 859	0 982 Accept	0 882 Accept	0 0358	0 513	0 193	0 136	1 133	No
Beryllium	66 7%	4 / 12	——	—— ——	—— ——	< 0 0003	0 0019	nc	nc	0 0019	——
Calcium	0 0%	12 / 12	0 859	0 916 Accept	0 806 Reject	102	881	407	301	2438	No
Cadmium	66 7%	4 / 12	——	—— ——	—— ——	< 0 0005	0 0016	nc	nc	0 0016	——
Chromium	58 3%	5 / 12	——	—— ——	—— ——	< 0 0053	0 0136	nc	nc	0 0136	——
Cobalt	91 7%	1 / 12	——	—— ——	—— ——	< 0 0089	0 01	nc	nc	0 01	——
Copper	50 0%	6 / 12	——	—— ——	—— ——	< 0 0008	0 0101	nc	nc	0 0101	——
Iron	0 0%	12 / 12	0 859	0 984 Accept	0 828 Reject	0 0768	2 64	0 784	0 703	7 23	No
Lead	100 0%	0 / 12	——	—— ——	—— ——	< 0 0016	< 0 0016	nc	nc	ND at 0 0016	——
Magnesium	0 0%	12 / 12	0 859	0 905 Accept	0 735 Reject	3 79	35 6	11 91	10 65	68 78	No
Manganese	0 0%	12 / 12	0 859	0 958 Accept	0 863 Accept	0 0393	2 17	0 705	0 659	10.571	No
Mercury	100 0%	0 / 12	——	—— ——	—— ——	< 0 0001	< 0 0001	nc	nc	ND at 0 0001	——
Molybdenum	100 0%	0 / 12	——	—— ——	—— ——	< 0 0144	< 0 0144	nc	nc	ND at 0 0144	——
Nickel	0 0%	12 / 12	0 859	0 919 Accept	0 785 Reject	0 0022	0 0203	0 0068	0 0055	0 036	No
Potassium	50 0%	6 / 12	——	—— ——	—— ——	< 0 466	3 9	nc	nc	3 9	——
Selenium	16 7%	10 / 12	0 859	0 891 Accept	0 851 Reject	< 0 0011	0 0042	0 0018	0 0009	0 0072	No
Silver	91.7%	1 / 12	——	—— ——	—— ——	< 0 0002	0 0003	nc	nc	0 0003	——
Sodium	0 0%	12 / 12	0 859	0 960 Accept	0 630 Reject	1 96	91 5	20 2	23 7	176 2	No
Thallium	100 0%	0 / 12	——	—— ——	—— ——	< 0 0632	< 0 0632	nc	nc	ND at 0 0632	——
Vanadium	9 1%	10 / 11	0 850	0 943 Accept	0 920 Accept	0 00145	0 0247	0 0093	0 0066	0 0653	No
Zinc	9 1%	10 / 11	0 850	0 964 Accept	0 874 Accept	0 00195	0 0307	0 0107	0 0082	0 0682	No

Notes:

Units for Min., Max , Mean, and $UTL_{95,95}$ are in milligrams per liter (mg/L)

—— = not applicable
nc = not calculated
ND = not detected
$UTL_{95,95}$ = Upper Tolerance Level- (95% confidence and 95% coverage)
Outlier? = Result of test to determine if the maximum value is a potential outlier.

W (crit) = Shapiro-Wilk critical value
W (log) = calculated W using log-transformed data and result when compared to W (crit)
W (raw) = calculated W using raw data and result when compared to W (crit)

TABLE 4-5
Summary of Background Values for Surface Water
Naval Air Station Fort Worth

Analyte	% Non-detects	Detects / Total	W (crit)	W (log)	W (raw)	Minimum	Maximum	Mean	Standard Deviation	$UTL_{95,95}$	Outlier?
Aluminum	0 0%	8 / 8	0 818	0 848 Accept	0 729 Reject	0 0509	0 178	0 084	0 041	0 272	Yes
Antimony	75 0%	2 / 8	—	— —	— —	< 0 002	0 0031	nc	nc	0 003	—
Arsenic	100 0%	0 / 8	—	— —	— —	< 0 0049	< 0 0049	nc	nc	ND at 0 0049	—
Barium	0 0%	8 / 8	0 818	0 957 Accept	0 928 Accept	0 0759	0 124	0 095	0 015	0 151	No
Beryllium	100 0%	0 / 8	—	— —	— —	< 0 0003	< 0 0003	nc	nc	ND at 0 0003	—
Calcium	0 0%	8 / 8	0 818	0 908 Accept	0 879 Accept	84 1	118	96 0	10 6	133 7	No
Cadmium	87 5%	1 / 8	—	— —	— —	< 0 0005	0 0005	nc	nc	ND at 0 0005	—
Chromium	62 5%	3 / 8	—	— —	— —	< 0 0053	0 0078	nc	nc	0 0078	—
Cobalt	100 0%	0 / 8	—	— —	— —	< 0 0089	< 0 0089	nc	nc	ND at 0 0089	—
Copper	25 0%	6 / 8	0 818	0 566 Reject	0 566 Reject	< 0 0004	0 0101	0 008	0 004	0 010	No
Iron	0 0%	8 / 8	0 818	0 930 Accept	0 989 Accept	0 0221	0 223	0 113	0 063	0 921	No
Lead	100 0%	0 / 8	—	— —	— —	< 0 0016	< 0 0016	nc	nc	ND at 0 0016	—
Magnesium	0 0%	8 / 8	0 818	0 993 Accept	0 976 Accept	2 07	5 52	3 58	1 11	9 35	No
Manganese	0 0%	8 / 8	0 818	0 937 Accept	0 864 Accept	0 0038	0 0716	0 0251	0 0218	0 4193	No
Mercury	87 5%	1 / 8	—	— —	— —	< 0 0001	0 0001	nc	nc	0 0001	—
Molybdenum	100 0%	0 / 8	—	— —	— —	< 0 0144	< 0 0144	nc	nc	ND at 0 0144	—
Nickel	87 5%	1 / 8	—	— —	— —	<0 002	0 0178	nc	nc	0 0178	—
Potassium	0 0%	8 / 8	0 818	0 893 Accept	0 924 Accept	2 06	3 93	3 00	0 68	6 35	No
Selenium	25 0%	6 / 8	0 818	0 689 Reject	0 779 Reject	< 0 0011	0 0025	0 0018	0 0008	0 0025	No
Silver	75 0%	2 / 8	—	— —	— —	< 0 0002	0 0003	nc	nc	0 0003	—
Sodium	0 0%	8 / 8	0 818	0 959 Accept	0 943 Accept	19 3	32 9	25 7	4 8	45 5	No
Thallium	100 0%	0 / 8	—	— —	— —	< 0 0632	< 0 0632	nc	nc	ND at 0 0632	—
Vanadium	25 0%	6 / 8	0 818	0 882 Accept	0 941 Accept	< 0 0029	0 0058	nc	nc	0 01[illegible]	—
Zinc	75 0%	2 / 8	—	— —	— —	<0 0039	0 0122	nc	nc	0 0122	No

Notes:

Units for Min , Max., Mean, and $UTL_{95,95}$ are in milligrams per liter (mg/L)

— = not applicable
nc = not calculated
ND = not detected

$UTL_{95,95}$ = Upper Tolerance Level (95% confidence and 95% coverage)
Outlier? = Result of test to determine if the maximum value is a potential outlier
W (crit) = Shapiro-Wilk critical value
W (log) = calculated W using log-transformed data and result when compared to W (crit)
W (raw) = calculated W using raw data and result when compared to W (crit)

TABLE 4-6
Summary of Background Values for Stream Sediment Samples
Naval Air Station Fort Worth

Analyte	% Non-detects	Detects / Total	W (crit)	W (log)	W (raw)	Minimum	Maximum	Mean	Standard Deviation	$UTL_{95,95}$	Outlier?
Aluminum	0 0%	14 / 14	0.874	0 947 Accept	0 933 Accept	1280	9240	4740	2560	19700	No
Antimony	92 9%	1 / 14	0 874	----- -----	----- -----	< 0 244	0 33	nc	nc	0 33	-----
Arsenic	0.0%	14 / 14	0.874	0 864 Reject	0 737 Reject	2 66	8 07	3 89	1.39	7 96	Yes
Barium	0 0%	14 / 14	0 874	0 945 Accept	0 924 Accept	21 6	91 1	47 2	21 5	144	No
Beryllium	14 3%	12 / 14	0 874	0 787 Reject	0 954 Accept	< 0 04	0 557	0 278	0 170	0 721	No
Calcium	0 0%	14 / 14	0 874	0 954 Accept	0 960 Accept	75100	2800	165000	49900	361000	No
Cadmium	0 0%	14 / 14	0 874	0 914 Accept	0 855 Reject	0 152	0 93	0 408	0 266	1 79	No
Chromium	0 0%	14 / 14	0 874	0 917 Accept	0 925 Accept	3 04	9 59	6 69	2.16	16 1	No
Cobalt	7.1%	13 / 14	0 874	0 473 Reject	0 908 Accept	< 0 02	3.44	2 31	0 961	4 82	No
Copper	0 0%	14 / 14	0 874	0 973 Accept	0 955 Accept	3 28	11 7	6 85	2 51	17.1	No
Iron	0.0%	14 / 14	0.874	0 865 Reject	0 902 Accept	3376	8108	6460	1460	10270	No
Lead	0 0%	14 / 14	0.874	0 918 Accept	0 937 Accept	2.21	28 3	13 0	8.51	88.1	No
Magnesium	0.0%	14 / 14	0 874	0 977 Accept	0 984 Accept	1450	2394	1920	234	2640	No
Manganese	0 0%	14 / 14	0 874	0 872 Reject	0 751 Reject	140	362	191	56.0	350	Yes
Mercury	92.9%	1 / 14	0.874	----- -----	----- -----	< 0 02	0.036	nc	nc	0.036	-----
Molybdenum	42 9%	8 / 14	0 874	0.768 Reject	0 875 Accept	< 0 11	2 68	1.07	0 971	3.57	No
Nickel	7.1%	13 / 14	0 874	0 634 Reject	0 968 Accept	< 0 06	12	6 51	3.67	16.1	No
Potassium	0.0%	14 / 14	0 874	0 944 Accept	0 720 Reject	133	3300	923	759	5000	No
Selenium	92 9%	1 / 14	0 874	----- -----	----- -----	< 0 134	< 0 63 / 0 214 *	0.187	0 121	< 0 63 / 0 214 *	-----
Silver	0 0%	14 / 14	0 874	0 740 Reject	0 691 Reject	0 031	1.57	0.659	0 729	1.57	No
Sodium	85 7%	2 / 14	0.874	----- -----	----- -----	< 2.44	6 07	nc	nc	6.07	-----
Thallium	92.9%	1 / 14	0 874	----- -----	----- -----	< 0 21	1 44	nc	nc	1.44	-----
Vanadium	0 0%	14 / 14	0.874	0 964 Accept	0 960 Accept	9 55	24.1	16 5	4.35	32.4	No
Zinc	0 0%	14 / 14	0 874	0.951 Accept	0 847 Reject	11 3	54 3	26.3	13 4	81.3	No

Notes:

Units for Min., Max., Mean, and $UTL_{95,95}$ are in milligrams per kilogram (mg/kg).

----- = not applicable
* = Maximum detection limit greater than detected value (see text).
nc = not calculated
ND = not detected
$UTL_{95,95}$ = Upper Tolerance Level (95% confidence and 95% coverage)
Outlier? = Result of test to determine if the maximum value is a potential outlier.

W (crit) = Shapiro-Wilk critical value
W (log) = calculated W using log-transformed data and result when compared to W (crit)
W (raw) = calculated W using raw data and result when compared to W (crit)

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TAB

Appendix D

APPENDIX D

FIELD FORMS

HYDRO GeoLogic INC

BORING LOG

Borehole ID _________
Sheet _____ of ____

AFIID				LOCID		
Project Name		Project Number		LTCCODE	Site ID	LPRCODE (IRPIMS)
Drilling Company DRL Code		Driller		Ground Elevation	Total Drilled Depth	EXCODE
Drilling Equipment	Drill/Excav Method	Borehole Diameter		Date/Time Drilling Started	Date/Time Total Depth Reached	
Type of Sampling Device				Water Level (bgs) *First/Final*	Site Name	
Sample Hammer Type	Driving Wt	Drop		Hydrogeologist	Checked by/Date	SITEXREF

Depth	Interval	Recovery	Blow Counts	Description (Include lithology, grain size, sorting, angularity, *Munsell color name & notation*, minerology, bedding, plasticity, density, consistency, etc , as applicable)	USCS Symbol	Lithology	Water Content	Remarks (Include all sample types & depth, odor, organic vapor measurements, etc)

HYDRO GeoLogic INC.

BORING LOG (cont'd)

Borehole ID ________
Sheet _____ of ____

Project Name	Project Number	Location

Depth	Interval	Recovery	Blow Counts	Description (Include lithology, grain size, sorting, angularity, Munsell color name & notation, minerology, bedding, plasticity, density, consistency, etc., as applicable)	USCS Symbol	Lithology	Water Content	Remarks (Include all sample types & depth, odor, organic vapor measurements, etc.)

HYDRO GeoLogic INC.

FIELD SAMPLING REPORT

LOCATION: ______________________ PROJECT : ______________________

SITE: ______________________

SAMPLE INFORMATION

MATRIX ______________________ SAMPLE ID: ______________________

SAMPLING METHOD ______________ DUP./REP. OF : ______________________

BEGINNING DEPTH ______________ MATRIX SPIKE/MATRIX SPIKE DUPLICATE
YES ( ) NO ( )

END DEPTH ______________________

GRAB ( ) COMPOSITE ( ) DATE: ____________ TIME: ____________

CONTAINER SIZE/TYPE	#	PRESERVATIVE/ PREPARATION	EXTRACTION METHOD	ANALYTICAL METHOD	ANALYSIS

NOTABLE OBSERVATIONS

PID READINGS	SAMPLE CHARACTERISTICS	MISCELLANEOUS
1st	COLOR	
2nd	ODOR:	
	OTHER:	

pH ______ Temperature ______ Dissolved oxygen ______ Specific Conductivity______

GENERAL INFORMATION

WEATHER: SUN/CLEAR ____ OVERCAST/RAIN ____ WIND DRIECTION ______ AMBIENT TEMP ______

SHIPMENT VIA: FED-X ____ HAND DELIVER ____ COURIER ______ OTHER ______

SHIPPED TO: ____

COMMENTS: ____

SAMPLER: ______________________ OBSERVER ______________________

MATRIX TYPE CODES

DC=DRILL CUTTINGS
WG=GROUND WATER
LH=HAZARDOUS LIQUID WASTE
SH=HAZARDOUS SOLID WASTE
SE=SEDIMENT
SL=SLUDGE
SO=SOIL
GS=SOIL GAS
WS=SURFACE WATER
SW=SWAP\WIPE

SAMPLING METHOD CODES

B=BAILER
BR=BRASS RING
CS=COMPOSITE SAMPLE
C=CONTINUOUS FLIGHT AUGER
DT=DRIVEN TUBE
W=SWAB\WIPE
G=GRAB
HA=HAND AUGER
H=HOLLOW STEM AUGER
HP=HYDRO PUNCH
SS=SPLIT SPOON
SP=SUBMERSIBLE PUMP

AFCEE FORM SR 11

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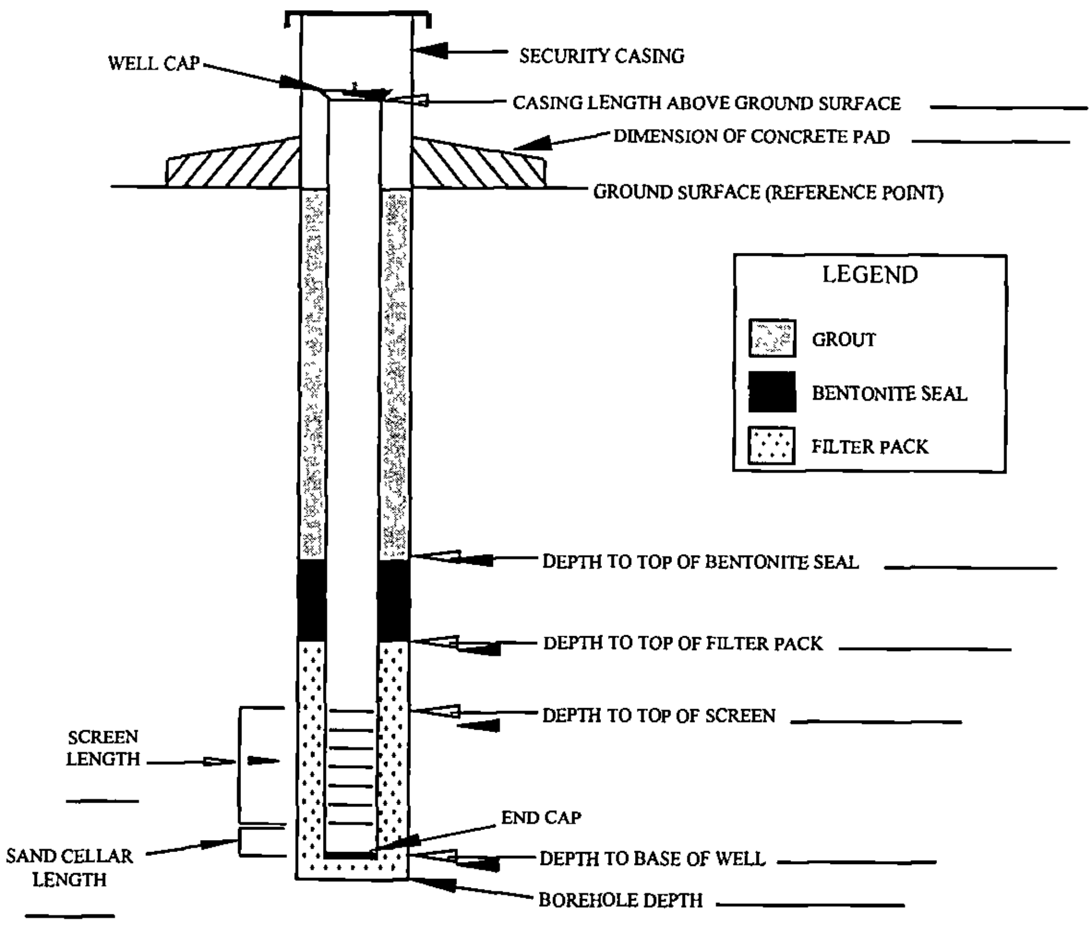
WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE: ____________________
DRILLING CONTRACTOR: ____________________
DRILLING TECHNIQUE: ____________________
AUGER SIZE AND TYPE ____________________
BOREHOLE IDENTIFICATION: ____________________
BOREHOLE DIAMETER: ____________________
WELL IDENTIFICATION: ____________________
WELL CONSTRUCTION START DATE: ____________
WELL CONSTRUCTION COMPLETE DATE: ____________
SCREEN MATERIAL: ____________________
SCREEN DIAMETER: ____________________
STRATUM-SCREENED INTERVAL (FT): ____________
CASING MATERIAL: ____________________
CASING DIAMETER: ____________________

TYPE OF FILTER PACK: ____________________
GRADIATION: ____________________
AMOUNT OF FILTER PACK USED ____________
TYPE OF BENTONITE ____________________
AMOUNT BENTONITE USED: ____________________
TYPE OF CEMENT: ____________________
AMOUNT CEMENT USED: ____________________
GROUT MATERIALS USED: ____________________
DIMENSIONS OF SECURITY CASING: ____________
TYPE OF WELL CAP: ____________________
TYPE OF END CAP: ____________________
COMMENTS

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY: ____________________ INSTALLATION OBSERVED BY: ____________________

DISCREPANCIES: ____

WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE ______________________

DRILLING CONTRACTOR ______________________

DRILLING TECHNIQUE: ______________________

AUGER SIZE AND TYPE: ______________________

BOREHOLE IDENTIFICATION: ______________________

BOREHOLE DIAMETER. ______________________

WELL IDENTIFICATION: ______________________

WELL CONSTRUCTION START DATE: __________

WELL CONSTRUCTION COMPLETE DATE: __________

SCREEN MATERIAL: ______________________

SCREEN DIAMETER: ______________________

STRATUM-SCREENED INTERVAL (FT) __________

CASING MATERIAL: ______________________

CASING DIAMETER. ______________________

TYPE OF FILTER PACK: ______________________

GRADIATION· ______________________

AMOUNT OF FILTER PACK USED: ______________________

TYPE OF BENTONITE ______________________

AMOUNT BENTONITE USED: ______________________

TYPE OF CEMENT: ______________________

AMOUNT CEMENT USED: ______________________

GROUT MATERIALS USED: ______________________

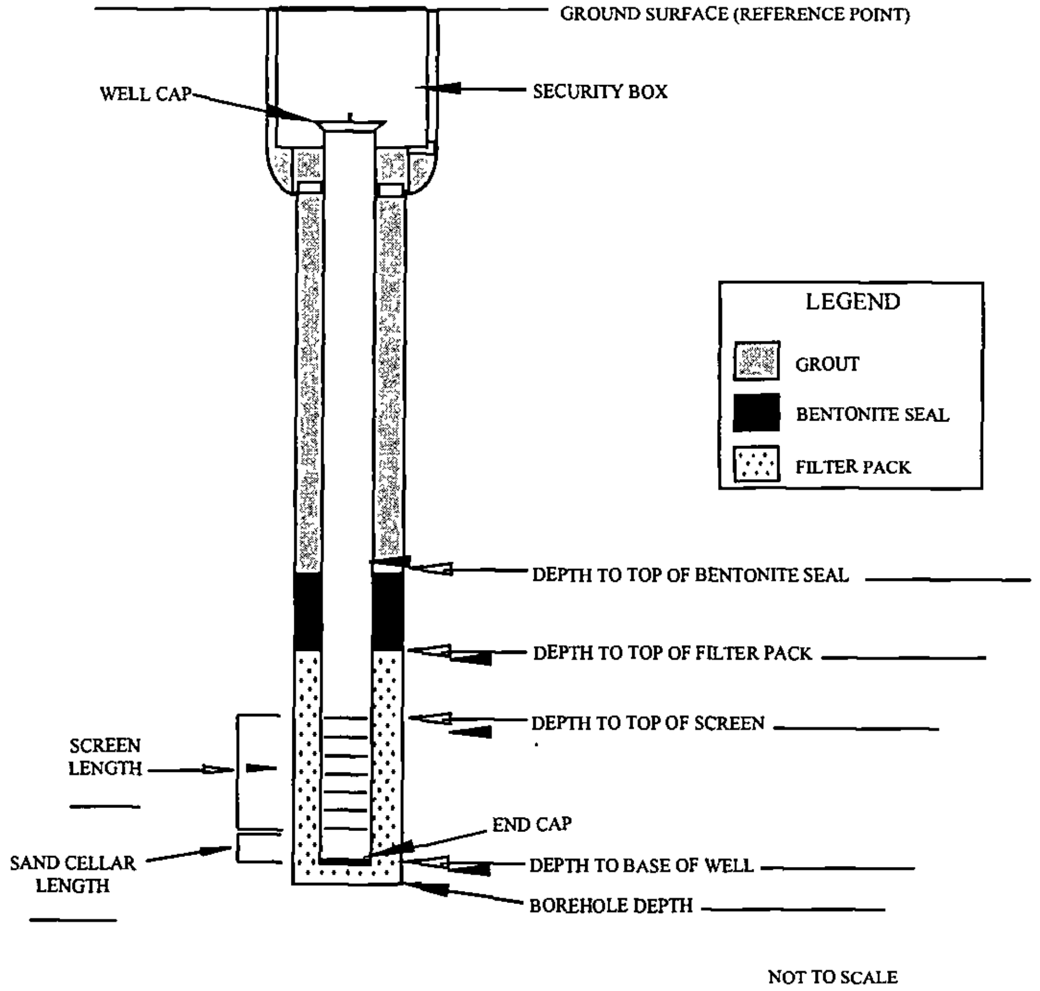
DIMENSIONS OF SECURITY BOX: ______________________

TYPE OF WELL CAP. ______________________

TYPE OF END CAP. ______________________

COMMENTS

SPECIAL CONDITIONS
(describe and draw)



INSTALLED BY ______________________ INSTALLATION OBSERVED BY· ______________________

DISCREPANCIES ______________________

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HYDRO GeoLogic INC.

WELL DEVELOPMENT RECORD

WELL/PIEZOMETER ID ______
SHEET ______ of ______

AFIID ____________________ LOCID ____________________ SITEID

PROJECT NAME ______________ PROJECT NO . ____________________ DATE

LOCATION ______________ DATE INSTALLED. ____________________

TOTAL DEPTH (FTOC) __________ CASING DIAMETER ______________ LOGCODE HGL-H

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe ____________________

Equipment decomtaminated prior to development ☐ Yes ☐ NO

Describe ____

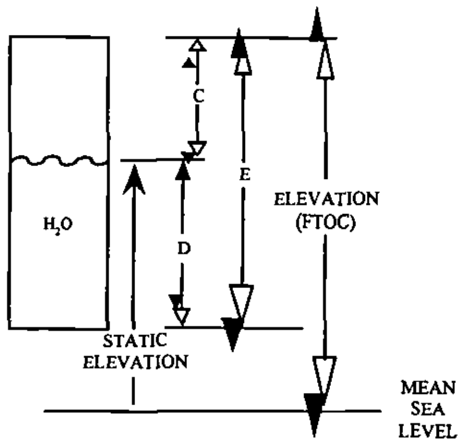
EQUIPMENT NUMBERS.

pH Meter __________ EC Meter __________ Turbidity Meter __________ Thermometer __________

CASING VOLUME INFORMATION·

Casing ID (inch)	1 0	1 5	2 0	2 2	3 0	4 0	4 3	5 0	6 0	7 0	8 0
Unit Casing Volume (A) (gal/ft)	0 04	0 09	0 16	0 2	0 37	0 65	0 75	1 0	1 5	2 0	2 6

PURGING INFORMATION



Measured Well Depth (B) ____________________ ft

Static Water Level Depth (C) ______________ ft

Length of Static Water Column (D) ______ - ______ = ________ ft
(B) (C)

Casing Water Volume (E) + ______ x ______ = ________ gal
(A) (D)

Total Purge Volume = ________ (gal)

Pumping/Purge Rate (PRODRATE) = __________ (gal/min)

Pumping Depth (PUMPDEP) = ____________ (ft)

Water Level Recovery Depth (DEPWAT) = __________ (ft)

Recovery Time (LECTIME) = ____________ (min)

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity (NTU)	Comments

HYDRO GeoLogic Inc.

MONITOR WELL STATIC WATER LEVEL FORM

PROJECT NAME: ______________________________ DATE: ______________

PROJECT NO.: ______________________________

WATER LEVEL INDICATOR ID NO.: ______________ FIELD BOOK NO.: __________

LOCATION: ______________________________ PAGE NO.: ______________

Monitor Well Name	LOCID	Time	Depth to Static Water Level (from T O.C.)	Total Well Depth (ft)	Explosimeter Reading (above background)	PID Reading (above background)

Note: Total well depth to be measured at time of gauging.

Comments: ______________________________

____

____

Sampler ______________________ Observer ______________________

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MONITOR WELL PURGING FORM

PROJECT: ______________________ DATE: ______________

LOCATION: ______________________ EXPLOSIMETER BOREHOLE READING ________

WELL ID: ______________________ PURGE VOLUME (3 WELLBORE VOLUMES): ______________ (L)

WELL DEPTH: ______________________

Time	Depth to Water (ft)	Flow Meter Reading	Volume Purged (L)	Temp. (°C)	pH	Electrical Conductivity (mmho)	Turbidity N.T.U	Comments

Note: Condition of the well: ______________________

pH - Calibrate at start and before last reading.

Sampler ______________________ Observer ______________________

HYDRO GeoLogic INC.

GROUNDWATER FIELD SAMPLING DATA SHEET

Well Name.:	Project Name:	LOCID:
Sampler(s):	Project No.:	
Well Depth:	Date:	Time:
DTW (ft TOC):	Screen Interval:	
Well Diameter (in):	Placement of Pump (ft TOC):	
Type of Pump:		

Field Parameters

Time	Depth to Water (ft)	Flow Rate (gpm)	Total Volume (gal)	pH	Temp (C)	Cond (umhos/cm)	ORP	D.O. (mg/L)	Turb (N.T.U.)	Description

Observations

Notes:
Signed/Sampler(s):

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CHAIN OF CUSTODY RECORD

HYDRO GeoLogic INC.
1155 Herndon Parkway
Suite 900
Herndon, VA 20170

Client:__________

Project Name/No.:__________

Project Manager:__________

Sampler:__________

Phone: (703) 478-5186 Fax: (703) 471-4180

APPLICABLE REGULATION

- ☐ RCRA
- ☐ ECRA
- ☐ CERCLA
- ☐ NPDES
- ☐ CWA
- ☐ SDWA
- ☐ OTHER

SAMPLE IDENTIFICATION	DATE COLL.	TIME COLL.	GRAB	COMPOSITE	MATRIX: SOIL	MATRIX: WATER	MATRIX: OTHER	TOTAL NO. OF CONTAINERS	ANALYSIS REQUIRED								REMARKS OR SAMPLE LOCATION

Special Instructions

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Turn Around Time Required ☐ Normal ☐ Rush

QC Level ☐ I ☐ II. ☐ III

Project Specific (specify)

1. Relinquished by	Date	Time	1. Received by	Date	Time
2. Relinquished by	Date	Time	2. Received by	Date	Time
3. Relinquished by	Date	Time	3. Received by	Date	Time

Comments

HYDRO GeoLogic INC.

WASTE INVENTORY TRACKING FORM

LOCATION : ______________________________

PROJECT NAME: ______________________________

ACTIVITIES: ______________________________

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments

Note. Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: ______________________________

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HYDRO GeoLogic INC

Daily Equipment Calibration Log

Project Name: ____________________

Project No.: ____________________

Date/Time	Calibrated by	Instrument Make/ Model/Serial	Standard/ Manufacturer/Lots	Calibration Solution or Gas Concentration	Instrument Readings	Comments

LOG OF DAILY TIME AND MATERIALS

Project Name: ____________________
Project Number: ____________________
Subcontractor: ____________________
Date: ____________________

Boring or Well No.: ____________________

ITEM	NO. UNITS
Drilling /ft	
_____-inch augerhole	/ft
_____-inch mud rotary hole	/ft
_____-inch air rotary	/ft
Split spoon samples	
Shelby tube samples	
_____-rock coring	/ft
Driven casing _____-inch	/ft
Well Materials	
_____-inch stainless steel riser pipe	/ft
_____-inch stainless steel screen	/ft
_____-inch PVC riser pipe	/ft
_____-inch PVC screen	/ft
Couplings	
Bottom caps	
Top caps	
Protective casings w/ locking caps	
Well installation	/ft
Revert (bags)	
Bentonite powder (bags)	
Bentonite pellets (buckets)	
Sand (bags)	
Cement (bags)	
Other Charges	
Standby	/hr
Decontamination	/hr
Well development	/hr
Spoil disposal (barrels)	

Other: ____

____

HydroGeoLogic Site Representative: ____________________

Subcontractor Site Representative: ____________________

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HEALTH AND SAFETY PLAN

COMPLIANCE AGREEMENT FORM

PROJECT: Limited RFI SWMUs 45, 54, and 55

CLIENT: U.S. Air Force Center for Environmental Excellence

LOCATION: NAS Fort Worth JRB, Texas

PROJECT NO: AFC001-0033

I, ____________________________, have received a copy of the Health and Safety Plan for the above-referenced project. I have read the plan, understand it, and agree to comply with all its provisions. I understand that I can be prohibited from working on the project for violating any of the safety requirements specified in the plan.

Signed:

____________________________ ____________________________

Signature Date

____

Company

HEALTH AND SAFETY PLAN AMENDMENTS FORM

Change in field activities or hazards: ______________________________

____

____

____

____

____

____

Proposed Amendments: ______________________________________

____

____

____

____

____

____

Proposed by: ______________________________ Date: ______________

Approved by: ____

Accented: ______________ Declined: ______________ Date: ______________

Amendment Number: ______________

Amendment Effective Date: ______________

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MEDICAL DATA SHEET

This brief Medical Data Sheet will be completed by all onsite personnel and will be kept in the command post during the conduct of site operations. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project________________________________

Name____________________ Home Telephone __________

Address ________________________________

Age __________ Height __________ Weight __________

Name of Next of Kin__________________________

Drug or other Allergies________________________

Particular Sensitivities________________________

Do You Wear Contacts?________________________

Provide a Checklist of Previous Illnesses or Exposure to Hazardous Chemicals.

What medications are you presently using?________________

Do you have any medical restrictions?________________

Name, Address, and Phone Number of personal physician: ________________

I am the individual described above. I have read and understand this HSP:

Signature

Date

SITE SAFETY BRIEFING FORM

Project ____
Date ________________ Time ____________ Job No. ______________
Location ____
Type of Work ____
____
____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment ____________________________
____
Chemical Hazards ______________________________________
____
Physical Hazards _______________________________________
____
Emergency Procedures ___________________________________
____
Hospital/Clinic ___________________________ Phone ___________
Hospital Address _______________________________________
Special Equipment ______________________________________
____
Other ____
____
____
____

ATTENDEES

Name (Printed)	Signature

Meeting Conducted by: ______________________

Site Safety Officer: ________________________

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Project________________

HEALTH AND SAFETY/AIR MONITORING LOG

Date: ______________________________ Logged by:______________________________

Weather: ____

Field Tasks: ____

HydroGeoLogic Personnel (or subs) working on the site (name and affiliation):

HydroGeoLogic Personnel (or subs) working in restricted zone:

HydroGeoLogic Site Visitors:

Air Quality Monitoring Measurements:

Time	Instrument	Parameter	Concentration	Locations

Background:

Exclusion zone:

Level of PPE: ____

Comments on other safety-related matters:

(including infractions, accidents, injuries, unusual occurrences, physical complaints)

HYDROGEOLOGIC, INC.
Accident/Incident/Near Miss Investigation Form

Employee's Name:______________________________
Address:______________________________
______________________________ SS#______________
Job Title:______________ Supervisor's Name:______________
Office Location:______________________________
Location at Time of Incident:______________________________
Date/Time of Incident:______________________________

____

Describe clearly how the accident occurred:______________________________
____
____
____

Was incident: Physical______________ Chemical______________
Parts of body affected ______________ Exposure: Dermal______________
right left Inhalation______________
Ingestion______________

Witnesses: 1)______________ 2)______________

Conditions/acts contributing to this incident______________________________
____
____
____

Managers must complete this section:
Explain specifically the corrective action you have taken to prevent a recurrence:______________
____
____
Did injured go to doctor:______________ Where:______________
______________ When:______________
Did injured go to hospital:______________ Where:______________
______________ When:______________

____

Signatures:

______________	______________	______________
Employee	Reporting Manager	Health & Safety Officer
______________	______________	______________
Date	Date	Date

Accidents must be reported immediately; this form must be completed and returned to the Health and Safety Officer within **24 hours.**

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE