Phase I
Remedial Investigation Report
Fire Training Area
Former Laredo AFB, Texas

Prepared for

**U.S. Army Corps of Engineers,
Tulsa District**

Contract No.
DACA56-97-D-0010, Task Order No. 16

January 1999

CH2MHILL
Tulsa, Oklahoma

Executive Summary

This document was prepared by CH2M HILL and presents the findings of the site investigation completed for the Fire Training Area at the Former Laredo Air Force Base (FLAFB), now located on airport property owned by the City of Laredo, Texas. The FLAFB was used as a military base from 1942-1975. In 1975, the former base lands were either deeded or sold to other federal, state, and county agencies, or private firms. The remainder of the base was deeded to the City of Laredo.

A field investigation was conducted that included the collection of soil and groundwater samples using the USACE's Site Characterization and Analysis Penetrometer System (SCAPS). The SCAPS unit consists of a hydraulically driven cone penetrometer that can be used to obtain soil samples. Temporary piezometers were installed in penetrometer holes to collect water samples and measure groundwater elevation.

Thirty penetrometer holes were used to collect soil and groundwater samples. Twenty soil samples were collected and analyzed for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Nineteen soil samples were collected and analyzed for total RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). Sixty-six soil samples were collected and analyzed for total lead. Sixty-one soil samples were collected and analyzed for benzene/ethylbenzene/toluene/xylene (BETX) and total petroleum hydrocarbons (TPH). Twenty-six groundwater samples were collected and analyzed for VOCs. One groundwater sample was collected and analyzed for SVOCs. Two groundwater samples were collected and analyzed for TPH and total RCRA metals. All analyses could not be ran on each sample because of the limited soil and groundwater sample volumes obtained using the SCAPS system.

The soil and water analytical results were compared to the Texas Natural Resource Conservation Commission's (TNRCC) Risk Reduction Standard #2 (RRS#2) for groundwater and soil (groundwater protection and soil/air ingestion standards for industrial use) to determine if any contaminants exceeded those standards. Some

Contents

Acronyms

amsl	above mean sea level
AFB	Air Force Base
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	Constituent of Potential Concern
DCE	dichloroethylene
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DQO	Data Quality Objective
DRO	diesel range organics (total petroleum hydrocarbons)
EPA	Environmental Protection Agency
FTA	Fire Training Area
FLAFB	Former Laredo Air Force Base
FUDS	Formerly Used Defense Site
GC	gas chromatograph
GRO	gasoline range organics (total petroleum hydrocarbons)
GW	TNRCC risk reduction standards for contaminants in groundwater
GWP-Ind	TNRCC risk reduction standards for contaminants in soils at industrial sites, protective of groundwater
LIA	Laredo International Airport
LIF	Laser Induced Fluorescence
MCL	maximum contaminant level
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
PCE	tetrachloroethylene
POTW	Publicly Owned Treatment Works
ppb	parts per billion
ppm	parts per million
PSA	Preliminary Site Assessment
PST	Petroleum Storage Tank
QA	Quality Assurance
RBCA	Risk Based Corrective Action
RCRA	Resource Conservation and Recovery Act of 1976
RI	Remedial Investigation
RRS	Risk Reduction Standard
SAI-Ind	TNRCC risk reduction standards for contaminants in soils at industrial sites, protective of soil/air ingestion

Section 1
Introduction

1. Introduction

1.1 Authorizations

This Remedial Investigation (RI) Report has been prepared for the United States Army Corps of Engineers (USACE), Tulsa District, by CH2M HILL, under contract No. DACA56-97-D-0010, Task Order 16. This report was prepared as part of the Defense Environmental Restoration Program (DERP) for Formerly Used Defense Sites (FUDS). This RI report was prepared in accordance with *Scope of Work, Remedial Investigation Report at the Former Laredo Air Force Base Fire Training Area (FTA)*, dated August 21, 1998. A copy of the Scope of Work is presented in Appendix A.

1.2 Purpose of Report

This report will detail the results of the RI field investigation undertaken by the USACE, Tulsa District, at the Fire Training Area (FTA) at the Former Laredo Air Force Base (FLAFB) in Laredo, Texas. It includes a site history and background, a discussion of the field activities, a physical description of the site, a discussion of possible Risk Assessment tasks, and the identification of potential data gaps. Recommendations are made concerning collection of additional data.

1.3 Report Organization

The following summary provides the general outline for this RI Report:

Section 1.0 provides an introduction to the RI Report, including the purpose of the report and the overall organization of the report.

Section 2.0 presents background information for the FTA at the FLAFB, including site description, site history, and a summary of previous investigations.

Section 3.0 presents a summary of the physical site characteristics in the vicinity of the FTA.

Section 4.0 presents a summary of the activities performed to collect the data presented and analyzed in this report.

Section 2
Site Background

2. Site Background

2.1 Site Location and Description

The FLAFB FTA is located on property that is presently part of the Laredo International Airport (LIA). The LIA is located in the northeast section of the City of Laredo, Webb County, Texas. The City of Laredo is located along the Texas/Mexico border and approximately 150 miles south-southwest of the City of San Antonio. A general location map is presented as Figure 2-1. A site location map is presented as Figure 2-2.

The FTA consists of an open area west of Daugherty Road and north of Hillside Road, within which are located two former burn pits (shown on Figure 2-3). At the time of the Preliminary Site Assessment performed in 1995, the western burn pit (Pit #2) was filled/covered with soil, and the eastern burn pit (Pit #1) was exposed.

2.2 Site History

The U. S. Government acquired 2,085.43 acres for the construction of Laredo Army Air Corps Base on May 7, 1942. This facility is now known as the FLAFB. The main mission of the base was gunnery and gunnery maintenance training. The government constructed runways and numerous facilities from 1942 to 1974. The Base was deactivated in 1947 and reactivated during the Korean conflict in 1952. It was again deactivated in March 1974. Approximately 309 acres were either deeded or sold to other federal, state, and county agencies, or private firms. The remainder of the Base was deeded to the City of Laredo.

Historical aerial photographs and records of FLAFB show that an area northwest of the existing LIA was used as a FTA during DoD and City of Laredo possession (HydroGeoLogic, 1998). The FTA appears initially in a 1956 aerial photograph. Two burn pits are presently onsite at the FTA. According to the HydroGeoLogic (1998) report, the military utilized both burn pits. The military reportedly utilized used oil and gasoline to create training fires in the pits. Air photos from 1975-1995 suggest that the City of Laredo used both burn pits between 1975 and 1992. They reportedly used them for burning diesel fuel and gasoline.Environmental investigation of the FTA began in 1995 (discussed below).

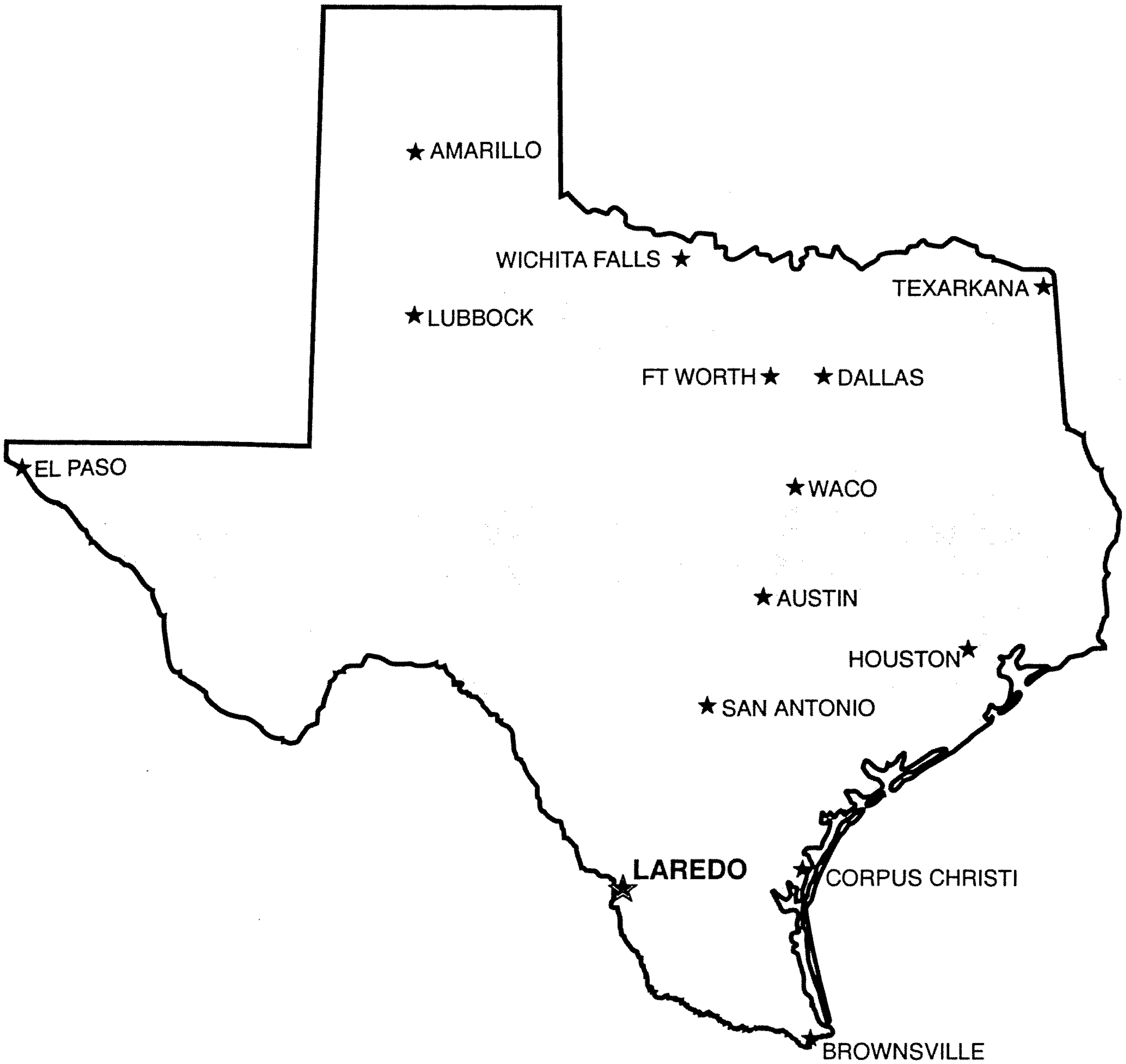


Figure 2-1
General Location Map
Former Laredo Air Force Base , Texas

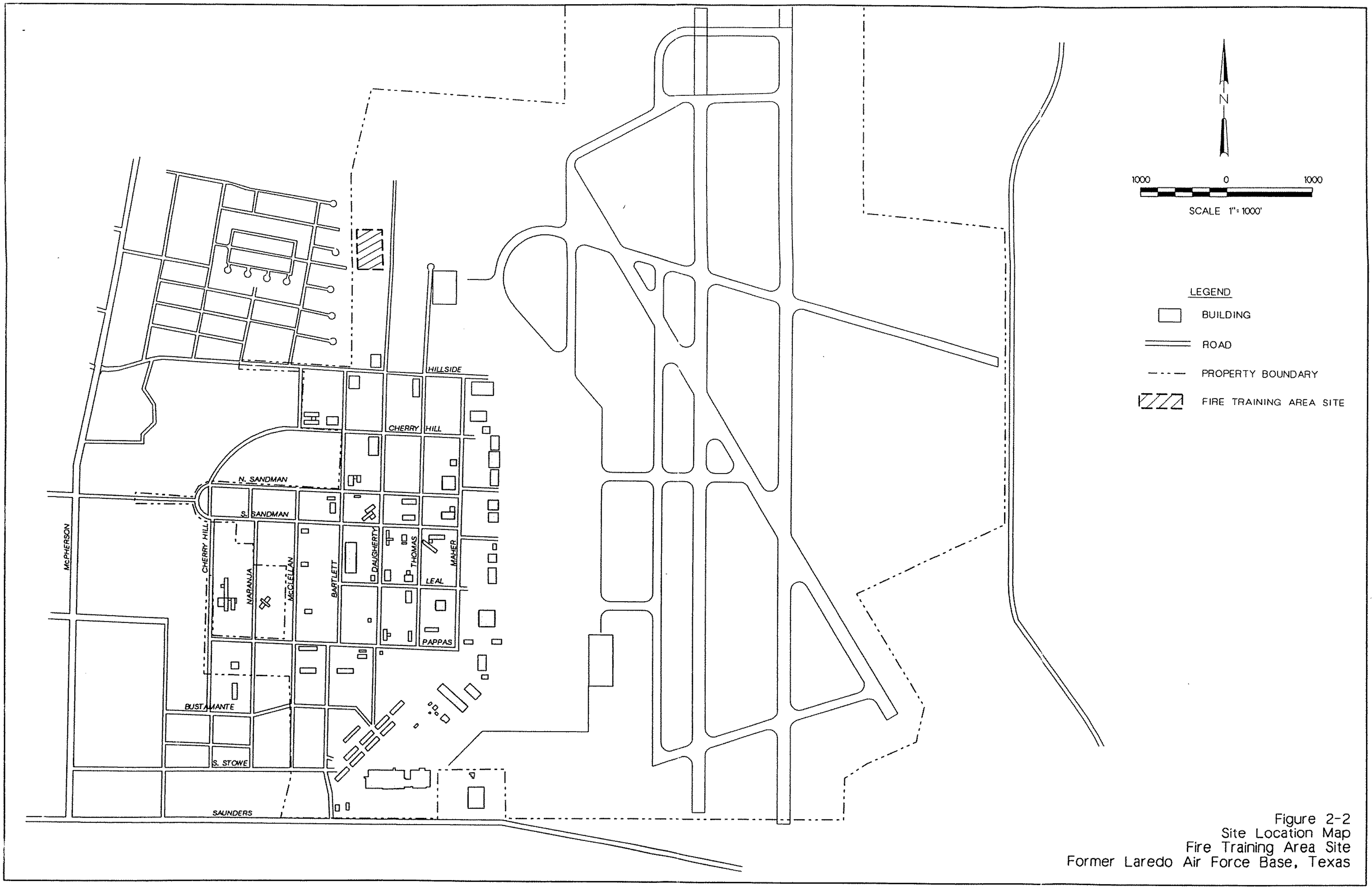


Figure 2-2
Site Location Map
Fire Training Area Site
Former Laredo Air Force Base, Texas

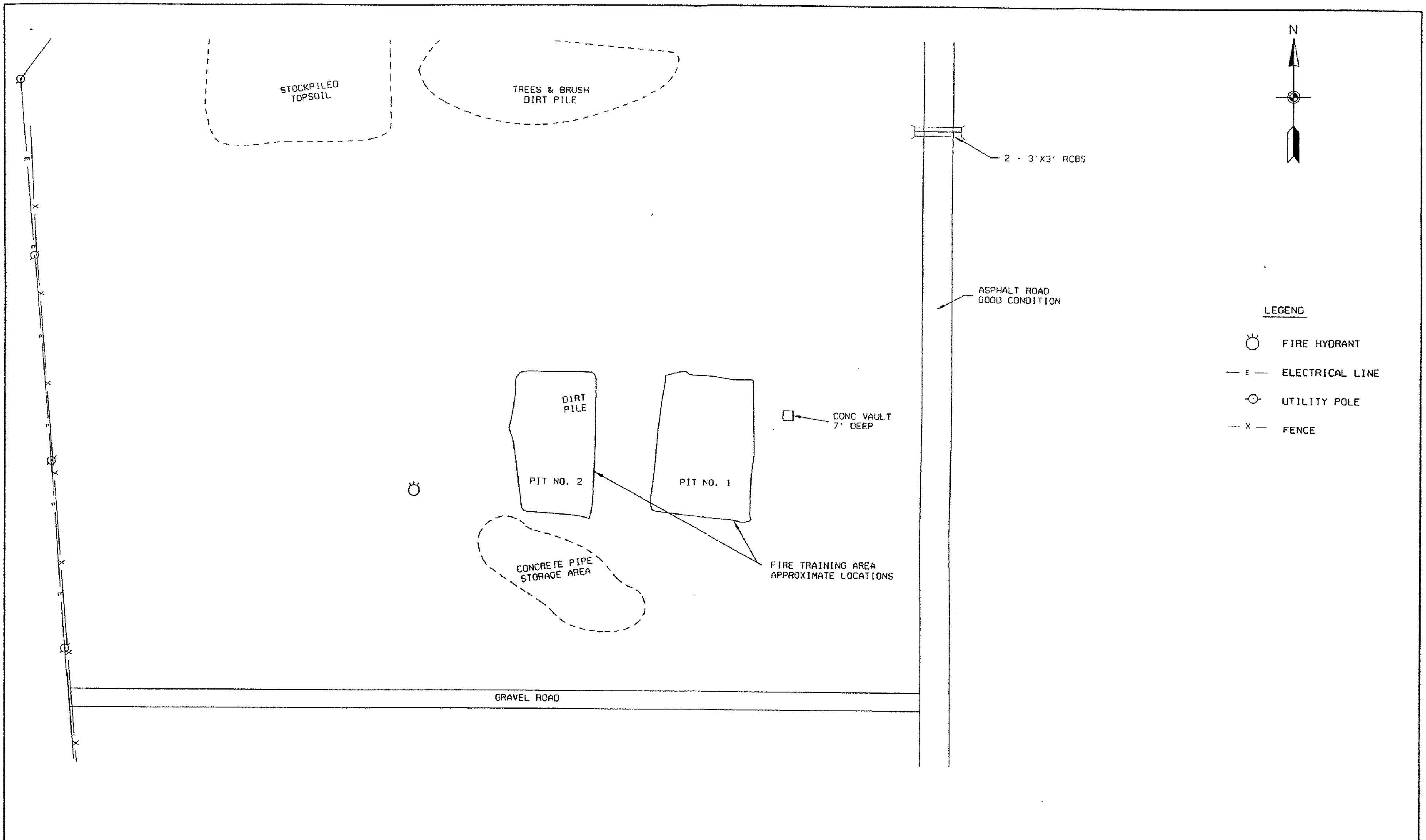


Figure 2-3
Site Map
Fire Training Site
Former Laredo Air Force Base, Texas

2.3 Previous Investigations

2.3.1 City of Laredo Preliminary Site Assessment

On January 12, 1995, the Texas Natural Resource Conservation Commission (TNRCC) performed an inspection of the FTA. The City of Laredo utilized the FTA after the closure of the FLAFB. Evidence of petroleum hydrocarbon contamination and the possible presence of heavy metals prompted the TNRCC to issue the city of Laredo a Notice of Violation (NOV).

Apparently in response to the NOV, approximately 2,772 gallons of water and free product were removed from one of the fire training pits (identified as Pit #1, the eastern of the two burn pits present at the FTA) on January 17, 1995. A Preliminary Site Assessment (PSA) of the FTA was then initiated on behalf of the City of Laredo by TAC, an environmental consulting firm.

The field investigation associated with the PSA was performed during March 1995, and the PSA report was developed in April 1995. A copy of the PSA report is presented in Appendix B.

At the time of the PSA field investigation, the western burn pit (identified by TAC as Pit #2) was observed to be covered with soil. The eastern burn pit (Pit #1) was uncovered. Pit #1 contained one 10,000-gallon tank (exhibiting several holes). As well, it was reported that a possible drain pipe was located on the north end of Pit #1.

During the PSA field investigation, the tank was removed from Pit #1. A test hole was excavated within Pit #2, to a depth of approximately 5 feet below ground surface. Five soil borings were drilled within and around the two fire training pits, including one boring in each pit, one boring at the north end of Pit#1 adjacent to the suspected drain pipe, and two borings located approximately 100 feet west of the two burn pits (Figure 2-4). The borings extended to a depth of approximately 5 feet below ground surface. Three soil samples were collected from each boring, at the ground surface, at a depth of one foot, and at a depth of 5 feet. The soil samples were analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Test Method 8020 and for total petroleum hydrocarbons (TPH) by USEPA Test Method 418.1. Table 2-1 presents a summary of the data from the investigation.

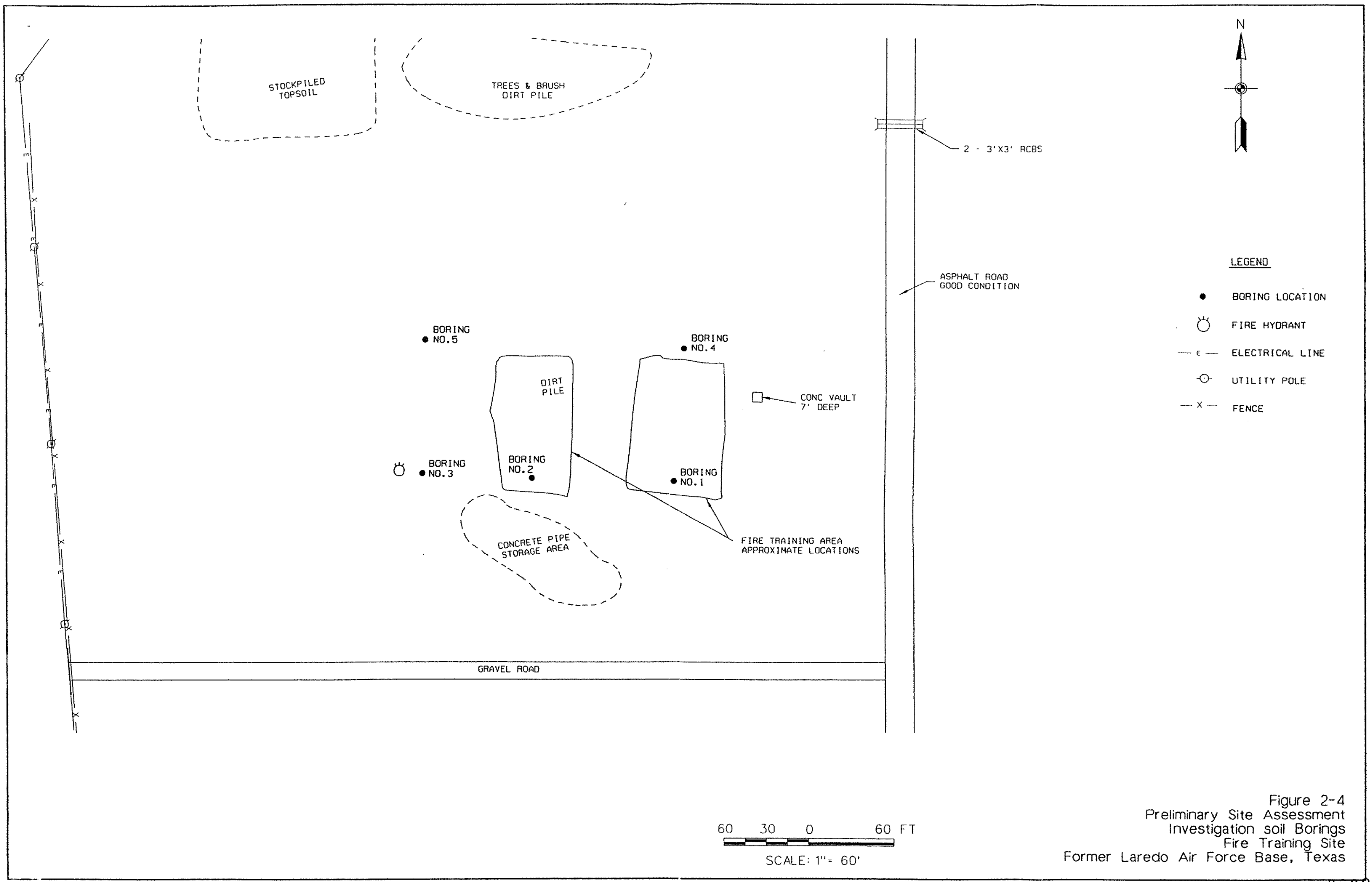


Figure 2-4
Preliminary Site Assessment
Investigation soil Borings
Fire Training Site
Former Laredo Air Force Base, Texas

TABLE 2-1

Preliminary Soil Assessment

Sample Location	Benzene µg/kg	Toluene µg/kg	EthylBenzene µg/kg	Xylenes µg/kg	BTEX µg/kg	TPH µg/kg
Boring #1 – Surface	<2	8.01	<2	<6	8.01 (<18.01)	1800
Boring #1 – 1' Deep	5.51	5.71	<2	<6	11.22 (<19.22)	7300
Boring #1 - 5' Deep	<40	<40	112	173	285 (<365)	7340
Boring #2 - Surface	<4	<4	57.4	80.9	138.3 (<146.3)	456
Boring #2 - 1' Deep	<2	<2	<2	<6	(<12)	2564
Boring #2 - 5' Deep	<2	<2	<2	<6	(<12)	3682
Boring #3 – Surface	<2	<2	<2	<6	(<12)	(<10)
Boring #3 - 1' Deep	<2	<2	<2	<6	(<12)	(<10)
Boring #3 - 5' Deep	<2	<2	<2	<6	(<12)	(<10)
Boring #4 – Surface	<2	<2	<2	<6	(<12)	29900
Boring #4 - 1' Deep	<2	<2	<2	<6	(<12)	373
Boring #4 - 5' Deep	<2	<2	<2	<6	(<12)	6120
Boring #5 – Surface	<2	<2	<2	<6	(<12)	(<10)
Boring #5 - 1' Deep	<2	<2	<2	<6	(<12)	(<10)
Boring #5 - 5' Deep	<2	<2	<2	<6	(<12)	(<10)

Approximately 2 feet below ground surface, within the test pit excavated in Pit #2, a layer of black material approximately 1.5 feet to 2.0 feet thick was identified. TAC did not report collecting or analyzing any samples of the black material.

For the soil samples collected from the soil borings, BTEX parameters were detected only in the soil samples collected from borings #1 and #2, located within the two fire training pits. TPH was reported for soil samples collected from borings #1 and #2, and also for soil samples collected from boring #4, located north of Pit #1, adjacent to the suspected drain pipe. No detectable concentrations of BTEX or TPH were reported for borings #3 and #5, located west of the two fire training pits.

The PSA report concluded that hydrocarbon contamination did exist at the site to a depth of at least five feet below ground surface. The report further concluded that the contamination was generally located within the two fire training pits and north of Pit #1, but the extent of the contamination was not yet delineated. The report recommended excavation and remediation/disposal of the soils within the fire training pits, the installation of three soil borings to assess vertical extent of contamination, and the installation of three groundwater monitor wells to assess groundwater contamination.

2.3.2 USACE, Tulsa District, Phase I Remedial Investigation

The USACE, Tulsa District conducted a Phase I Remedial Investigation (RI) for the FTA in September 1996, and a draft report was developed. The present report is based upon the draft USACE report and the findings of the USACE RI.

Section 3
Site Characteristics

3. Site Characteristics

3.1 Physiography

The area of investigation is located within Webb County, Texas. Webb County is situated within the Arid Plains physiographic province. The countryside around Laredo is characterized by small hills, covered with low-growing brushy vegetation and numerous arroyos and dry creek beds gently sloping toward the Rio Grande River. The Rio Grande River lies approximately 2.5 miles west of the site. The surface elevation of Webb County ranges from 372 feet above mean seal level (amsl) at the Rio Grande River up to 945 feet amsl. The elevation in the vicinity of the FLAFB is approximately 460 to 490 feet amsl. An unnamed intermittent stream lies north-northwest of the site. The only other major surface water resource in the area is Casa Blanca Lake, located approximately one mile east of LIA.

3.2 Soils

The soils within the area are characterized as Catarina-Montell-Jimenez soil association as cracking, crumbly clay soils overlying a stiff caliche soil. Generally, the soils consist primarily of a Copita fine sandy loam that is intermixed with areas of a Verick fine sandy loam, a Maverick-Catarina complex, and three Nido-Rock outcrop complexes.

The Copita fine sandy loam is usually found on level to gently sloping ground. The soil is well drained with a medium surface runoff. Permeability of the Copita series fine sandy loam is considered moderate with a range of 0.6 inches per hour (in/hr) to 2.0 in/hr. The Verick series of fine sandy loam is gently sloping soil found on summits and side slopes of low hills. The soil is moderately alkaline with a moderate permeability. The Maverick-Catarina complex is a mixture of two clays that are found on the summits and side slopes of gently rolling hills. Both of these soils are moderately alkaline with a rapid surface runoff. Permeability of these soils is slow, ranging from 0.06 in/hr to 0.2 in/hr. The small Nido-Rock outcroppings that exist at the site drain well with a rapid surface runoff and moderate permeability.

3.3 Geology

The surface geology of Webb County is mostly Tertiary in age, with a narrow band of Quaternary-age alluvium along the Rio Grande flood plain. Webb County falls within the Rio Grande Embayment. The sedimentary rocks throughout Laredo are part of the Quaternary (Eocene)-age Claiborne formation, which is composed of sandstone, sand mudstone, and shale. A major fault zone trends to the southeast, near the southeastern border of the county. The Eagle Pass syncline is present northwest of Laredo, continuing on the northern border of the county.

3.4 Meteorology

Webb County receives an average of 17.87 inches of rainfall per year. The average minimum temperature in January is 47°F, and the average maximum temperature in July is 99°F.

3.5 Surface Water Hydrology

In the Laredo area, the porous soils and sloping landscape direct surface runoff toward the Rio Grande River. The Rio Grande River is impounded in the International Amistad Reservoir, and its flow is controlled by dam releases. The majority of the region's drinking water and irrigation water is obtained from the river and is treated at a plant in central Laredo. Casa Blanca Lake, adjacent to the eastern boundary of the site, has been created by damming the San Ygnacio Creek. The arid climate accounts for the poor water quality, with alkaline pH (7.9 to 8.0) and dissolved solids between 500 and 1,000 parts per million (ppm) in the reservoir and the lake. Other creeks in the region are intermittent, draining into the Rio Grande.

3.6 Hydrogeology

The regional groundwater flow direction is toward the southwest and west at an estimated velocity of 5 feet per day. Webb County lies atop the Eocene outcrop/downdip Carrizo-Wilcox aquifer. A report prepared by Coastal Ecosystems Management, Inc., states that it is unlikely that this water is of sufficient quality or accessibility to be utilized for human consumption. Potable water for the area is obtained through the City of Laredo public water supply system and is collected entirely from the Rio Grande River.

During the investigation of a sanitary landfill site in the residential neighborhood directly west of the FTA site, groundwater level measurements were collected. The data, collected in June of 1997, indicates that the groundwater generally flows in a northwesterly direction directly adjacent to the FTA site (500 feet north and west of the FTA), and in a westerly direction further to the west in the neighborhood (>1000 feet west of the FTA) (USACE, 1998).

An investigation at a site approximately one mile south of the FTA (USACE, 1998) indicates that the shallow groundwater is present at a depth of approximately 8 to 10 feet below ground surface, with flow generally toward the west-southwest, following the general trend of surface topography. The general trend of topography at the FTA is a northward slope. If the shallow groundwater at the FTA also follows the general trend of the surface topography, then the flow of shallow groundwater at the FTA could be expected to be generally toward the north. An assessment of the depth to groundwater and the shallow groundwater flow direction at the FTA was performed as part of this RI. The results of the assessment are discussed in Section 4.3.

Section 4

Field Investigation Activities

4. Field Investigation Activities

4.1 Sampling Methodology

The field activities performed during the RI field investigation consisted primarily of the collection of soil and groundwater samples. The soil and groundwater samples were collected using the USACE's Site Characterization and Analysis Penetrometer System (SCAPS). The SCAPS is capable of determining soil stratigraphy, collecting soil samples, and installing and grouting temporary wells. The SCAPS screening penetrometers are equipped with sensors that can determine physical and chemical characteristics, for instance, strength, electrical resistivity, spectral properties, and electroactivity of soil layers through which the penetrometer tip is forced.

The SCAPS is mounted on a Kenworth truck chassis weighing approximately 40,000 pounds. The truck is equipped with two hydraulic rams capable of exerting approximately 38,000 pounds of force to make a direct push. Hydraulic jacks support the weight of the truck while the penetrometer is pushed into the ground with the hydraulic rams. The system can push 1.7-inch-diameter rods to approximately 75 feet in geologically suitable material. Soil samples are collected with a Mostap or Hogentogler™ sampler and water samples are collected by Hydropunch II™ or Power Punch devices.

The portable Gas Chromatograph (GC) is capable of screening soil and groundwater media for a number of volatile aromatic and chlorinated hydrocarbon contaminants at the parts per billion (ppb) range. The GC provides semiqualitative and semiquantitative onsite field data. The GC is used to provide quick information regarding volatile organic contamination and directing the investigation activities of the SCAPS at the site. The GC is operated from inside a field trailer parked near the site.

The SCAPS sampling locations were situated within an area measuring approximately 500 feet by 700 feet. The area was staked on a 50-foot grid, with the nodes of the grid establishing the potential sampling locations. Each location on the grid was assigned an identification number. The SCAPS sampling locations were then selected from among the grid points, based upon proximity to the source area and field indications of contamination from adjacent boring locations. The sample boring identification numbers were created by prefacing the three-digit location number with the letter "P". For example, "P189" identifies the sample boring drilled at location 189. One sampling location,"P1," was selected in the field by sampling personnel and is located at the southern end of the eastern burn pit (Pit #1). Pit #1 was surrounded by a fence due to hydrocarbon saturated soil, so the field sampling crew installed a boring (P1) as close as possible to the pit, immediately to the south, in order to obtain the vertical extent of the contamination. A total of 30 locations were sampled. Borings advanced for the purposes of utilizing the Laser Induced Fluorescence (LIF) capabilities of the SCAPS system were identified with the designation "F" followed by the location number. For example, "F201" identifies the LIF boring at location 201. (Note: The "P" and "F" designations are only used in reference to the data presented in Appendix C, except for "P1" location.)

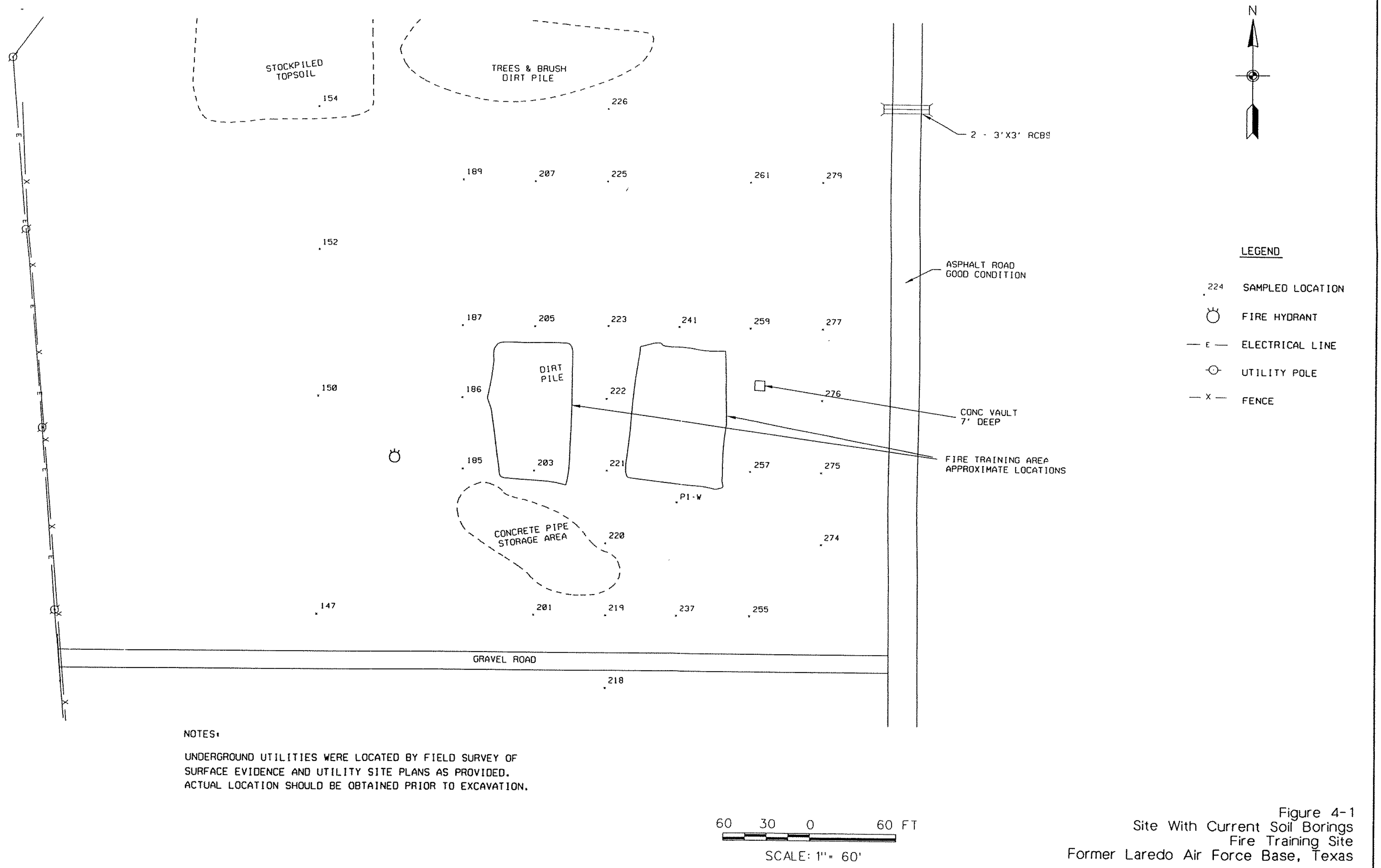
The sample identification numbers were similarly based upon the location identification numbers. Soil sample identification numbers consisted of the designation "SL" followed by the three-digit location number, a hyphen, and the approximate depth of the sampled interval. For example, "SL150-5" represents a soil sample collected from a depth of 5 feet at location 150. Surface samples were not given sampling depth identifiers. Similarly, groundwater samples consisted of the three-digit location number followed by the designation "W". For example, 158W represents the groundwater sample collected from location 185. One sample location (222) was sampled twice for groundwater—the sample was given the additional designation "-2" to identify it as the second sample.

The SCAPS sampling points are illustrated in Figure 4-1. A copy of the field data produced during the investigation is presented in Appendix C.

4.2 Soil and Vadose Zone Investigation

4.2.1 SCAPS Laser Induced Fluorescence

Nine soil borings were advanced to utilize the LIF capabilities of the SCAPS system. The LIF is intended to indicate the presence of hydrocarbon contamination within site soils. The borings for which LIF was utilized are F1, F186, F189, F201, F223, F257, F271, F275, and F279. The borings were advanced to depths ranging from 3.7 feet (F271) to 21.8 feet (F223). sive with respect to the presence of hydrocarbons



NOTES:

UNDERGROUND UTILITIES WERE LOCATED BY FIELD SURVEY OF SURFACE EVIDENCE AND UTILITY SITE PLANS AS PROVIDED. ACTUAL LOCATION SHOULD BE OBTAINED PRIOR TO EXCAVATION.

Figure 4-1
Site With Current Soil Borings
Fire Training Site
Former Laredo Air Force Base, Texas

The data produced by the LIF was inconclusive with respect to the presence of hydrocarbons.

4.2.2 Soil Sample Collection and Analysis

Soil samples were collected to assess contamination within the vadose soil zone. A total of 86 soil samples were collected from 30 SCAPS boring locations. Generally, the soil samples were collected at the ground surface, at a depth of 5.0-6.5 feet bgs, and at a depth of 10.0 – 11.5 feet bgs. Five of the soil samples (SL147-9′, SL189-6′, SL219-6′, SL220-8′, SL226-6′, and SL241-8′) were collected at alternate depths due to boring refusal or the presence of burn pit debris. The total depths of the soil borings were approximately 17 feet bgs, or to refusal. Only six of the 30 borings (P147, P150, P152, P154, P218, and P219) reached refusal at a depth shallower than 17 feet. Refusal was due to the presence of burn pit debris and/or other unidentified dense material.

Samples collected at the ground surface (zero to .5 feet) were collected utilizing a stainless steel trowel. Subsurface soil samples were collected utilizing the SCAPS equipment. Prior to the main thrust of the site investigation, a ground surface soil sample was collected from within the eastern burn pit to establish analyte detection and reporting limits for the field GC. A visibly contaminated soil sample was collected. High concentrations of unknown hydrocarbon contaminants detected in the sample pushed the physical limits of the instrument and effectively made it inoperable for several days. The soil samples were therefore all shipped to an analytical laboratory (the USACE Southwest Division Laboratory) for analysis instead of using the field GC. The Southwest Division Laboratory forwarded the samples to Environmental Chemical Corporation for analysis.

Not all soil samples were analyzed for all of the parameters of interest, due to the limited sample volumes obtained using the SCAPS system. Twenty of the soil samples were submitted for analysis of volatile organic compounds (VOCs) by EPA Test Method 8260 and semi-volatile organic compounds (SVOCs) by EPA Test Method 8270. Sixty-one soil samples were submitted for analysis of aromatic hydrocarbons (BTEX-benzene, toluene, ethylbenzene, and xylenes) by EPA Test Method 8020 and for TPH by EPA Test Method 8015 Modified. Nineteen of the soil samples were submitted for analysis of total RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) by EPA Test Methods 6010, 7740, 7060, and 7471, as appropriate. Sixty-six soil samples were submitted for analysis of total lead by EPA Test Method 6010. Table 4-1 indicates the parameters for which each soil sample was analyzed.

The results of these analyses are presented in Section 5 of this report.

4.3 Groundwater Investigation

4.3.1 Groundwater Sample Collection and Analysis

Twenty-six groundwater samples were collected from 25 of the 30 SCAPS sampling locations (two samples were collected from boring P222: 222W and 222W-2). To collect the groundwater samples, temporary 3/4" diameter PVC wells were installed within the borings, generally at a depth of approximately 20 feet bgs. Temporary wells were allowed to recover for approximately a day if no groundwater was observed within 30 minutes to a few hours of installation. VOC samples were collected with a stainless steel or teflon bailer. Additional sample volumes were collected with a portable peristaltic pump with an adjustable flow rate feature designed for "grab" sampling.

All 26 groundwater samples were submitted to the analytical laboratory for analysis of VOCs by EPA Test Method 8260. One groundwater sample, 154W, was also analyzed for TPH by EPA Test Method 8015 Modified and for total RCRA metals. Sample 222W-2 was analyzed for TPH, total RCRA metals, and for SVOCs (EPA Method 8270). The groundwater samples were shipped to the USACE Southwest Division Laboratory, which forwarded the samples to Environmental Chemical Corporation for analysis. Table 4-2 indicates the parameters for which each groundwater sample was analyzed.

The results of these analyses are presented in Section 5 of this report.

TABLE 4-1
Analysis Completed on Soil Samples

Sample No.	Date Sampled	Matrix	8020 Btex	6010 Lead (Pb)	8015M TPH	8260 VOCs	8270 SVOCs	6010, 7740,7060, 7471 RCRA Metals
SL PI	19 Sept 96	Soil	▨	▨	▨			
SL PI-5	19 Sept 96	Soil	▨	▨	▨			
SL PI-10	19 Sept 96	Soil	▨	▨	▨			
SL 147	24 Sept 96	Soil	▨	▨	▨			
SL 147-5	24 Sept 96	Soil	▨	▨	▨			
SL 147-9	24 Sept 96	Soil	▨	▨	▨			
SL 150	24 Sept 96	Soil	▨	▨	▨			
SL 150-5	24 Sept 96	Soil	▨	▨	▨			
SL 150-10	24 Sept 96	Soil	▨	▨	▨			
SL 152	23 Sept 96	Soil	▨	▨	▨			
SL 152-5	23 Sept 96	Soil	▨	▨	▨			
SL 152-10	23 Sept 96	Soil	▨	▨	▨			
SL 154	24 Sept 96	Soil	▨	▨	▨			
SL 154-5	24 Sept 96	Soil	▨	▨	▨			
SL 154-10	24 Sept 96	Soil	▨	▨	▨			
SL 185	22 Sept 96	Soil				▨	▨	▨
SL 185-5	20 Sept 96	Soil				▨	▨	▨
SL 185-10	20 Sept 96	Soil				▨	▨	▨
SL 186	22 Sept 96	Soil	▨	▨	▨			
SL186-5	20 Sept 96	Soil	▨	▨	▨			
SL 186-10	20 Sept 96	Soil	▨	▨	▨			
SL 187	22 Sept 96	Soil				▨	▨	▨
SL 187-5	20 Sept 96	Soil				▨	▨	▨
SL 187-10	20 Sept 96	Soil				▨	▨	▨
SL 189	23 Sept 96	Soil	▨	▨	▨			
SL 189-6	23 Sept 96	Soil	▨	▨	▨			
SL 189-10	23 Sept 96	Soil	▨	▨	▨			
SL 203	22 Sept 96	Soil	▨	▨	▨			
SL 203-5	20 Sept 96	Soil	▨	▨	▨			
SL 203-10	20 Sept 96	Soil	▨	▨	▨			
SL 205	22 Sept 96	Soil	▨	▨	▨			
SL 205-5	20 Sept 96	Soil	▨	▨	▨			
SL 205-10	20 Sept 96	Soil	▨	▨	▨			
SL 218	24 Sept 96	Soil	▨	▨	▨			
SL 218-5	24 Sept 96	Soil	▨	▨	▨			
SL 218-10	24 Sept 96	Soil	▨	▨	▨			
SL 219	22 Sept 96	Soil				▨	▨	▨
SL 219-6	21 Sept 96	Soil				▨	▨	▨
SL 219-10	21 Sept 96	Soil				▨	▨	▨
SL 220	22 Sept 96	Soil	▨	▨	▨			
SL 220-8	21 Sept 96	Soil	▨	▨	▨			
SL 221	22 Sept 96	Soil	▨	▨	▨			
SL 221-5	21 Sept 96	Soil	▨	▨	▨			
SL 222	22 Sept 96	Soil	▨	▨	▨			

TABLE 4-1
Analysis Completed on Soil Samples

Sample No.	Date Sampled	Matrix	8020 Btex	6010 Lead (Pb)	8015M TPH	8260 VOCs	8270 SVOCs	6010, 7740,7060, 7471 RCRA Metals
SL 222-5	21 Sept 96	Soil	▨	▨	▨			
SL 222-10	21 Sept 96	Soil	▨	▨	▨			
SL 223	22 Sept 96	Soil	▨	▨	▨			
SL 223-5	21 Sept 96	Soil	▨	▨	▨			
SL 223-10	21 Sept 96	Soil	▨	▨	▨			
SL 225	23 Sept 96	Soil	▨	▨	▨			
SL 225-5	23 Sept 96	Soil	▨	▨	▨			
SL 225-10	23 Sept 96	Soil	▨	▨	▨			
SL 226	24 Sept 96	Soil	▨	▨	▨			
SL 226-6	24 Sept 96	Soil	▨	▨	▨			
SL 226-10	24 Sept 96	Soil	▨	▨	▨			
SL 237	22 Sept 96	Soil	▨	▨	▨			
SL 237-5	21 Sept 96	Soil	▨	▨	▨			
SL 237-10	21 Sept 96	Soil	▨	▨	▨			
SL 241	22 Sept 96	Soil	▨	▨	▨			
SL 241-8	20 Sept 96	Soil	▨	▨	▨			
SL 255	22 Sept 96	Soil	▨	▨	▨			
SL 255-5	21 Sept 96	Soil	▨	▨	▨			
SL 255-10	21 Sept 96	Soil	▨	▨	▨			
SL 257	19 Sept 96	Soil	▨	▨	▨			
SL 257-5	19 Sept 96	Soil	▨	▨	▨			
SL 257-10	19 Sept 96	Soil	▨	▨	▨			
SL 259	22 Sept 96	Soil	▨	▨	▨			
SL 259-5	20 Sept 96	Soil	▨	▨	▨			
SL 259-10	20 Sept 96	Soil	▨	▨	▨			
SL 261	23 Sept 96	Soil	▨	▨	▨			
SL 261-5	23 Sept 96	Soil	▨	▨	▨			
SL 261-10	23 Sept 96	Soil	▨	▨	▨			
SL 274	22 Sept 96	Soil	▨	▨	▨			
SL 274-5	21 Sept 96	Soil	▨	▨	▨			
SL 274-10	21 Sept 96	Soil	▨	▨	▨			
SL 275	23 Sept 96	Soil	▨	▨	▨			
SL 275-5	23 Sept 96	Soil	▨	▨	▨			
SL 275-10	23 Sept 96	Soil	▨	▨	▨			
SL 276	23 Sept 96	Soil	▨	▨	▨			
SL 276-5	23 Sept 96	Soil	▨	▨	▨			
SL 276-10	23 Sept 96	Soil	▨	▨	▨			
SL 277	23 Sept 96	Soil	▨	▨	▨			
SL 277-5	23 Sept 96	Soil	▨	▨	▨			
SL 279	23 Sept 96	Soil	▨	▨	▨			
SL 279-5	23 Sept 96	Soil	▨	▨	▨			
SL 279-10	23 Sept 96	Soil	▨	▨	▨			

Notes: Shading indicates analysis completed

TABLE 4-2
Analysis Completed on Water Samples

Sample No.	Date Sampled	Matrix	8020 Btex	6010 Lead (Pb)	8015M TPH	8260 VOCs	8270 SVOCs	6010, 7740,7060, 7471 RCRA Metals
PI W	20 Sept 96	Water				▨		
147 W	24 Sept 96	Water				▨		
150 W	24 Sept 96	Water				▨		
152 W	24 Sept 96	Water				▨		
154 W	24 Sept 96	Water			▨	▨		▨
185 W	20 Sept 96	Water				▨		
186 W	20 Sept 96	Water				▨		
187 W	24 Sept 96	Water				▨		
189 W	23 Sept 96	Water				▨		
203 W	24 Sept 96	Water				▨		
205 W	20 Sept 96	Water				▨		
218 W	24 Sept 96	Water				▨		
219 W	24 Sept 96	Water				▨		
220 W	21 Sept 96	Water				▨		
221 W	21 Sept 96	Water				▨		
222 W	21 Sept 96	Water				▨		
222 W-2	24 Sept 96	Water			▨	▨	▨	▨
223 W	21 Sept 96	Water				▨		
225 W	23 Sept 96	Water				▨		
226 W	24 Sept 96	Water				▨		
237 W	21 Sept 96	Water				▨		
241 W	20 Sept 96	Water				▨		
257 W	20 Sept 96	Water				▨		
259 W	20 Sept 96	Water				▨		
261 W	23 Sept 96	Water				▨		
279 W	23 Sept 96	Water				▨		

Notes:
Shading indicates analysis completed

4.3.2 Water Level Measurements

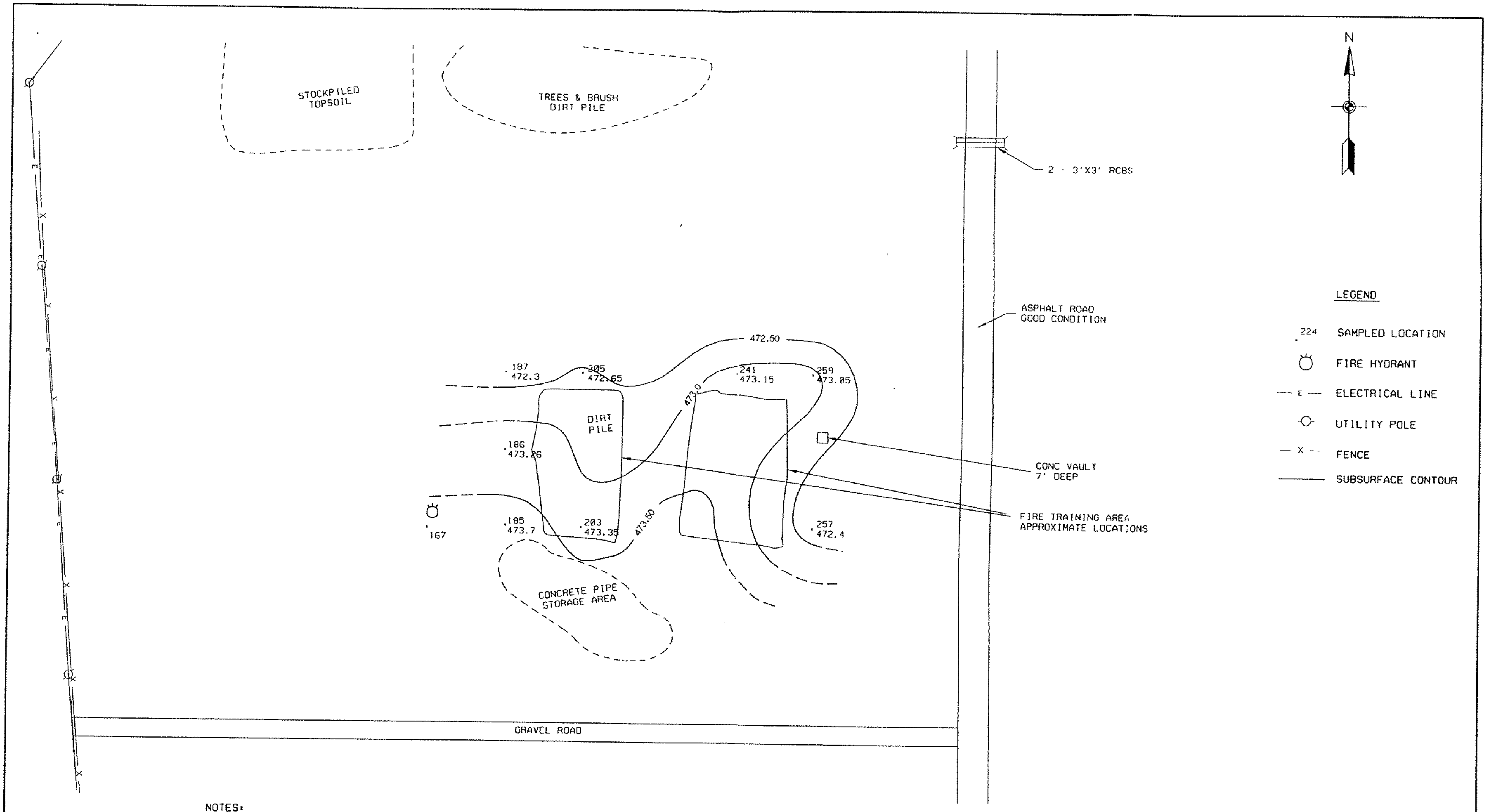
Groundwater levels within eight of the temporary wells were measured and the groundwater elevation for each location was calculated, based upon the surveyed ground surface elevation. The groundwater elevations are presented below:

Sample Location	Surface Elevation	Depth to Groundwater	Groundwater Elevation
185	482.6	8.90	473.70
186	482.0	8.74	473.26
187	480.9	8.60	472.30
203	483.5	10.15	473.35
205	481.5	8.85	472.65
241	481.2	8.05	473.15
257	482.2	9.80	472.40
259	481.4	8.35	473.05

Based upon this information, groundwater is present beneath the FTA site at a depth of approximately 8 to 10 feet. The apparent groundwater flow direction is generally toward the north (reflecting surface topography). However, two days prior to the soil and groundwater investigations, a water main failure at the fire hydrant at sample location 167 may have affected the normal groundwater elevations and flow direction at the site. A potentiometric surface map is shown in Figure 4-2.

4.4 Field QA/QC Procedures

For QA/QC purposes, QA split, equipment blank, and trip blank samples were collected during the performance of the field activities. QA split samples were collected at a frequency of one QA split for every ten samples (six QA samples for soils, and three QA samples for groundwater). The soil QA samples are SL147-QA, SL185-QA, SL185-5-QA, SL220-8-QA, SL225-10-QA, and SL241-8-QA. The groundwater QA samples are 150W-QA, 187W-QA, and 220W-QA. QA split samples were shipped to the USACE Southwestern Division Laboratory. The Southwestern Division Laboratory performed the metals analyses on the QA samples. The other analyses were performed by Inchcape Testing Services Environmental Laboratories. The QA samples were analyzed for the same parameters as the regular soil samples with which the QA samples were associated.



NOTES:

UNDERGROUND UTILITIES WERE LOCATED BY FIELD SURVEY OF SURFACE EVIDENCE AND UTILITY SITE PLANS AS PROVIDED. ACTUAL LOCATION SHOULD BE OBTAINED PRIOR TO EXCAVATION.

60 30 0 60 FT

SCALE: 1"= 60'

Figure 4-2
Groundwater Elevation - September 1996
Fire Training Area Site
Former Laredo Air Force Base, Texas

Equipment blank samples were prepared at a rate of one blank per 20 soil samples, for a total of three equipment blanks. Equipment blanks are prepared by pouring ASTM Reagent Grade II water over or through a decontaminated soil sampling tool (such as a trowel and mostap sampler) or a groundwater sampling tool (such as a bailer or pump), then collecting the rinseate into appropriate sample containers. The equipment blank samples were SL205-5-EB, SL255-EB, and SL227-5-EB. The equipment blank samples were analyzed for the same parameters as the soil samples with which the piece of equipment was associated. No equipment blanks were collected in association with groundwater samples.

Two trip blank samples were utilized during the field investigation, sample numbers TB-01 and TB-02. Trip blanks are included inside each sample cooler containing water samples to be analyzed for VOCs. The trip blank samples remain with the VOC sample containers during shipment of the containers from the laboratory to the field, throughout the field sampling program, and during shipment of the samples to the laboratory for analysis. The trip blank samples were analyzed for VOCs along with the regular field groundwater samples.

A Data Quality Review of the data generated by the field investigation was performed by the USACE, Tulsa District and is provided in Appendix D. The Data Quality Review is discussed in Section 5.3.

4.5 Management of Investigation Derived Waste

Use of the SCAPS system during the field investigation resulted in minimal quantities of investigation-derived waste being generated. Approximately one 5-gallon bucket of decontamination water and approximately one-third of a five-gallon bucket of waste soil cuttings was generated. Due to the extremely limited volume of waste materials the decontamination water and the waste soil cuttings were disposed by placing the waste within the burn pit. The investigation-derived wastes were not sampled. The analytical results of the soil and groundwater samples are considered to be sufficient to characterize the waste.

Section 5

Investigation Results

5. Investigation Results

5.1 Soil Analytical Results

5.1.1 VOCs and SVOCs

Of the 20 soil samples analyzed for VOCs and SVOCs, 4 samples (SL219-6, SL219-10, SL225, and SL259) were reported to contain detectable concentrations of VOC compounds. Napthalene was reported for SL219-6 at a concentration of 5.3 micrograms per kilogram (µg/kg). 1,4-Dichlorobenzene was reported for SL-219-10 at a concentration of 6.0 µg/kg. Toluene was reported for surface samples SL225 and SL259 at concentrations of 1.2 µg/kg and 1.1 µg/kg, respectively. Two of the soil samples (SL219 and SL274-10) were reported to contain detectable concentrations of SVOC compounds. Sample SL219 was reported to contain fluoranthene at a concentration of 211 µg/kg, pyrene at a concentration of 240 µg/kg, benzo(a)anthracene at a concentration of 144 µg/kg, chrysene at a concentration of 165 µg/kg, and bis(2-ethylhexyl)phthalate at a concentration of 598 µg/kg.

The analytical results for the soil VOC and SVOC analyses are presented in Table 5-1.

5.1.2 BTEX and TPH

Of the 61 soil samples that were analyzed for the presence of BTEX compounds, benzene, ethylbenzene, and xylenes were not detected in any of the soil samples analyzed. Detectable concentrations of toluene were reported for only six samples (SL152, SL154, SL203, SL218, SL226, and SL275). The detected toluene concentrations range from 4.2 mg/kg for sample SL203 to 9.1 mg/kg for sample SL226.

Of the 61 soil samples analzyed for TPH, detectable concentrations of non-volatile TPH (typically referred to as "diesel range organics") were reported for 31 of the samples. The detected concentrations of non-volatile TPH range from 16.5 mg/kg for sample SLP1-10 to 9,830 mg/kg for sample SL241. Three soil samples that were reported to contain non-volatile TPH were also reported to contain detectable concentrations of volatile TPH (typically referred to as "gasoline range organics"). The detected concentrations of volatile TPH range from 0.054 mg/kg for sample SL226 to 4.6 mg/kg for sample SL222-5.

TABLE 5-1
VOCs and SVOC - Soil Sample Analytical Results

Soil Boring	**RRS#2**	**SL 185**	**SL 185-5**	**SL 185-10**	**SL 187**	**SL 187-5**	**SL 187-10**	**SL 219**
Sample No.	**GWP-IND**	**S60778-15**	**S60778-7**	**S60778-9**	**S60778-33**	**S60778-26**	**S60778-27**	**S60778-46**
Date Sampled	**µg/kg**	**22 Sept 96**	**20 Sept 96**	**23 Sept 96**	**22 Sept 96**	**20 Sept 96**	**20 Sept 96**	**22 Sept 96**
VOC (8260) µg/kg								
Vinyl Chloride	200	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Methylene Chloride	500	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
1,1-Dichloroethene	700	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
1,1-Dichloroethane	1,020,000	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Chloroform	10,000	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
1,2-Dichloroethane	500	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Bromodichloromethane	10,000	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
1,2-Dichloropropane	500	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Trichloroethene	500	U (2.7)	U (2.5)	U (2.2)	U (2.1)	U (2.4)	U (2.4)	U (2.0)
Benzene	500	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Tetrachloroethene	500	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Toluene	100,000	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Chlorobenzene	10,000	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Ethylbenzene	70,000	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Xylene (total)	1,000,000	U (4.1)	U (3.7)	U (3.3)	U (3.2)	U (3.7)	U (3.6)	U (3.0)
sec-Butylbenzene		U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
tert-Butylbenzene		U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
1,2-Dichlorobenzene	60,000	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
1,4-Dichlorobenzene	7,500	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
cis-1,2-Dichloroethene	7,000	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
trans-1,2-Dichloroethene	10,000	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Isopropylbenzene		U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
4-Isopropyltoluene		U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
Naphthalene	409,000	U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
n-Propylbenzene		U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
1,2,4-Trimethylbenzene		U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
1,3,5-Trimethylbenzene		U (1.4)	U (1.2)	U (1.1)	U (1.1)	U (1.2)	U (1.2)	U (1.0)
SVOC (8270) µg/kg								
Benzyl Alcohol		U (133)	U (136)	U (126)	U (109)	U (134)	U (126)	U (112)
Naphthalene	409,000	U (128)	U (131)	U (122)	U (105)	U (129)	U (122)	U (108)
2-Methylnaphthalene		U (107)	U (109)	U (101)	U (87.8)	U (108)	U (101)	U (89.7)
Fluoranthene	409,000	U (121)	U (124)	U (115)	U (99.7)	U (122)	U (115)	211 (102)
Pyrene	310,000	U (232)	U (238)	U (221)	U (192)	U (235)	U (221)	240 (196)
Benzo [a] anthracene		U (105)	U (107)	U (99.6)	U (86.3)	U (106)	U (99.6)	144 (88.1)
Chrysene		U (132)	U (136)	U (126)	U (109)	U (134)	U (126)	165 (111)
bis (2-Ethylhexyl) phthalate	2,040	U (159)	U (163)	U (151)	U (131)	U (161)	U (151)	598 (134)

Notes
RRS#2 = TNRCC Risk Reduction Standard #2, Section 335, App. II
U = contaminant not detected based on method detection limit
Values within parentheses are method detection limits

TABLE 5-1
VOCs and SVOC - Soil Sample Analytical Results

Soil Boring Sample No. Date Sampled	RRS#2 GWP-IND µg/kg	SL 219-6 S60778-38 21 Sept 96	SL 219-10 S60778-39 21 Sept 96	SL 221 S60778-44 22 Sept 96	SL 221-5 S60778-36 21 Sept 96	SL 225 S60790-21 23 Sept 96	SL 225-5 S60790-22 23 Sept 96
VOC (8260) µg/kg							
Vinyl Chloride	200	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
Methylene Chloride	500	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
1,1-Dichloroethene	700	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
1,1-Dichloroethane	1,020,000	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
Chloroform	10,000	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
1,2-Dichloroethane	500	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
Bromodichloromethane	10,000	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
1,2-Dichloropropane	500	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
Trichloroethene	500	U (2.3)	U (2.4)	U (2.1)	U (2.7)	U (2.3)	U (2.6)
Benzene	500	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
Tetrachloroethene	500	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
Toluene	100,000	U (1.2)	U (1.2)	U (1.1)	U (1.4)	1.2 (1.1)	U (1.3)
Chlorobenzene	10,000	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
Ethylbenzene	70,000	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
Xylene (total)	1,000,000	U (3.5)	U (3.7)	U (3.2)	U (2.7)	U (3.4)	U (3.9)
sec-Butylbenzene		U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
tert-Butylbenzene		U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
1,2-Dichlorobenzene	60,000	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
1,4-Dichlorobenzene	7,500	U (1.2)	6.0 (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
cis-1,2-Dichloroethene	7,000	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
trans-1,2-Dichloroethene	10,000	U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
Isopropylbenzene		U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
4-Isopropyltoluene		U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
Naphthalene	409,000	5.3 (2.3)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
n-Propylbenzene		U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
1,2,4-Trimethylbenzene		U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
1,3,5-Trimethylbenzene		U (1.2)	U (1.2)	U (1.1)	U (1.4)	U (1.1)	U (1.3)
SVOC (8270) µg/kg							
Benzyl Alcohol		U (138)	U (134)	U (113)	U (143)	U (116)	U (129)
Naphthalene	409,000	U (133)	U (129)	U (109)	U (138)	U (112)	U (125)
2-Methylnaphthalene		U (111)	U (108)	U (90.6)	U (115)	U (93.6)	U (104)
Fluoranthene	409,000	U (126)	U (122)	U (103)	U (131)	U (106)	U (118)
Pyrene	310,000	U (241)	U (235)	U (198)	U (251)	U (204)	U (227)
Benzo [a] anthracene		U (109)	U (106)	U (89.0)	U (113)	U (92.0)	U (102)
Chrysene		U (137)	U (134)	U (113)	U (143)	U (116)	U (129)
bis (2-Ethylhexyl) phthalate	2,040	U (165)	U (161)	U (135)	U (171)	U (139)	U (155)

Notes
RRS#2 = TNRCC Risk Reduction Standard #2, Section 335, App. II
U = contaminant not detected based on method detection limit
Values within parentheses are method detection limits

TABLE 5-1
VOCs and SVOC - Soil Sample Analytical Results

Soil Boring	RRS#2	SL 225-10	SL 259	SL 259-5	SL 259-10	SL 274	SL 274-5	SL 274-10
Sample No.	**GWP-IND**	**S60790-23**	**S60778-32**	**S60778-24**	**S60778-25**	**S60778-49**	**S60790-2**	**S60790-3**
Date Sampled	**µg/kg**	**23 Sept 96**	**22 Sept 96**	**20 Sept 96**	**20 Sept 96**	**22 Sept 96**	**21 Sept 96**	**21 Sept 96**
VOC (8260) µg/kg								
Vinyl Chloride	200	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Methylene Chloride	500	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
1,1-Dichloroethene	700	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
1,1-Dichloroethane	1,020,000	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Chloroform	10,000	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
1,2-Dichloroethane	500	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Bromodichloromethane	10,000	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
1,2-Dichloropropane	500	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Trichloroethene	500	U (2.5)	U (1.9)	U (2.4)	U (2.5)	U (2.2)	U (2.5)	U (2.5)
Benzene	500	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Tetrachloroethene	500	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Toluene	100,000	U (1.3)	1.1 (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Chlorobenzene	10,000	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Ethylbenzene	70,000	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Xylene (total)	1,000,000	U (3.8)	U (2.9)	U (3.6)	U (3.7)	U (3.3)	U (3.8)	U (3.8)
sec-Butylbenzene		U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
tert-Butylbenzene		U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
1,2-Dichlorobenzene	60,000	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
1,4-Dichlorobenzene	7,500	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
cis-1,2-Dichloroethene	7,000	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
trans-1,2-Dichloroethene	10,000	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Isopropylbenzene		U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
4-Isopropyltoluene		U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
Naphthalene	409,000	U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (2.5)	U (2.5)
n-Propylbenzene		U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
1,2,4-Trimethylbenzene		U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
1,3,5-Trimethylbenzene		U (1.3)	U (0.97)	U (1.2)	U (1.2)	U (1.1)	U (1.3)	U (1.3)
SVOC (8270) µg/kg								
Benzyl Alcohol		U (133)	U (109)	U (133)	U (134)	U (116)	U (128)	U (131)
Naphthalene	409,000	U (128)	U (105)	U (128)	U (129)	U (112)	U (123)	U (126)
2-Methylnaphthalene		U (107)	U (87.8)	U (107)	U (108)	U (93.6)	U (103)	U (103)
Fluoranthene	409,000	U (121)	U (99.7)	U (121)	U (122)	U (106)	U (117)	U (117)
Pyrene	310,000	U (232)	U (192)	U (232)	U (235)	U (204)	U (224)	U (224)
Benzo [a] anthracene		U (105)	U (86.3)	U (105)	U (106)	U (92.0)	U (101)	U (101)
Chrysene		U (132)	U (109)	U (132)	U (134)	U (116)	U (127)	U (127)
bis (2-Ethylhexyl) phthalate	2,040	U (159)	U (131)	U (159)	U (161)	U (139)	U (153)	807 (157)

Notes
RRS#2 = TNRCC Risk Reduction Standard #2, Section 335, App. II
U = contaminant not detected based on method detection limit
Values within parentheses are method detection limits

The analytical results for the soil BTEX and TPH analyses are presented in Table 5-2.

5.1.3 Total RCRA Metals

Nineteen soil samples were analyzed for total RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). No inorganic background samples were collected. Arsenic, barium, and chromium were detected in all 19 soil samples. Detected concentrations of arsenic range from 2.2 mg/kg for SL219-6 to 11.5 mg/kg for SL187-5. Detected concentrations of barium range from 7.3 mg/kg for SL187-10 to 725 mg/kg for SL187. Detected concentrations of chromium range from 5.2 mg/kg for SL219-10 to 21.0 mg/kg for SL221-5. Cadmium was detected in 17 of the soil samples, at concentrations ranging from 0.5 mg/kg for SL274-5 to 3.8 mg/kg for SL221-5. Lead was detected in 16 of the soil samples, at concentrations ranging from 3.1 mg/kg for SL274-10 to 152 mg/kg for SL221-5. Mercury was detected in 9 of the soil samples, at concentrations ranging from 0.12 mg/kg for SL187-10 to 0.88 mg/kg for SL274. Selenium was detected in five of the soil samples, at concentrations ranging from 0.29 mg/kg for SL185-5 to 0.65 mg/kg for SL187-5. Silver was not detected in any of the 19 soil samples.

The analytical results for the soil metals analyses are presented in Table 5-3.

5.1.4 Total Lead

In addition to the 19 soil samples analyzed for total RCRA metals, 66 soil samples were analyzed for total lead. Lead was detected in 61 of the soil samples analyzed for total lead. The detected lead concentrations ranged from 3.1 mg/kg for SL147-5 to 737 mg/kg for SL241.

The analytical results for the soil lead analyses are included within in Table 5-3.

5.2 Groundwater Analytical Results

5.2.1 VOCs and SVOCs

All 26 groundwater samples collected during the filed investigation were analyzed for the presence of VOC compounds. VOC compounds were detected in 25 of the 26 samples, with total VOC concentrations ranging from 0.41 micrograms per liter (µg/L) for sample 189W to

TABLE 5-2
BTEX and TPH - Soil Analytical Results

BETX(µg/kg) 8020							TPH(mg/kg) 8015	
Soil Boring	Sample No.	Date Sampled	Benzene	Ethyl Benzene	Toluene	Xylene (total)	Nonvolatile	Volatile
RRS#2	GWP-IND	µg/kg	500	70,000	100,000	1,000,000	NA	1
PSTD	RBCA	mg/kg					500	
SL PI	S60778-20	19 Sept 96	U (4)	U (4)	U (4)	U (4)	372 (10.0)	U (0.05)
SL PI-5	S60778-18	19 Sept 96	U (4)	U (4)	U (4)	U (4)	97.4 (10.0)	U (0.05)
SL PI-10	S60778-19	19 Sept 96	U (4)	U (4)	U (4)	U (4)	16.5 (10.0)	U (0.05)
SL 147	S60790-31	24 Sept 96	U (4)	U (4)	U (4)	U (4)	456 (10.0)	U (0.05)
SL 147-5	S60790-32	24 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 147-9	S60790-33	24 Sept 96	U (3)	U (3)	U (3)	U (3)	U (10.0)	U (0.05)
SL 150	S60790-38	24 Sept 96	U (4)	U (4)	U (4)	U (4)	57.6 (10.0)	U (0.05)
SL 150-5	S60790-39	24 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 150-10	S60790-40	24 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 152	S60790-25	23 Sept 96	U (3)	U (3)	4.3 (3)	U (3)	191 (10.0)	U (0.05)
SL 152-5	S60790-26	23 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 152-10	S60790-27	23 Sept 96	U (3)	U (3)	U (3)	U (3)	U (10.0)	U (0.05)
SL 154	S60790-41	24 Sept 96	U (3)	U (3)	4.4 (3)	U (3)	55.3 (10.0)	U (0.05)
SL 154-5	S60790-42	24 Sept 96	U (3)	U (3)	U (3)	U (3)	22.5 (10.0)	U (0.05)
SL 154-10	S60790-43	24 Sept 96	U (3)	U (3)	U (3)	U (3)	U (10.0)	U (0.05)
SL 186	S60778-14	22 Sept 96	U (3)	U (3)	U (3)	U (3)	23.0 (10.0)	U (0.05)
SL186-5	S60778-5	20 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 186-10	S60778-6	20 Sept 96	U (3)	U (3)	U (3)	U (3)	U (10.0)	U (0.05)
SL 189	S60790-18	23 Sept 96	U (4)	U (4)	U (4)	U (4)	76.6 (10.0)	U (0.05)
SL 189-6	S60790-19	23 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 189-10	S60790-20	23 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 203	S60778-34	22 Sept 96	U (3)	U (3)	4.2 (3)	U (3)	145 (10.0)	U (0.05)
SL 203-5	S60778-28	20 Sept 96	U (10)	U (10)	U (10)	U (10)	372 (10.0)	2.8 (0.05)
SL 203-10	S60778-29	20 Sept 96	U (4)	U (4)	U (4)	U (4)	25.7 (10.0)	0.13 (0.05)
SL 205	S60778-12	22 Sept 96	U (3)	U (3)	U (3)	U (3)	148 (10.0)	U (0.05)
SL 205-5	S60778-3	20 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 205-10	S60778-4	20 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 218	S60790-28	24 Sept 96	U (4)	U (4)	6.0 (4)	U (4)	171 (10.0)	U (0.05)
SL 218-5	S60790-29	24 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 218-10	S60790-30	24 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 220	S60778-45	22 Sept 96	U (3)	U (3)	U (3)	U (3)	66.3 (10.0)	U (0.05)
SL 220-8	S60778-37	21 Sept 96	U (4)	U (4)	U (4)	U (4)	29.7 (10.0)	U (0.05)
SL 222	S60778-35	22 Sept 96	U (3)	U (3)	U (3)	U (3)	▨ 2340 (10.0)	U (0.05)
SL 222-5	S60778-30	21 Sept 96	U (8)	U (8)	U (8)	U (8)	▨ 1020 (10.0)	4.6 (0.05)
SL 222-10	S60778-31	21 Sept 96	U (4)	U (4)	U (4)	U (4)	64.3 (10.0)	U (0.05)

Notes
Values within parentheses are method detection limits
NA = not applicable
U = contaminant not detected based on method detection limit
RRS#2 = Risk Reduction Standard #2, Section 335
PSTD RBCA = Petroleum Storage Tank Division, Risk Based Corrective Action
▨ Contaminant exceeds PSTD RBCA

TABLE 5-2
BTEX and TPH - Soil Analytical Results

BETX(µg/kg) 8020							TPH(mg/kg) 8015	
Soil Boring	Sample No.	Date Sampled	Benzene	Ethyl Benzene	Toluene	Xylene (total)	Nonvolatile	Volatile
RRS#2	GWP-IND	µg/kg	500	70,000	100,000	1,000,000	NA	1
PSTD	RBCA	mg/kg					500	
SL 223	S60778-17	22 Sept 96	U (3)	U (3)	U (3)	U (3)	107 (10.0)	U (0.05)
SL 223-5	S60778-10	21 Sept 96	U (3)	U (3)	U (3)	U (3)	U (10.0)	U (0.05)
SL 223-10	S60778-11	21 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 226	S60790-35	24 Sept 96	U (3)	U (3)	9.1 (3)	U (3)	85.9 (10.0)	0.054 (0.05)
SL 226-6	S60790-36	24 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 226-10	S60790-37	24 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 237	S60778-47	22 Sept 96	U (3)	U (3)	U (3)	U (3)	71.1 (10.0)	U (0.05)
SL 237-5	S60778-40	21 Sept 96	U (4)	U (4)	U (4)	U (4)	37.0 (10.0)	U (0.05)
SL 237-10	S60778-41	21 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 241	S60778-13	22 Sept 96	U (3)	U (3)	U (3)	U (3)	9830 (10.0)	U (0.05)
SL 241-8	S60778-1	20 Sept 96	U (4)	U (4)	U (4)	U (4)	88.4 (10.0)	1.4 (0.05)
SL 255	S60778-48	22 Sept 96	U (3)	U (3)	U (3)	U (3)	26.5 (10.0)	U (0.05)
SL 255-5	S60778-42	21 Sept 96	U (3)	U (3)	U (3)	U (3)	U (10.0)	U (0.05)
SL 255-10	S60778-43	21 Sept 96	U (3)	U (3)	U (3)	U (3)	U (10.0)	U (0.05)
SL 257	S60778-23	19 Sept 96	U (3)	U (3)	U (3)	U (3)	67.6 (10.0)	U (0.05)
SL 257-5	S60778-21	19 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 257-10	S60778-22	19 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 261	S60790-15	23 Sept 96	U (3)	U (3)	U (3)	U (3)	71.5 (10.0)	U (0.05)
SL 261-5	S60790-16	23 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 261-10	S60790-17	23 Sept 96	U (3)	U (3)	U (3)	U (3)	U (10.0)	U (0.05)
SL 275	S60790-6	23 Sept 96	U (3)	U (3)	4.3 (3)	U (3)	20 (10.0)	U (0.05)
SL 275-5	S60790-4	23 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 275-10	S60790-5	23 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 276	S60790-7	23 Sept 96	U (3)	U (3)	U (3)	U (3)	48.4 (10.0)	U (0.05)
SL 276-5	S60790-8	23 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 276-10	S60790-9	23 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)
SL 277	S60790-10	23 Sept 96	U (3)	U (3)	4.3 (3)	U (3)	359 (10.0)	U (0.05)
SL 277-5	S60790-11	23 Sept 96	U (3)	U (3)	U (3)	U (3)	U(10.0)	U(0.05)
SL 279	S60790-12	23 Sept 96	U (3)	U (3)	4.6 (3)	U (3)	182 (10.0)	U (0.05)
SL 279-5	S60790-13	23 Sept 96	U (3)	U (3)	U (3)	U (3)	U (10.0)	U (0.05)
SL 279-10	S60790-14	23 Sept 96	U (4)	U (4)	U (4)	U (4)	U (10.0)	U (0.05)

Notes
Values within parentheses are method detection limits
NA = not applicable
U = contaminant not detected based on method detection limit
RRS#2 = Risk Reduction Standard #2, Section 335
PSTD RBCA = Petroleum Storage Tank Division, Risk Based Corrective Action
▨ Contaminant exceeds PSTD RBCA

TABLE 5-3
Total Metals - Soil Sample Analytic Results (mg/kg)

Soil Boring	Sample No.	Date Sampled	Arsenic (7060A)	Barium (6010A)	Cadmium (6010A)	Chromium (6010A)	Lead (6010A)	Mercury (7471A)	Selenium (7740A)	Silver (6010A)
RRS#2	GWP-IND	mg/kg	5	200	0.5	10	1.5	0.2	5	51.1
SL PI	S60778-20	19 Sept 96	NA	NA	NA	NA	19.3 (2.2)	NA	NA	NA
SL PI-5	S60778-18	19 Sept 96	NA	NA	NA	NA	9.1 (2.6)	NA	NA	NA
SL PI-10	S60778-19	19 Sept 96	NA	NA	NA	NA	11.1 (2.6)	NA	NA	NA
SL 147	S60790-31	24 Sept 96	NA	NA	NA	NA	54.1 (2.4)	NA	NA	NA
SL 147-5	S60790-32	24 Sept 96	NA	NA	NA	NA	22.9 (2.5)	NA	NA	NA
SL 147-9	S60790-33	24 Sept 96	NA	NA	NA	NA	3.1 (2.2)	NA	NA	NA
SL 150	S60790-38	24 Sept 96	NA	NA	NA	NA	36.4 (2.2)	NA	NA	NA
SL 150-5	S60790-39	24 Sept 96	NA	NA	NA	NA	7.0 (2.5)	NA	NA	NA
SL 150-10	S60790-40	24 Sept 96	NA	NA	NA	NA	8.4 (2.4)	NA	NA	NA
SL 152	S60790-25	23 Sept 96	NA	NA	NA	NA	39.4 (2.1)	NA	NA	NA
SL 152-5	S60790-26	23 Sept 96	NA	NA	NA	NA	6.1 (2.4)	NA	NA	NA
SL 152-10	S60790-27	23 Sept 96	NA	NA	NA	NA	17.4 (2.4)	NA	NA	NA
SL 154	S60790-41	24 Sept 96	NA	NA	NA	NA	3.5 (2.3)	NA	NA	NA
SL 154-5	S60790-42	24 Sept 96	NA	NA	NA	NA	U (2.4)	NA	NA	NA
SL 154-10	S60790-43	24 Sept 96	NA	NA	NA	NA	3.4 (2.5)	NA	NA	NA
SL 185	S60778-15	22 Sept 96	7.7 (0.26)	75.0 (0.24)	1.0 (0.48)	10.2 (0.85)	27.1 (2.4)	U (0.12)	U (0.26)	U (0.61)
SL 185-5	S60778-7	20 Sept 96	6.0 (0.26)	8.8 (0.23)	0.88 (0.47)	6.9 (0.82)	U (2.3)	0.40 (0.13)	0.29 (0.26)	U (0.59)
SL 185-10	S60778-9	20 Sept 96	9.3 (0.23)	12.5 (0.24)	2.0 (0.47)	17.2 (0.83)	10.4 (2.4)	U (0.12)	U (0.23)	U (0.59)
SL 186	S60778-14	22 Sept 96	NA	NA	NA	NA	23.8 (2.1)	NA	NA	NA
SL186-5	S60778-5	20 Sept 96	NA	NA	NA	NA	20.0 (2.5)	NA	NA	NA
SL 186-10	S60778-6	20 Sept 96	NA	NA	NA	NA	U (2.3)	NA	NA	NA
SL 187	S60778-33	22 Sept 96	6.2 (0.21)	725 (0.21)	1.0 (0.41)	6.4 (0.72)	21.1 (2.1)	U (0.10)	U (0.21)	U (0.52)
SL 187-5	S60778-26	20 Sept 96	11.5 (0.24)	73.9 (0.24)	1.6 (0.48)	7.5 (0.84)	27.9 (2.4)	0.20 (0.13)	0.65 (0.24)	U (0.60)
SL 187-10	S60778-27	20 Sept 96	5.3 (0.22)	7.3 (0.24)	1.2 (0.48)	9.5 (0.83)	7.1 (2.4)	0.12 (0.12)	U (0.22)	U (0.60)
SL 189	S60790-18	23 Sept 96	NA	NA	NA	NA	54.0 (2.3)	NA	NA	NA
SL 189-6	S60790-19	23 Sept 96	NA	NA	NA	NA	U (2.4)	NA	NA	NA
SL 189-10	S60790-20	23 Sept 96	NA	NA	NA	NA	5.6 (2.3)	NA	NA	NA
SL 203	S60778-34	22 Sept 96	NA	NA	NA	NA	15.9 (2.1)	NA	NA	NA
SL 203-5	S60778-28	20 Sept 96	NA	NA	NA	NA	18.1 (2.4)	NA	NA	NA
SL 203-10	S60778-29	20 Sept 96	NA	NA	NA	NA	23.8 (2.4)	NA	NA	NA
SL 205	S60778-12	22 Sept 96	NA	NA	NA	NA	91.7 (2.1)	NA	NA	NA
SL 205-5	S60778-3	20 Sept 96	NA	NA	NA	NA	6.9 (2.3)	NA	NA	NA
SL 205-10	S60778-4	20 Sept 96	NA	NA	NA	NA	4.9 (2.4)	NA	NA	NA
SL 218	S60790-28	24 Sept 96	NA	NA	NA	NA	563 (2.4)	NA	NA	NA
SL 218-5	S60790-29	24 Sept 96	NA	NA	NA	NA	24.9 (2.4)	NA	NA	NA
SL 218-10	S60790-30	24 Sept 96	NA	NA	NA	NA	U (2.6)	NA	NA	NA
SL 219	S60778-46	22 Sept 96	7.5 (0.21)	507 (0.21)	0.64 (0.43)	8.2 (0.75)	34.7 (2.1)	U (0.10)	U (0.21)	U (0.53)
SL 219-6	S60778-38	21 Sept 96	2.2 (0.26)	18.6 (0.26)	0.60 (0.52)	6.4 (0.91)	11.9 (2.6)	0.17 (0.13)	U (0.26)	U (0.65)
SL 219-10	S60778-39	21 Sept 96	4.3 (0.27)	26.8 (0.26)	U (0.51)	5.2 (0.89)	17.5 (2.6)	0.14 (0.13)	U (0.27)	U (0.64)

TABLE 5-3
Total Metals - Soil Sample Analytic Results (mg/kg)

Soil Boring	Sample No.	Date Sampled	Arsenic (7060A)	Barium (6010A)	Cadmium (6010A)	Chromium (6010A)	Lead (6010A)	Mercury (7471A)	Selenium (7740A)	Silver (6010A)
RRS#2	GWP-IND	mg/kg	5	200	0.5	10	1.5	0.2	5	51.1
SL 220	S60778-45	22 Sept 96	NA	NA	NA	NA	12.1 (2.1)	NA	NA	NA
SL 220-8	S60778-37	21 Sept 96	NA	NA	NA	NA	5.1, (2.5)	NA	NA	NA
SL 221	S60778-44	22 Sept 96	5.2 (0.21)	638 (0.21)	0.70 (0.43)	7.1 (0.74)	59.8 (2.1)	U (0.11)	U (0.21)	U (0.53)
SL 221-5	S60778-36	21 Sept 96	7.8 (0.28)	93.1 (0.24)	3.8 (0.49)	21.9 (0.86)	152 (2.4)	0.13 (0.13)	U (0.28)	U (0.61)
SL 222	S60778-35	22 Sept 96	NA	NA	NA	NA	198 (2.1)	NA	NA	NA
SL 222-5	S60778-30	21 Sept 96	NA	NA	NA	NA	113 (2.4)	NA	NA	NA
SL 222-10	S60778-31	21 Sept 96	NA	NA	NA	NA	28.9 (2.5)	NA	NA	NA
SL 223	S60778-17	22 Sept 96	NA	NA	NA	NA	189 (2.0)	NA	NA	NA
SL 223-5	S60778-10	21 Sept 96	NA	NA	NA	NA	4.6 (2.3)	NA	NA	NA
SL 223-10	S60778-11	21 Sept 96	NA	NA	NA	NA	4.0 (2.5)	NA	NA	NA
SL 225	S60790-21	23 Sept 96	4.3 (0.2)	76.2 (0.2)	0.6 (0.4)	6.5 (0.8)	9.4 (2.205)	U (0.1)	U (0.2)	U (0.6)
SL 225-5	S60790-22	23 Sept 96	8.9 (0.3)	77.7 (0.3)	2.0 (0.5)	10.5 (0.9)	93.6 (2.5)	0.2 (0.1)	0.3 (0.3)	U (0.6)
SL 225-10	S60790-23	23 Sept 96	7.4 (0.2)	7.9 (0.2)	1.3 (0.5)	7.9 (0.8)	4.7 (2.4)	U (0.1)	U (0.2)	U (0.6)
SL 226	S60790-35	24 Sept 96	NA	NA	NA	NA	32.1 (2.0)	NA	NA	NA
SL 226-6	S60790-36	24 Sept 96	NA	NA	NA	NA	6.6 (2.6)	NA	NA	NA
SL 226-10	S60790-37	24 Sept 96	NA	NA	NA	NA	10.0 (2.7)	NA	NA	NA
SL 237	S60778-47	22 Sept 96	NA	NA	NA	NA	23.6 (2.1)	NA	NA	NA
SL 237-5	S60778-40	21 Sept 96	NA	NA	NA	NA	5.8 (2.5)	NA	NA	NA
SL 237-10	S60778-41	21 Sept 96	NA	NA	NA	NA	15.3 (2.5)	NA	NA	NA
SL 241	S60778-13	22 Sept 96	NA	NA	NA	NA	737 (2.0)	NA	NA	NA
SL 241-8	S60778-1	20 Sept 96	NA	NA	NA	NA	34.2 (2.8)	NA	NA	NA
SL 255	S60778-48	22 Sept 96	NA	NA	NA	NA	26.4 (2.2)	NA	NA	NA
SL 255-5	S60778-42	21 Sept 96	NA	NA	NA	NA	4.3 (2.4)	NA	NA	NA
SL 255-10	S60778-43	21 Sept 96	NA	NA	NA	NA	26.8 (2.3)	NA	NA	NA
SL 257	S60778-23	19 Sept 96	NA	NA	NA	NA	39.2 (2.3)	NA	NA	NA
SL 257-5	S60778-21	19 Sept 96	NA	NA	NA	NA	9.6 (2.3)	NA	NA	NA
SL 257-10	S60778-22	19 Sept 96	NA	NA	NA	NA	18.3 (2.5)	NA	NA	NA
SL 259	S60778-32	22 Sept 96	4.5 (0.20)	639 (0.21)	1.0 (0.43)	7.5 (0.74)	20.5 (2.1)	0.13 (0.10)	U (0.20)	U (0.53)
SL 259-5	S60778-24	20 Sept 96	3.1 (0.25)	27.7 (0.26)	U (0.51)	5.4 (0.90)	U (2.6)	U (0.12)	U (0.25)	U (0.64)
SL 261	S60790-15	23 Sept 96	NA	NA	NA	NA	8.0 (2.1)	NA	NA	NA
SL 261-5	S60790-16	23 Sept 96	NA	NA	NA	NA	5.9 (2.3)	NA	NA	NA
SL 261-10	S60790-17	23 Sept 96	NA	NA	NA	NA	4.8 (2.3)	NA	NA	NA

TABLE 5-3

Total Metals - Soil Sample Analytic Results (mg/kg)

Soil Boring	Sample No.	Date Sampled	Arsenic (7060A)	Barium (6010A)	Cadmium (6010A)	Chromium (6010A)	Lead (6010A)	Mercury (7471A)	Selenium (7740A)	Silver (6010A)
RRS#2	**GWP-IND**	**mg/kg**	**5**	**200**	**0.5**	**10**	**1.5**	**0.2**	**5**	**51.1**
SL 274	S60778-49	22 Sept 96	7.1 (0.22)	111 (0.22)	0.92 (0.43)	7.3 (0.76)	33.9 (2.2)	0.88 (0.11)	U (0.22)	U (0.54)
SL 274-5	S60790-2	21 Sept 96	5.5 (0.3)	25.5 (0.2)	0.5 (0.5)	7.8 (0.8)	U (2.4)	U (0.1)	0.5 (0.3)	U (0.6)
SL 274-10	S60790-3	21 Sept 96	7.7 (0.3)	8.0 (0.2)	0.6 (0.5)	7.9 (0.8)	3.1 (2.4)	U (0.1)	0.3 (0.3)	U (0.605)
SL 275	S60790-6	23 Sept 96	NA	NA	NA	NA	49.6 (2.1)	NA	NA	NA
SL 275-5	S60790-4	23 Sept 96	NA	NA	NA	NA	17.9 (2.4)	NA	NA	NA
SL 275-10	S60790-5	23 Sept 96	NA	NA	NA	NA	3.4 (2.4)	NA	NA	NA
SL 276	S60790-7	23 Sept 96	NA	NA	NA	NA	11 (2.3)	NA	NA	NA
SL 276-5	S60790-8	23 Sept 96	NA	NA	NA	NA	U (2.5)	NA	NA	NA
SL 276-10	S60790-9	23 Sept 96	NA	NA	NA	NA	27.3 (2.6)	NA	NA	NA
SL 277	S60790-10	23 Sept 96	NA	NA	NA	NA	138 (2.1)	NA	NA	NA
SL 277-5	S60790-11	23 Sept 96	NA	NA	NA	NA	6.4 (2.3)	NA	NA	NA
SL 279	S60790-12	23 Sept 96	NA	NA	NA	NA	73.3 (2.1)	NA	NA	NA
SL 279-5	S60790-13	23 Sept 96	NA	NA	NA	NA	7.0 (2.1)	NA	NA	NA
SL 279-10	S60790-14	23 Sept 96	NA	NA	NA	NA	7.1 (2.4)	NA	NA	NA

Notes

▨ Contaminant exceeds TNRCC's RRS#2

U = contaminant not detected based on method detection limit
Values within parentheses are method detection limits
NA = sample not analyzed for contaminant

7,842.8 µg/L for sample 218W. The second greatest total VOC concentration is for sample P1W, with 6,033.7 µg/L. The compound present in the most samples is benzene, which is present in 17 of the 26 samples, at detected concentrations ranging from 0.27 µg/L for sample 147W to 5,610 µg/L for sample P1W. The second-greatest benzene concentration is 1,690 µg/L for sample 218W. Trichloroethene (TCE) is the second most commonly present compound, detected in 13 of the 19 samples. Detected TCE concentrations range from 0.50 µg/L for sample 147W to 37.2 µg/L for sample 205W.

One groundwater sample, 222W-2, was analyzed for the presence of SVOC compounds. Benzyl alcohol was detected at a concentration of 6.5 µg/L, naphthalene was detected at a concentration of 1.8 µg/L, 2-methylnaphthalene was detected at a concentration of 0.96 µg/L, and bis(2-ethylhexyl)pphtalate was detected at a concentration of 37.2 µg/L.

The analytical results for the VOC and SVOC analyses are presented in Table 5-4.

5.2.2 TPH

Two groundwater samples, 154W and 222W-2, were analyzed for TPH. Non-volatile TPH was reported for both samples, at concentrations of 1.5 milligram per liter (mg/L) and 3.7 mg/L, respectively. Volatile TPH was detected only in sample 222W-2, at a concentration of 0.050 mg/L.

The analytical results for the TPH analyses are presented in Table 5-4.

5.2.3 Total RCRA Metals

Two groundwater samples, 154W and 222W-2, were analyzed for total RCRA metals. Detectable concentrations of barium and chromium were reported for both samples. Barium concentrations were 0.1 mg/L and 0.2 mg/L for samples 154W and 222W-2, respectively. Chromium concentrations were 0.01 mg/L and 0.03 mg/L, respectively. Arsenic, cadmium, and lead were reported only for sample 222W-2, at concentrations of 0.03 mg/L, 0.005 mg/L, and 0.3 mg/L, respectively. Mercury, selenium, and silver were not detected in either groundwater sample.

The analytical results for the metals analyses are presented in Table 5-5.

TABLE 5-4
VOCs, SVOCs, and TPH – Water Sample Analytical Results

Water Sample	RRS#2	PI W	147W	150W	152W	154W	185W
Sample No.	**GW**	**S60778-50**	**S60790-59**	**S60790-51**	**S60790-49**	**S60790-54**	**S60778-56**
Date Sampled	**μg/l**	**20 Sept 96**	**24 Sept 96**	**24 Sept 96**	**23 Sept 96**	**24 Sept 96**	**20 Sept 96**
VOC (8260) μg/l							
Vinyl Chloride	2	U (0.24)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.24)
Methylene Chloride	5	U (0.22)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.22)
1,1-Dichloroethene	7	U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
1,1-Dichloroethane	3,650	U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
Chloroform	100	U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	0.20 (0.20)
1,2-Dichloroethane	5	U (0.31)	U (0.3)	U (0.3)	U (0.3)	U (0.3)	U (0.31)
Bromodichloromethane	100	U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
1,2-Dichloropropane	5	U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
Trichloroethene	5	U (0.25)	0.50 (0.3)	U (0.3)	U (0.3)	1.6 (0.3)	1.3 (0.25)
Benzene	5	5610 (20.00)	0.27 (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
Tetrachloroethene	5	U (0.25)	U (0.3)	U (0.3)	1.2 (0.3)	0.37 (0.3)	7.3 (0.25)
Toluene	1,000	U (0.50)	U (0.5)	U (0.5)	U (0.5)	U (0.5)	U (0.50)
Chlorobenzene	100	U (0.50)	U (0.5)	U (0.5)	U (0.5)	U (0.5)	2.2 (0.50)
Ethyl benzene	700	226 (2.00)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
Xylene (total)	10,000	1.9 (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
sec-Butylbenzene		10.3 (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
tert-Butylbenzene		18.4 (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
1,2-Dichlorobenzene	600	U (0.24)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.24)
1,4-Dichlorobenzene	75	U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	1.4 (0.20)
cis-1,2-Dichloroethene	70	U (0.20)	U (0.2)	U (0.2)	1.1 (0.2)	0.72 (0.2)	U (0.20)
trans-1,2-Dichloroethene	100	U (0.29)	U (0.3)	U (0.3)	U (0.3)	U (0.3)	U (0.29)
Isopropylbenzene		97.6 (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
4-Isopropyltoluene		1.9 (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
Naphthalene	1,460	5.9 (1.3)	2.4 (1)	U (1)	U (1)	U (1)	U (1.3)
n-Propylbenzene		52.9 (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
1,2,4-Trimethylbenzene		8.8 (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
1,3,5-Trimethylbenzene		U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.2)	U (0.20)
SVOC (8270) μg/l							
Benzyl Alcohol		NA	NA	NA	NA	NA	NA
Naphthalene	1,460	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene		NA	NA	NA	NA	NA	NA
Fluoranthene	1,460	NA	NA	NA	NA	NA	NA
Pyrene	1,100	NA	NA	NA	NA	NA	NA
Benzo [a] anthracene		NA	NA	NA	NA	NA	NA
Chrysene		NA	NA	NA	NA	NA	NA
bis (2-Ethylhexyl) phthalate	6.8	NA	NA	NA	NA	NA	NA
TPH (8015) mg/l	**PSTD A.L. mg/l**						
Nonvolatile	5	NA	NA	NA	NA	1.5 (0.30)	NA
Volatile	5	NA	NA	NA	NA	U (0.05)	NA

Notes: PSTD A.L. = Petroleum Storage Tank Division Action Level; RRS#2 = TNRCC Risk Reduction Standard #2, section 335, App. II; NA = sample not taken and analyzed; Values within parentheses are method detection limits

▨ Contaminant exceeds TNRCC's RRS#2

U = contaminant not detected based on method detection limit

TABLE 5-4
VOCs, SVOCs, and TPH – Water Sample Analytical Results

Water Sample Sample No. Date Sampled	RRS#2 GW µg/l	186W S60778-55 20 Sept 96	187W S60790-55 24 Sept 96	189W S60790-48 23 Sept 96	203W S60790-56 24 Sept 96	205W S60778-54 20 Sept 96	218W S60790-58 24 Sept 96
VOC (8260) µg/l							
Vinyl Chloride	2	U (0.24)	U (0.2)	U (0.2)	U (0.2)	0.39 (0.24)	U (0.2)
Methylene Chloride	5	U (0.22)	U (0.2)	U (0.2)	U (0.2)	U (0.22)	U (0.2)
1,1-Dichloroethene	7	U (0.20)	0.67 (0.2)	U (0.2)	U (0.2)	0.54 (0.20)	U (0.2)
1,1-Dichloroethane	3,650	U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.20)	U (0.2)
Chloroform	100	0.34 (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.20)	U (0.2)
1,2-Dichloroethane	5	U (0.31)	U (0.3)	U (0.3)	U (0.3)	U (0.31)	U (0.3)
Bromodichloromethane	100	U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.20)	U (0.2)
1,2-Dichloropropane	5	U (0.20)	U (0.2)	U (0.2)	0.30 (0.2)	U (0.20)	U (0.2)
Trichloroethene	5	10.0 (0.25)	27.7 (0.3)	U (0.3)	0.53 (0.3)	37.2 (0.25)	1.5 (0.3)
Benzene	5	0.30 (0.20)	U (0.2)	U (0.2)	17.4 (0.2)	0.41 (0.20)	1690 (20)
Tetrachloroethene	5	37.3 (0.25)	13.9 (0.3)	0.41 (0.3)	0.30 (0.3)	58.0 (0.25)	U (0.3)
Toluene	1,000	U (0.50)	U (0.5)	U (0.5)	U (0.5)	U (0.50)	2280 (50)
Chlorobenzene	100	0.75 (0.50)	U (0.5)	U (0.5)	U (0.5)	1.1 (0.50)	U (0.5)
Ethyl benzene	700	U (0.20)	U (0.2)	U (0.2)	10.5 (0.2)	U (0.20)	437 (20)
Xylene (total)	10,000	U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.20)	2250 (20)
sec-Butylbenzene		U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.20)	11.9 (0.2)
tert-Butylbenzene		U (0.20)	U (0.2)	U (0.2)	0.94 (0.2)	U (0.20)	15.2 (0.2)
1,2-Dichlorobenzene	600	U (0.24)	0.21 (0.2)	U (0.2)	4.3 (0.2)	17.8 (0.24)	U (0.2)
1,4-Dichlorobenzene	75	0.46 (0.20)	0.29 (0.2)	U (0.2)	4.4 (0.2)	4.5 (0.20)	U (0.2)
cis-1,2-Dichloroethene	70	1.5 (0.20)	9.2 (0.2)	U (0.2)	U (0.2)	17.0 (0.20)	U (0.2)
trans-1,2-Dichloroethene	100	U (0.29)	0.48 (0.3)	U (0.3)	U (0.3)	0.53 (0.29)	U (0.3)
Isopropylbenzene		U (0.20)	U (0.2)	U (0.2)	1.1 (0.2)	U (0.20)	48.4 (0.2)
4-Isopropyltoluene		U (0.20)	U (0.2)	U (0.2)	U (0.2)	U (0.20)	11.5 (0.2)
Naphthalene	1,460	U (1.3)	U (1)	U (1)	U (1)	U (1.3)	362 (100)
n-Propylbenzene		U (0.20)	U (0.2)	U (0.2)	0.48 (0.2)	U (0.20)	62.3 (0.2)
1,2,4-Trimethylbenzene		U (0.20)	U (0.2)	U (0.2)	0.87 (0.2)	U (0.20)	499 (20)
1,3,5-Trimethylbenzene		U (0.20)	U (0.2)	U (0.2)	0.44 (0.2)	U (0.20)	174 (0.2)
SVOC (8270) µg/l							
Benzyl Alcohol		NA	NA	NA	NA	NA	NA
Naphthalene	1,460	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene		NA	NA	NA	NA	NA	NA
Fluoranthene	1,460	NA	NA	NA	NA	NA	NA
Pyrene	1,100	NA	NA	NA	NA	NA	NA
Benzo [a] anthracene		NA	NA	NA	NA	NA	NA
Chrysene		NA	NA	NA	NA	NA	NA
bis (2-Ethylhexyl) phthalate	6.8	NA	NA	NA	NA	NA	NA
TPH (8015) mg/l	**PSTD A.L. mg/l**						
Nonvolatile	5	NA	NA	NA	NA	NA	NA
Volatile	5	NA	NA	NA	NA	NA	NA

Notes: PSTD A.L. = Petroleum Storage Tank Division Action Level; RRS#2 = TNRCC Risk Reduction Standard #2, section 335, App. II; NA = sample not taken and analyzed; Values within parentheses are method detection limits

▨ Contaminant exceeds TNRCC's RRS#2

U = contaminant not detected based on method detection limit

TABLE 5-4

VOCs, SVOCs, and TPH – Water Sample Analytical Results

Water Sample **Sample No.** **Date Sampled**	**RRS#2** **GW** **µg/l**	**219W** **S60790-57** **24 Sept 96**	**220W** **S60778-59** **21 Sept 96**	**221W** **S60778-61** **21 Sept 96**	**222W** **S60778-63** **21 Sept 96**	**222W-2** **S60790-53** **24 Sept 96**	**223W** **S60778-64** **21 Sept 96**
VOC (8260) µg/l							
Vinyl Chloride	2	U (0.2)	U (0.24)	U (0.24)	U (0.24)	U (0.2)	0.43 (0.24)
Methylene Chloride	5	U (0.2)	U (0.22)	U (0.22)	U (0.22)	U (0.2)	U (0.22)
1,1-Dichloroethene	7	U (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.2)	U (0.20)
1,1-Dichloroethane	3,650	U (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.2)	U (0.20)
Chloroform	100	U (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.2)	U (0.20)
1,2-Dichloroethane	5	U (0.3)	U (0.31)	U (0.31)	U (0.31)	U (0.3)	U (0.31)
Bromodichloromethane	100	U (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.2)	U (0.20)
1,2-Dichloropropane	5	0.55 (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.2)	U (0.20)
Trichloroethene	5	U (0.3)	U (0.25)	U (0.25)	U (0.25)	U (0.3)	7.3 (0.25)
Benzene	5	0.47 (0.2)	0.35 (0.20)	0.89 (0.20)	2.4 (0.20)	0.43 (0.2)	1.7 (0.20)
Tetrachloroethene	5	0.33 (0.3)	U (0.25)	U (0.25)	U (0.25)	U (0.3)	3.5 (0.25)
Toluene	1,000	U (0.5)	U (0.50)	U (0.50)	U (0.50)	0.59 (0.5)	U (0.50)
Chlorobenzene	100	U (0.5)	U (0.50)	U (0.50)	U (0.50)	U (0.5)	U (0.50)
Ethyl benzene	700	U (0.2)	U (0.20)	U (0.20)	0.61 (0.20)	U (0.2)	U (0.20)
Xylene (total)	10,000	U (0.2)	U (0.20)	U (0.20)	0.91 (0.20)	U (0.2)	U (0.20)
Sec-Butylbenzene		0.23 (0.2)	U (0.20)	U (0.20)	0.30 (0.20)	U (0.2)	U (0.20)
Tert-Butylbenzene		0.36 (0.2)	U (0.20)	U (0.20)	0.39 (0.20)	U (0.2)	U (0.20)
1,2-Dichlorobenzene	600	U (0.2)	U (0.24)	U (0.24)	U (0.24)	U (0.2)	29.5 (0.24)
1,4-Dichlorobenzene	75	10.5 (0.2)	0.80 (0.20)	U (0.20)	5.5 (0.20)	1.5 (0.2)	12.4 (0.20)
Cis-1,2-Dichloroethene	70	U (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.2)	13.0 (0.20)
Trans-1,2-Dichloroethene	100	U (0.3)	U (0.29)	U (0.29)	U (0.29)	U (0.3)	U (0.29)
Isopropylbenzene		0.24 (0.2)	U (0.20)	U (0.20)	0.32 (0.20)	U (0.2)	U (0.20)
4-Isopropyltoluene		U (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.2)	U (0.20)
Naphthalene	1,460	5.7 (1)	U (1.3)	U (1.3)	4.3 (1.3)	U (1)	U (1.3)
n-Propylbenzene		0.36 (0.2)	U (0.20)	U (0.20)	0.39 (0.20)	U (0.2)	U (0.20)
1,2,4-Trimethylbenzene		1.8 (0.2)	U (0.20)	U (0.20)	0.57 (0.20)	0.22 (0.2)	U (0.20)
1,3,5-Trimethylbenzene		0.90 (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.2)	U (0.20)
SVOC (8270) µg/l							
Benzyl Alcohol		NA	NA	NA	NA	6.5 (2.0)	NA
Naphthalene	1,460	NA	NA	NA	NA	1.8 (0.53)	NA
2-Methylnaphthalene		NA	NA	NA	NA	0.96 (0.67)	NA
Fluoranthene	1,460	NA	NA	NA	NA	U (0.89)	NA
Pyrene	1,100	NA	NA	NA	NA	U (0.84)	NA
Benzo [a] anthracene		NA	NA	NA	NA	U (0.69)	NA
Chrysene		NA	NA	NA	NA	U (0.70)	NA
Bis (2-Ethylhexyl) phthalate	6.8	NA	NA	NA	NA	37.2 (0.92)	NA
TPH (8015) mg/l	**PSTD A.L. mg/l**						
Nonvolatile	5	NA	NA	NA	NA	3.7 (0.30)	NA
Volatile	5	NA	NA	NA	NA	0.050 (0.05)	NA

Notes: PSTD A.L. = Petroleum Storage Tank Division Action Level; RRS#2 = TNRCC Risk Reduction Standard #2, section 335, App. II; NA = sample not taken and analyzed; Values within parentheses are method detection limits

▨ Contaminant exceeds TNRCC's RRS#2

U = contaminant not detected based on method detection limit

TABLE 5-4
VOCs, SVOCs, and TPH - Water Sample Analytical Results

Water Sample Sample No. Date Sampled	RRS#2 GW µg/l	225W S60790-47 23 Sept 96	226W S60790-50 24 Sept 96	237W S60778-62 21 Sept 96	241W S60778-53 20 Sept 96	257W S60778-51 20 Sept 96	259W S60778-52 20 Sept 96
VOC (8260) µg/l							
Vinyl Chloride	2	U (0.2)	U (0.2)	U (0.24)	U (0.24)	U (0.24)	U (0.24)
Methylene Chloride	5	U (0.2)	U (0.2)	U (0.22)	U (0.22)	U (0.22)	72.9 (0.22)
1,1-Dichloroethene	7	U (0.2)	U (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.20)
1,1-Dichloroethane	3,650	U (0.2)	U (0.2)	U (0.20)	U (0.20)	U (0.20)	0.65 (0.20)
Chloroform	100	U (0.2)	U (0.2)	U (0.20)	U (0.20)	U (0.20)	3.4 (0.20)
1,2-Dichloroethane	5	U (0.3)	U (0.3)	U (0.31)	U (0.31)	U (0.31)	2.5 (0.31)
Bromodichloromethane	100	U (0.2)	U (0.2)	U (0.20)	U (0.20)	U (0.20)	0.28 (0.20)
1,2-Dichloropropane	5	U (0.2)	U (0.2)	U (0.20)	3.8 (0.20)	U (0.20)	10.6 (0.20)
Trichloroethene	5	0.92 (0.3)	1.9 (0.3)	U (0.25)	0.51 (0.25)	U (0.25)	4.4 (0.25)
Benzene	5	0.45 (0.2)	0.92 (0.2)	U (0.20)	1.5 (0.20)	19.6 (0.20)	3.3 (0.20)
Tetrachloroethene	5	U (0.3)	U (0.3)	U (0.25)	U (0.25)	U (0.25)	U (0.25)
Toluene	1,000	U (0.5)	U (0.5)	U (0.50)	U (0.50)	U (0.50)	U (0.50)
Chlorobenzene	100	U (0.5)	U (0.5)	U (0.50)	U (0.50)	U (0.50)	U (0.50)
Ethyl benzene	700	U (0.2)	U (0.2)	U (0.20)	0.39 (0.20)	0.27 (0.20)	0.64 (0.20)
Xylene (total)	10,000	U (0.2)	U (0.2)	U (0.20)	U (0.20)	1.3 (0.20)	1.9 (0.20)
sec-Butylbenzene		U (0.2)	U (0.2)	U (0.20)	0.21 (0.20)	U (0.20)	U (0.20)
tert-Butylbenzene		U (0.2)	U (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.20)
1,2-Dichlorobenzene	600	1.2 (0.2)	8.6 (0.2)	U (0.24)	U (0.24)	U (0.24)	0.26 (0.24)
1,4-Dichlorobenzene	75	0.25 (0.2)	2.0 (0.2)	2.1 (0.20)	0.35 (0.20)	U (0.20)	2.4 (0.20)
cis-1,2-Dichloroethene	70	1.8 (0.2)	3.7 (0.2)	U (0.20)	2.6 (0.20)	U (0.20)	1.8 (0.20)
trans-1,2-Dichloroethene	100	U (0.3)	0.94 (0.3)	U (0.29)	U (0.29)	U (0.29)	U (0.29)
Isopropylbenzene		U (0.2)	0.26 (0.2)	U (0.20)	U (0.20)	0.47 (0.20)	0.50 (0.20)
4-Isopropyltoluene		U (0.2)	U (0.2)	0.23 (0.20)	U (0.20)	U (0.20)	U (0.20)
Naphthalene	1,460	U (1)	U (1)	62.3 (1.3)	U (1.3)	U (1.3)	U (1.3)
n-Propylbenzene		U (0.2)	U (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.20)
1,2,4-Trimethylbenzene		U (0.2)	U (0.2)	U (0.20)	U (0.20)	U (0.20)	0.81 (0.20)
1,3,5-Trimethylbenzene		U (0.2)	U (0.2)	U (0.20)	U (0.20)	U (0.20)	U (0.20)
SVOC (8270) µg/l							
Benzyl Alcohol		NA	NA	NA	NA	NA	NA
Naphthalene	1,460	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene		NA	NA	NA	NA	NA	NA
Fluoranthene	1,460	NA	NA	NA	NA	NA	NA
Pyrene	1,100	NA	NA	NA	NA	NA	NA
Benzo [a] anthracene		NA	NA	NA	NA	NA	NA
Chrysene		NA	NA	NA	NA	NA	NA
bis (2-Ethylhexyl) phthalate	6.8	NA	NA	NA	NA	NA	NA
TPH (8015) mg/l	**PSTD A.L. mg/l**						
Nonvolatile	5	NA	NA	NA	NA	NA	NA
Volatile	5	NA	NA	NA	NA	NA	NA

Notes: PSTD A.L. = Petroleum Storage Tank Division Action Level; RRS#2 = TNRCC Risk Reduction Standard #2, section 335, App. II; NA = sample not taken and analyzed; Values within parentheses are method detection limits

▨ Contaminant exceeds TNRCC's RRS#2

U = contaminant not detected based on method detection limit

TABLE 5-4

VOCs, SVOCs, and TPH-Water Sample Analytic Results

Water Sample **Sample No.** **Date Sampled**	**RRS#2** **GW** **µg/l**	**261W** **S60790-46** **23 Sept 96**	**279W** **S60790-45** **23 Sept 96**
VOC (8260) µg/l			
Vinyl Chloride	2	U (0.2)	U (0.2)
Methylene Chloride	5	U (0.2)	U (0.2)
1,1-Dichloroethene	7	U (0.2)	U (0.2)
1,1-Dichloroethane	3,650	U (0.2)	U (0.2)
Chloroform	100	U (0.2)	U (0.2)
1,2-Dichloroethane	5	U (0.3)	U (0.3)
Bromodichloromethane	100	U (0.2)	U (0.2)
1,2-Dichloropropane	5	U (0.2)	U (0.2)
Trichloroethene	5	U (0.3)	U (0.3)
Benzene	5	U (0.2)	U (0.2)
Tetrachloroethene	5	U (0.3)	U (0.3)
Toluene	1,000	U (0.5)	U (0.5)
Chlorobenzene	100	U (0.5)	U (0.5)
Ethyl benzene	700	U (0.2)	U (0.2)
Xylene (total)	10,000	U (0.2)	U (0.2)
sec-Butylbenzene		U (0.2)	U (0.2)
tert-Butylbenzene		U (0.2)	U (0.2)
1,2-Dichlorobenzene	600	U (0.2)	U (0.2)
1,4-Dichlorobenzene	75	0.32 (0.2)	U (0.2)
cis-1,2-Dichloroethene	70	1.1 (0.2)	U (0.2)
trans-1,2-Dichloroethene	100	U (0.3)	U (0.3)
Isopropylbenzene		U (0.2)	U (0.2)
4-Isopropyltoluene		U (0.2)	U (0.2)
Naphthalene	1,460	U (1)	1.9 (1)
n-Propylbenzene		U (0.2)	U (0.2)
1,2,4-Trimethylbenzene		U (0.2)	U (0.2)
1,3,5-Trimethylbenzene		U (0.2)	U (0.2)
SVOC (8270) µg/l			
Benzyl Alcohol		NA	NA
Naphthalene	1,460	NA	NA
2-Methylnaphthalene		NA	NA
Fluoranthene	1,460	NA	NA
Pyrene	1,100	NA	NA
Benzo [a] anthracene		NA	NA
Chrysene		NA	NA
bis (2-Ethylhexyl) phthalate	6.8	NA	NA
TPH (8015) mg/l	**PSTD** **A.L.** **mg/l**		
Nonvolatile	5	NA	NA
Volatile	5	NA	NA

Notes: PSTD A.L. = Petroleum Storage Tank Division Action Level; RRS#2 = TNRCC Risk Reduction Standard #2, section 335, App. II; NA = sample not taken and analyzed; Values within parentheses are method detection limits

▨ Contaminant exceeds TNRCC's RRS#2

U = contaminant not detected based on method detection limit

TABLE 5-5
Total Metals Water Sample Analytical Results

Water Sample	**RRS#2**	**154W**	**222W-2**
Sample No.	**GW**	**S60790-54**	**S60790-53**
Date Sampled	**mg/l**	**24 Sept 96**	**24 Sept 96**
Total Metals (mg/l)			
Arsenic (7060A)	0.05	U (0.002)	0.03 (0.002)
Barium (6010A)	2	0.1 (0.002)	0.2 (0.002)
Cadmium (6010A)	0.005	U (0.004)	0.005 (0.004)
Chromium (6010A)	0.1	0.01 (0.01)	0.03 (0.01)
Lead (6010A)	0.015	U (0.02)	0.3 (0.02)
Mercury (7471A)	0.002	U (0.0002)	U (0.0002)
Selenium (7740A)	0.05	U (0.002)	U (0.002)
Silver (6010A)	0.183	U (0.005)	U (0.005)

Notes
U = contaminant not detected based on method detection limit
Values within parentheses are method detection limits
▨ Contaminant exceeds TNRCC's RRS#2

5.3 Data Quality Review

A Data Quality Review for the results of the chemical analyses of the soil and groundwater samples collected during the RI field activities was performed by the USACE, Tulsa District. The Data Quality Review concluded that the data generated during the RI is complete and adequate for its intended purpose, a Preliminary Remedial Investigation Report. A copy of the Data Quality Review is presented as Appendix D.

Section 6

Nature and Extent of Contamination

6. Nature and Extent of Contamination

This section of the report discusses the types of contaminant constituents found during the field investigation and their occurrence across the site.

6.1 VOCs

VOC compounds were detected in both soil and groundwater samples. The presence of VOC compounds within site soils appears relatively minor. VOCs were reported for only four of 20 soil samples, from three borings (SL219-6, SL219-10, SL225, and SL259). None of the detected VOC concentrations exceed the respective TNRCC Risk Reduction Standard #2(RRS#2) for groundwater protection at industrial facilities (GWP-Ind). Two of the soil samples were collected from the ground surface. The detected VOC concentrations (for toluene) do not exceed the TNRCC RRS#2 for soil/air ingestion for industrial use (SAI-Ind). Therefore, based upon the soil samples collected during the field investigation, VOC contamination of site soils does not appear to be a concern.

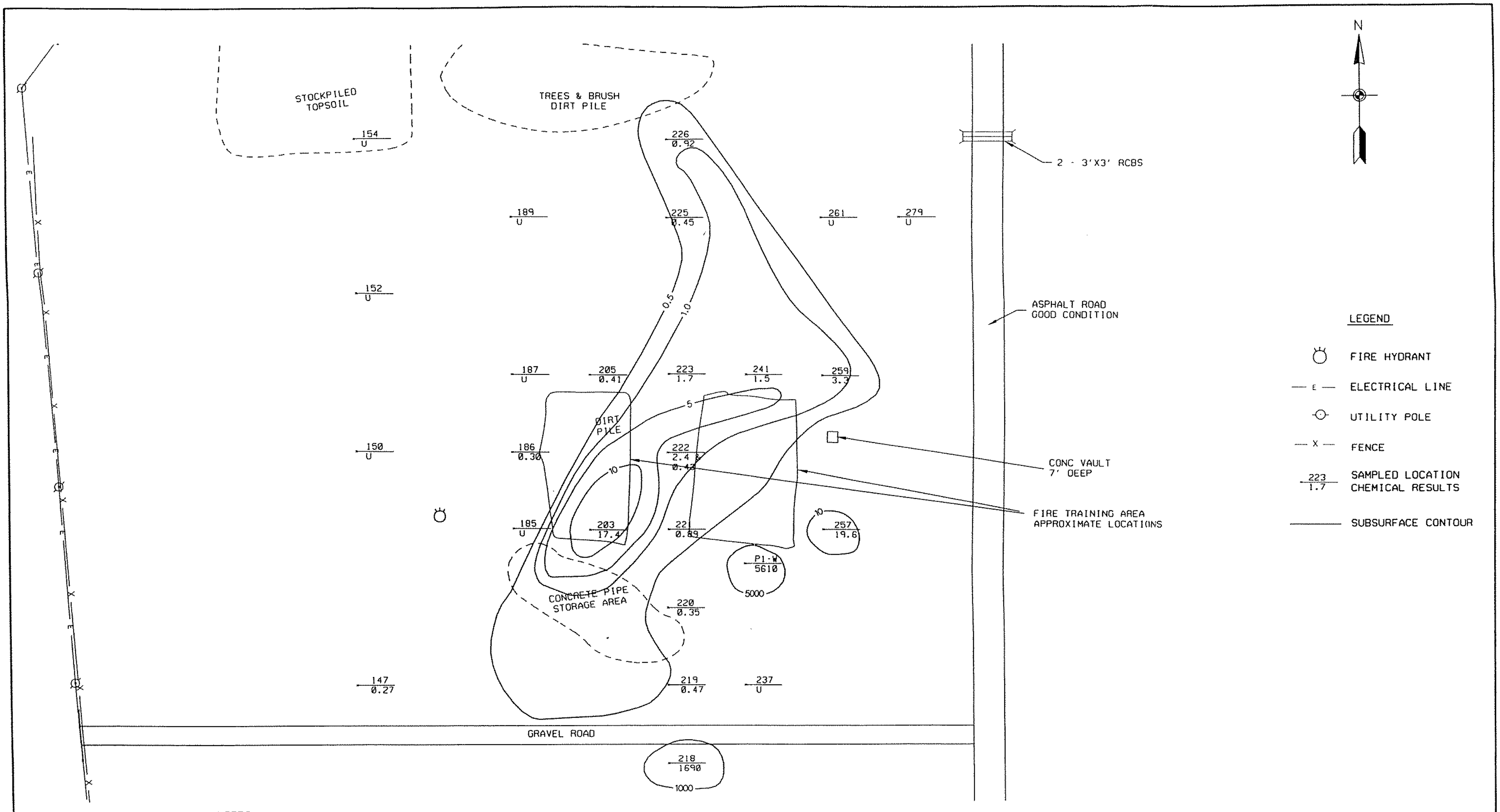
VOC compounds were detected in 25 of the 26 groundwater samples collected during the field investigation (samples PIW, 147W, 152W, 154W, 185W, 186W, 187W, 189W, 203W, 205W, 218W, 219W, 220W, 221W, 222W, 222W-2, 223W, 225W, 226W, 237W, 241W, 257W, 259W, 261W, and 279W). Ten of the samples (PIW, 185W, 186W, 187W, 203W, 205W, 218W, 223W, 257W, and 259W) contained one or more VOC compounds at concentrations that exceed the applicable TNRCC RRS#2 standards for groundwater (GW). These samples were collected generally within or adjacent to the two burn pits at the FTA. Sample 218W was collected approximately 150 feet south of the burn pits. The compounds exceeding the GW RRS#2 were benzene, TCE, tetrachloroethene (PCE), toluene, 1,2-dichloropropane, and methylene chloride. These compounds (as well as others) were detected in other groundwater samples, although at concentrations not exceeding the GW RRS#2. Based upon the groundwater samples collected during the field investigation, VOC contamination of site groundwater does appear to be a concern.

Maps illustrating the detected concentrations of benzene, TCE, and PCE in groundwater are presented as Figures 6-1, 6-2, and 6-3, respectively. It is noted that the benzene, TCE, and PCE plumes each appear to extend northward from the burn pit area. This is consistent with the apparent direction of groundwater flow (Figure 4-2), as well as the general trend of the surface topography. It is also noted that the general trend of the plumes generally correspond with areas of apparently stained soils visible on historical aerial photographs. The nature and extent of the VOC contamination appears to be well defined by the existing data.

6.2 SVOCs

SVOC compounds were detected in only two of the 20 soil samples analyzed for SVOCs. One sample, SL219, is a surface soil (one foot depth, maximum) sample collected approximately 100 feet south of the burn pits. The sample exhibited detectable concentrations of five compounds—fluoranthene, pyrene, benzo(a)anthracene, chrysene, and bis(2-ethylhexyl)phthalate. The concentrations for fluoranthene, pyrene, and bis(2-ethylhexyl)phthalate do not exceed the applicable TNRCC GWP-Ind or SAI-Ind RRS#2 standards. The second soil sample, SL274-10, collected approximately 60 feet southeast of the burn pits, exhibited a detectable concentration of bis(2-ethylhexyl)phthalate. The concentration of bis(2-ethylhexyl)phthalate is below the applicable TNRCC GWP-Ind RRS#2 standard. Therefore, based upon the soil samples collected during the field investigation, SVOC contamination of site soils does not appear to be a concern.

During the field investigation, only one groundwater sample, 222W-2, located at the center of the FTA, was analyzed for SVOCs. Four SVOC compounds—benzyl alcohol, naphthalene, 2-methylnaphthalene, and bis(2-ethylhexyl)phthalate—were detected. Only the concentration for bis(2-ethylhexyl)phthalate exceeds the applicable TNRCC GW RRS#2 standard. It should be noted that bis(2-ethylhexyl)phthalate is a common laboratory contaminant and may not be related to past site activities. Based upon this one groundwater sample, SVOC contamination of site groundwater appears to be a concern. However, because only one groundwater sample was analyzed for SVOCs, the extent of the contamination has not been determined.



NOTES:

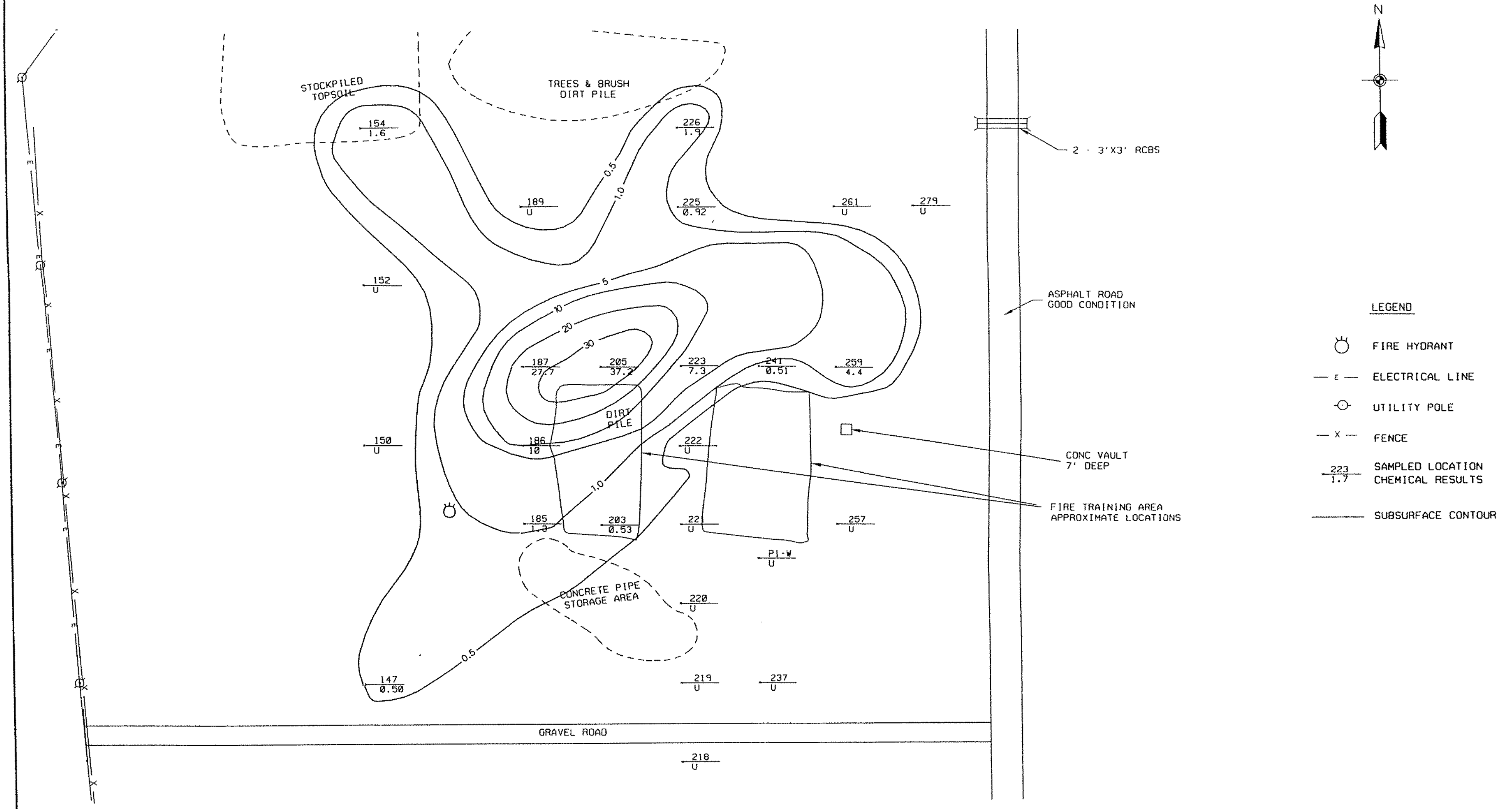
UNDERGROUND UTILITIES WERE LOCATED BY FIELD SURVEY OF SURFACE EVIDENCE AND UTILITY SITE PLANS AS PROVIDED. ACTUAL LOCATION SHOULD BE OBTAINED PRIOR TO EXCAVATION.

FIELD DATA RECORDED IN ELECTRONIC DATA COLLECTOR BOOK

60 30 0 60 FT

SCALE: 1"= 60'

Figure 6-1
Water Sample Results For Benzene (ug/l)
Fire Training Area Site
Former Laredo Air Force Base, Texas

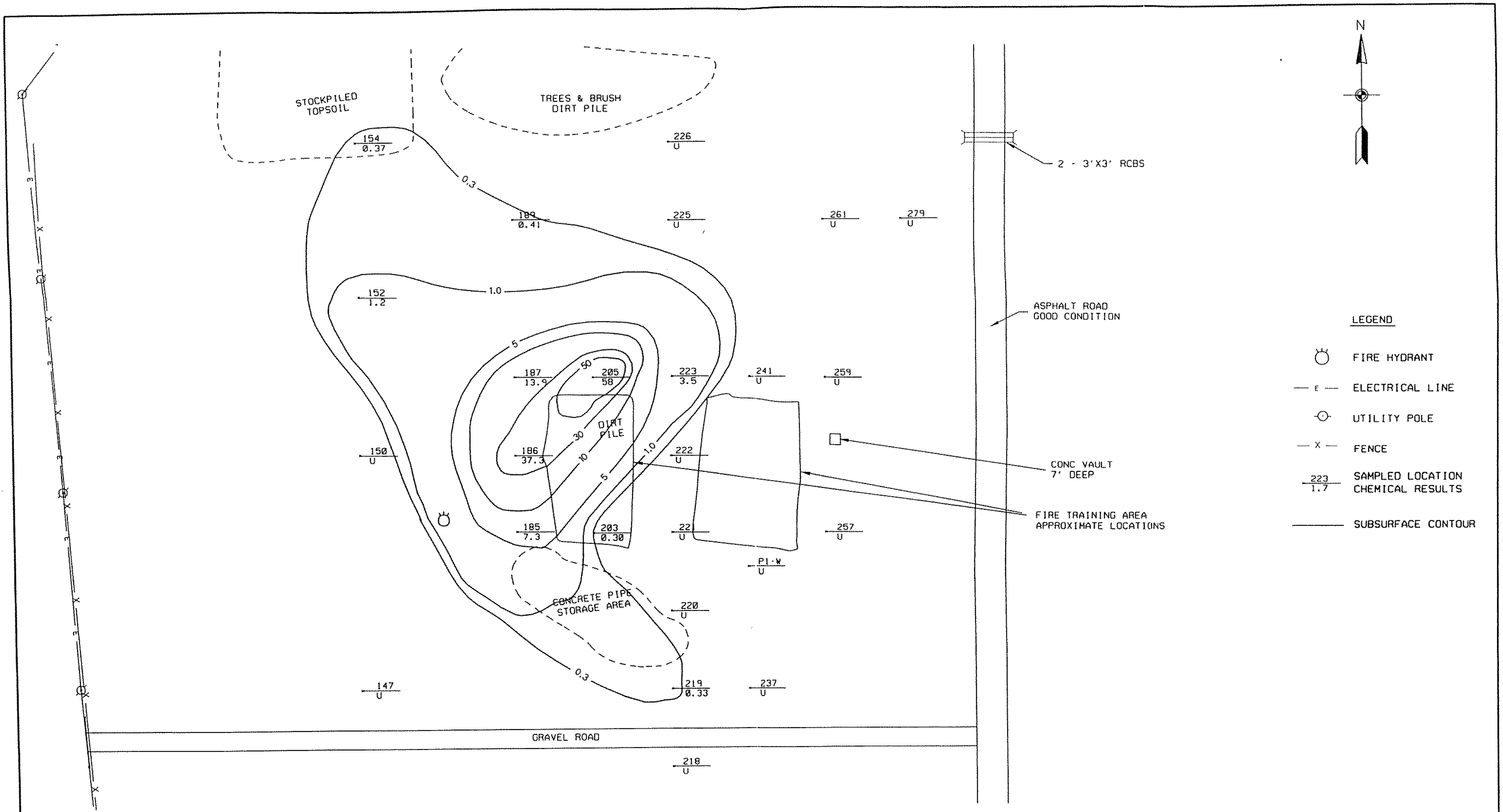


NOTES:

UNDERGROUND UTILITIES WERE LOCATED BY FIELD SURVEY OF SURFACE EVIDENCE AND UTILITY SITE PLANS AS PROVIDED. ACTUAL LOCATION SHOULD BE OBTAINED PRIOR TO EXCAVATION.

FIELD DATA RECORDED IN ELECTRONIC DATA COLLECTOR BOOK

Figure 6-2
Water Sample Results For
Trichloroethene (ug/l)
Fire Training Area Site
Former Laredo Air Force Base, Texas



NOTES:

UNDERGROUND UTILITIES WERE LOCATED BY FIELD SURVEY OF SURFACE EVIDENCE AND UTILITY SITE PLANS AS PROVIDED. ACTUAL LOCATION SHOULD BE OBTAINED PRIOR TO EXCAVATION.

FIELD DATA RECORDED IN ELECTRONIC DATA COLLECTOR BOOK

60 30 0 60 FT

SCALE: 1"= 60'

Figure 6-3
Water Sample Results For
Tetrachloroethene (ug/l)
Fire Training Area Site
Former Laredo Air Force Base, Texas

6.3 BTEX

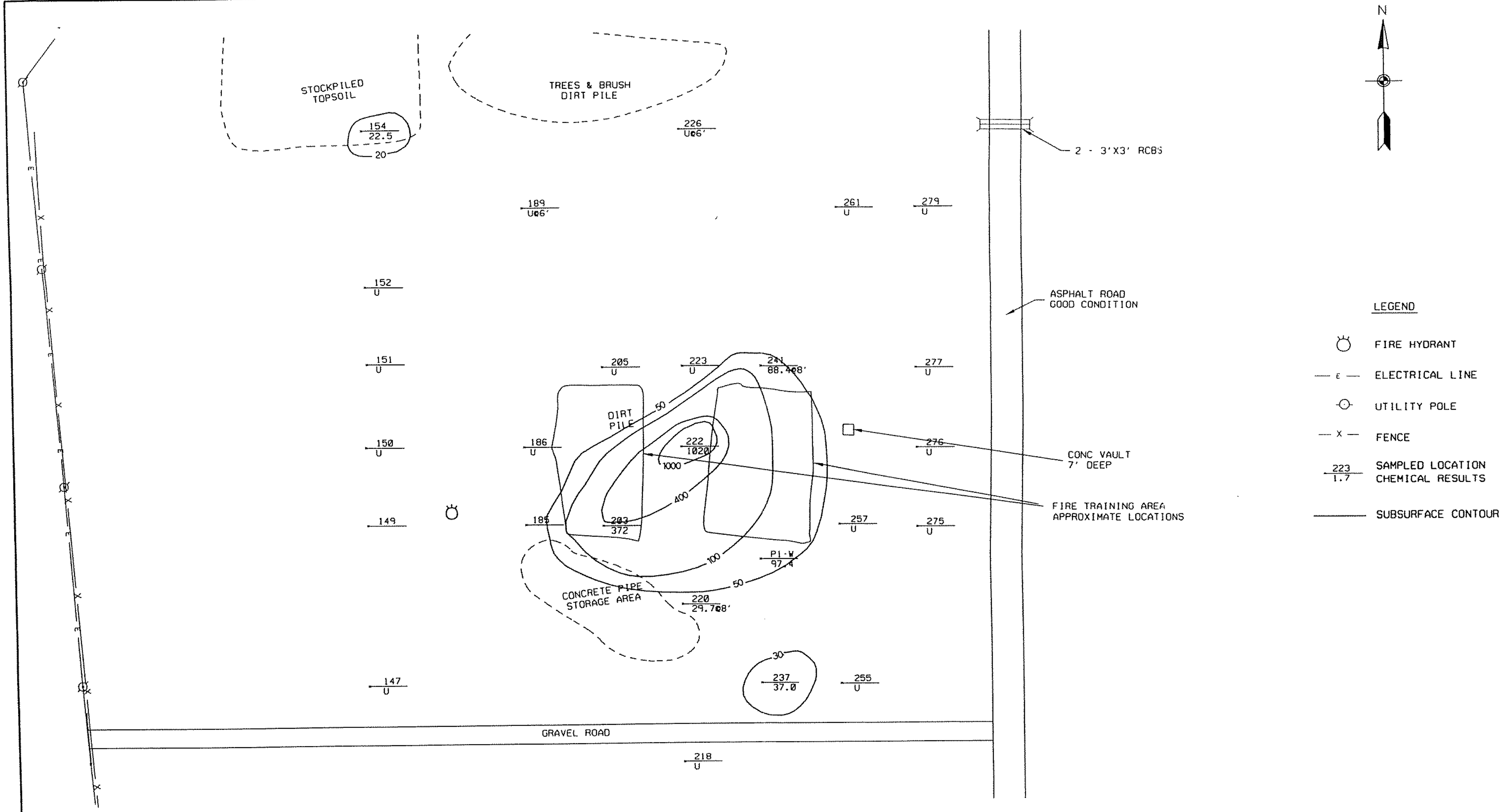
Of the 61 soil samples analyzed for BTEX, benzene, ethylbenzene, and xylenes were not detected. Detectable concentrations of toluene were detected in only six samples (SL152, SL154, SL203, SL218, SL226, and SL275). These samples are surface soil samples, collected from across the FTA site. Their locations do not appear to exhibit any particular pattern, other than being surface samples. None of the detected toluene concentrations exceeded the applicable TNRCC GWP-Ind or SAI-Ind RRS#2 standards. Based upon these analytical results, BTEX contamination of site soils does not appear to be a concern.

No groundwater samples collected during the field activities were analyzed for BTEX parameters. The samples were analyzed for VOCs instead, which includes the BTEX parameters. See Section 6.1 for information on the BTEX compounds.

6.4 TPH

Thirty-one of the 61 soil samples analyzed for TPH were reported to contain non-volatile TPH. Three of these samples were also reported to contain volatile TPH. None of the detected volatile TPH concentrations exceeded the applicable TNRCC GWP-Ind standard for volatile TPH. There is no TNRCC RR#2 standard for non-volatile TPH, so the analytical results for non-volatile TPH were compared to the TNRCC Petroleum Storage Tank Division, Risk Based Corrective Action levels (PST-RBCA). Three of the samples, SL222, SL222-5, and SL 241, for which non-volatile TPH was detected exceed the TNRCC PST-RBCA standard for non-volatile TPH. These samples were collected from two borings located between the two burn pits and adjacent to the eastern burn pit. Based upon these analytical results, TPH contamination of site soils appears to be a concern, at least in the immediate vicinity of the burn pits to a depth of approximately 5 feet. Maps illustrating the detected concentrations of non-volatile TPH at depths of 5 feet bgs and 10 feet bgs are presented as Figures 6-4, and 6-5, respectively.

During the field investigation, only two groundwater samples, 154W (located approximately 200 feet northwest of the burn pits) and 222W-2 (located between the two burn pits), were analyzed for TPH. Non-volatile TPH was detected in both samples, and volatile TPH was detected only in sample 222W-2. For both samples, the detected TPH



NOTES:

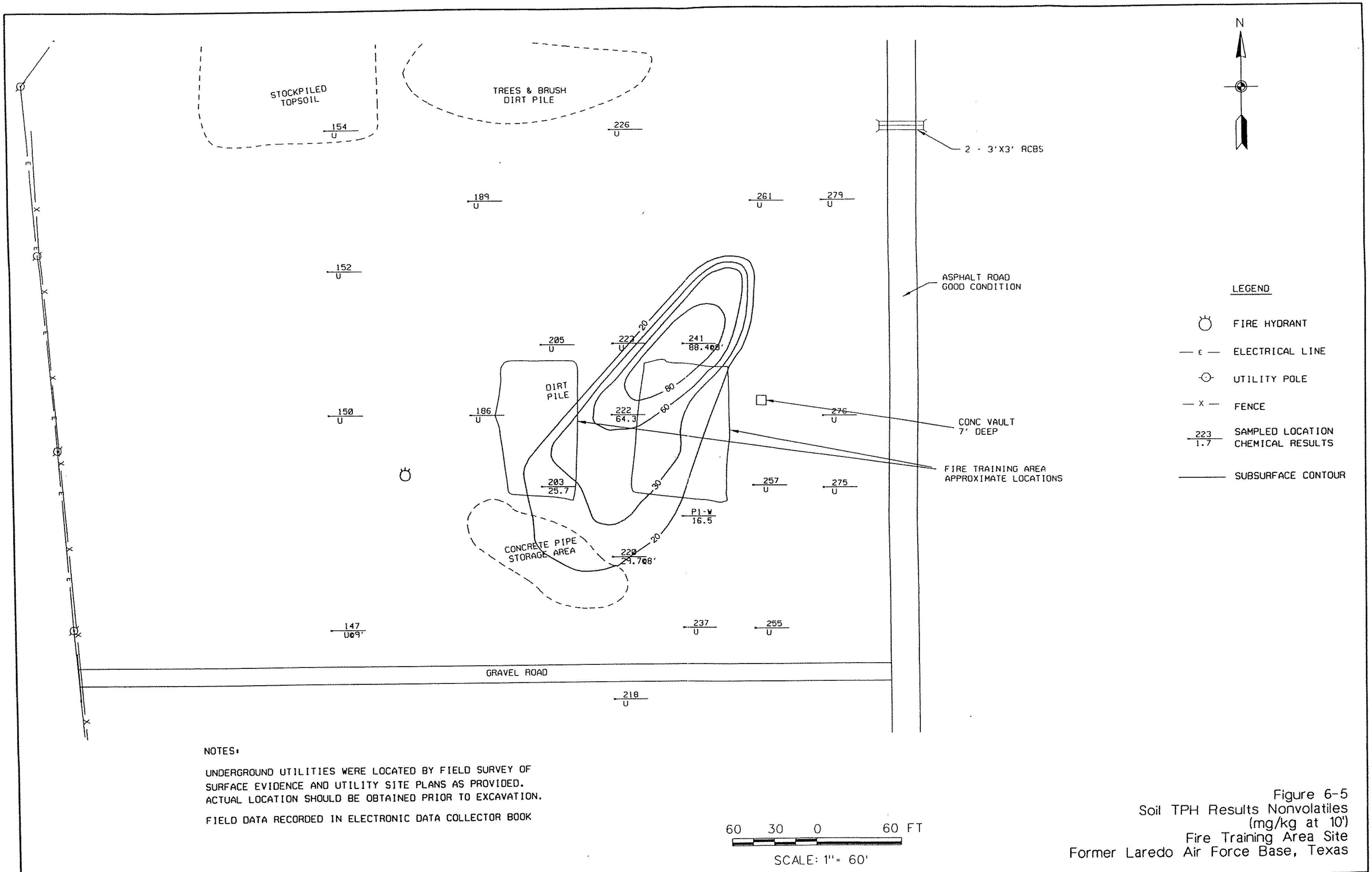
UNDERGROUND UTILITIES WERE LOCATED BY FIELD SURVEY OF SURFACE EVIDENCE AND UTILITY SITE PLANS AS PROVIDED. ACTUAL LOCATION SHOULD BE OBTAINED PRIOR TO EXCAVATION.

FIELD DATA RECORDED IN ELECTRONIC DATA COLLECTOR BOOK

60 30 0 60 FT

SCALE: 1"= 60'

Figure 6-4
Soil TPH Results Nonvolatiles
(mg/kg at 5')
Fire Training Area Site
Former Laredo Air Force Base, Texas



NOTES:

UNDERGROUND UTILITIES WERE LOCATED BY FIELD SURVEY OF SURFACE EVIDENCE AND UTILITY SITE PLANS AS PROVIDED. ACTUAL LOCATION SHOULD BE OBTAINED PRIOR TO EXCAVATION.

FIELD DATA RECORDED IN ELECTRONIC DATA COLLECTOR BOOK

Figure 6-5
Soil TPH Results Nonvolatiles
(mg/kg at 10')
Fire Training Area Site
Former Laredo Air Force Base, Texas

concentrations are within the TNRCC GW RRS#2 and PST-RBCA standards. However, because only two groundwater samples were analyzed for TPH, whether or not TPH contamination of site groundwater is a concern can not be determined.

6.5 Metals

Nineteen soil samples were analyzed for total RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). Additionally, 66 other soil samples were analyzed for total lead. A discussion for each of the metals in site soil samples follows.

Arsenic was detected in all 19 soil samples analyzed. Sixteen of the soil samples exceed the applicable TNRCC GWP-Ind and/or SAI-Ind RRS#2 standards (5 mg/kg and 3.27 mg/kg, respectively). There does not appear to be any relationship between arsenic concentration and sample depth. The samples were collected from across the site, with no apparent relationship between arsenic concentration and sample location.

Barium was also detected in all 19 soil samples analyzed. Four of the soil samples exceed the applicable TNRCC GWP-Ind RRS#2 standard (200 mg/kg). All four soil samples are surface soil samples, but are below the applicable TNRCC SAI-Ind standard (137,000 mg/kg). The barium concentrations appear to generally decrease with depth in each boring.

Cadmium was detected in 17 of the soil samples analyzed. Sixteen of the 17 samples exceed the TNRCC GWP-Ind RRS#2 standard (0.5 mg/kg). None of the surface soil samples exceed the applicable TNRCC SAI-Ind standard (1,020 mg/kg). The cadmium concentrations do not appear to generally increase or decrease with depth in each boring.

Chromium was detected in all 19 of the soil samples analyzed. Four of the 19 samples exceed the TNRCC GWP-Ind RRS#2 standard (10 mg/kg). None of the surface soil samples exceed the applicable TNRCC SAI-Ind standard (5,110 mg/kg). The chromium concentrations do not appear to generally increase or decrease with depth in each boring.

A total of 85 soil samples were analyzed for lead. Lead was detected in 77 of the 85 soil samples analyzed. All of the detected lead concentrations exceed the TNRCC GWP-Ind RRS#2 standard (1.5 mg/kg). None of the surface soil samples exceed the applicable TNRCC SAI-Ind standard (1,000 mg/kg). The lead concentrations generally are greater in the burn pit areas, and are greater at the ground surface, generally decreasing with depth in each boring.

Mercury was detected in 9 of the 19 soil samples analyzed. Only two of the 19 samples exceed the TNRCC GWP-Ind RRS#2 standard (0.2 mg/kg). None of the surface soil samples exceed the applicable TNRCC SAI-Ind standard (613 mg/kg). The mercury concentrations do not appear to generally increase or decrease with depth in each boring.

Selenium was detected in five of the soil samples analyzed. None of the 19 samples exceed the applicable TNRCC GWP-Ind or TNRCC SAI-Ind RRS#2 standard (5 mg/kg and 10,200 mg/kg, respectively).

Silver was not detected in any of the 19 soil samples analyzed.

Only two groundwater samples were analyzed for total RCRA metals. Only barium and chromium were detected in sample 154W. Neither concentration exceeds the TNRCC GW RRS#2 standard (2 mg/L and 0.1 mg/L for barium and chromium, respectively). Arsenic, barium, cadmium, chromium, and lead were detected in sample 222W-2. Only the concentration for lead (0.3 mg/L) exceeds the TNRCC GW RRS#2 standard (0.015 mg/L for lead). Because of the limited number of groundwater samples analyzed for metals in groundwater, no conclusions concerning the extent of metals contamination in groundwater can be made at this time.

6.6 Constituents of Potential Concern

This section summarizes the constituents identified within the soils or groundwater at the FTA site which exceed the TNRCC RRS#2 standards. These constituents are considered to be the constituents of potential concern (COPCs) for the site. It is noted that the results of further investigations may add or delete COPCs from this list.

6.6.1 Soils

Surface soils- Constituents of potential concern within the surface soils include arsenic, barium, cadmium, chromium, lead, mercury, and TPH. Of these, only lead and TPH appear to be of significant concern, because of the number and extent of soil samples reported to contain lead and TPH at concentrations significantly above appropriate standards. Arsenic, barium, cadmium, chromium and mercury may be deleted as COPCs after comparison to background values or after further sampling indicates that the reported concentrations of these constituents that are above RRS are anomalies or are true indications of anthropogenic contamination.

Subsurface soils- Constituents of potential concern in the soil column (from 2 ft bgs to the water table) include arsenic, cadmium, chromium, lead, and TPH. As stated for surface soils, lead and TPH appear to be of significant concern because of the number and extent of the soil samples reported to contain lead and TPH at concentrations significantly above appropriate standards

6.6.2 Groundwater

Metals- Because only two groundwater samples were analyzed for metals, the potential for metals constituents to be COPCs in groundwater can not be assessed at this time.

VOCs- Soluble components of fuel and fuel related products must be considered as COPCs (for instance, benzene, toluene, ethyl benzene and xylenes). Of these four constituents, only benzene and toluene were reported at concentrations significantly exceeding appropriate standards in one or more groundwater samples. The chlorinated solvents TCE, PCE, 1,2-dichloropropane, and methylene chloride are also considered to be COPCs. All four compounds were reported at concentrations exceeding appropriate standards in one or more groundwater samples. TCE and PCE were reported in several groundwater samples. 1,2-Dichloropropane was reported for four samples. Methylene chloride was reported for only one sample. It is noted that methylene chloride is a common laboratory contaminant. Further investigation may delete methylene chloride as a COPC. Several other VOC compounds were detected in one or more groundwater samples at concentrations that do not exceed appropriate standards. Some of these compounds may be added as COPCs if further sampling indicates concentrations of these constituents that are above the appropriate standards.

SVOCs- Because only one groundwater sample was analyzed for the presence of SVOC compounds, no statement regarding SVOCs as COPCs at the FTA site can be made at this time. Further investigation is required before any selection of SVOCs as COPCs can be made.

TPH- Because only two groundwater samples were analyzed for the presence of TPH, no definitive statement regarding TPH as a COPC can be made at this time.

The COPCs for the FTA are summarized below:

Metals/Inorganics	Volatile Organics	Others
Arsenic	Benzene	TPH
Barium	Toluene	
Cadmium	Ethylbenzene	
Chromium	Xylenes	
Lead	TCE	
Mercury	PCE	
	1,2-Dichloropropane	
	Methylene Chloride	

Section 7
Applicable or Relevant and Appropriate Requirements

7. Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121 (d)(2)(A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), incorporates into the law the CERCLA compliance policy. This policy specifies that Superfund remedial actions meet any federal standards, requirement, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). Also included is a provision requiring that state ARARs be met if they are more stringent than federal requirements only to the point where state ARARs are consistently enforced. The purpose of this requirement is to make CERCLA response actions consistent with other pertinent federal and state environmental requirements. Although the site investigated during this RI is not a CERCLA Superfund project, all investigation and reporting will meet CERCLA standards.

Under SARA, an ARAR is defined as follows:

- Any standard, requirement, criterion, or limitation under federal environmental law.
- Any promulgated standard, requirement, criteria, or limitation under a state environmental or facility siting law that is more stringent than the associated federal standard, requirement, criterion, or limitation.

The preliminarily identified ARARs associated with this RI of the FTA are presented in Tables 7-1 and Table 7-2.

Table 7-1

Potential Federal Applicable or Relevant and Appropriate Requirements

Fire Training Area, Former Laredo Air Force Base, Texas

Potential ARAR	Description
Alternate Cleanup Levels (RCRA 40CFR 264.94)	Establishes alternate cleanup levels (ACLs) for public water systems
DOT Rules for Transportation of Hazardous Materials (DOT) 40 CFR 107)	Provides regulations for the transport of hazardous waste on the highway system, rail system, by water, or by air.
Federal Water Quality Standards Regulations (CWA 40 CFR Part 131)	Establishes methods and requirements for states in the development of ambient water quality criteria for the protection of aquatic organisms and/or the protection of human health.
General Pre-treatment Regulations for Existing and New Sources of Pollution for Publicly Owned Treatment Works (POTW) (CWA 40 CFR Parts 401 and 403)	Provides effluent limitation guidelines for existing sources, standards of performance for new sources, and pre-treatment standards for new and existing sources.
Maximum Contaminant Levels (SDWA 40 CFR 141 Subpart B)	Establishes maximum contaminant levels (MCLs) which are heath-based standards for public water systems.
National Pollutant Discharge Elimination System (NPDES) Requirements (CWA 40 CFR 122)	Regulates discharges of pollutants from any point source into waters of the U.S.
National Emission Standards for Hazardous Air Pollutants (NESHAP) (CAA 40 CFR 61)	Provides national emission standards for listed hazardous air pollutants.
National Ambient Air Quality Standards (NAAQS) (CWA 40 CFR Part 50)	Defines levels of air quality that are necessary to protect the public health.
Occupational Safety and Health Standards for Air Contaminants (OSHA 29 CFR 1910.1000; OSHA 29 CFR 1926)	Provides national standards of worker exposure to listed air contaminants.
RCRA Land Disposal Restrictions (RCRA 40 CFR 268)	Identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may continue to be land disposed.
RCRA Manifesting, Recordkeeping, and Reporting Requirements (RCRA 40 CFR 264 Subpart E)	These standards apply to owners and operators of all facilities which treat, store, or dispose of hazardous waste.

Table 7-1

Potential Federal Applicable or Relevant and Appropriate Requirements

Fire Training Area, Former Laredo Air Force Base, Texas

Potential ARAR	Description
RCRA Standards of Identification and Listing of Hazardous Waste (RCRA 40 CFR 261)	Provides criteria of hazardous versus solid wastes. It also lists characteristics of hazardous waste.
Releases from Solid Waste Management Units (RCRA 40 CFR 264 Subpart G)	Facility owner or operator must close a hazardous waste facility in a way that minimizes the need for further maintenance and controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous constituents to the environment.
Storm water Discharge Requirements National Pollutant Discharge Elimination System (CWA 40 CFR 122.26)	Requirements to obtain a permit under the storm water discharge permit to the NPDES program.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (RCRA 40 CFR 264)	Regulations apply to owners and operators of facilities that treat, store, or dispose of hazardous waste.
Standards applicable to Transporters of Hazardous Waste (RCRA 40 CFR 263)	Establishes the standards which apply to persons transporting hazardous waste within the U.S. if the transportation requires a manifest under RCRA.
Standards Applicable to Generators of Hazardous Waste (RCRA 40 CFR 262, Subparts B, C, and F)	Regulates the manifesting, pre-transport requirements, and record keeping and reporting for hazardous waste generators.

Table 7-2

Potential Texas State Applicable or Relevant and Appropriate Requirements

Fire Training Area, Former Laredo Air Force Base, Texas

Potential ARARs	Description
30 TAC 101.4	Prohibits general nuisance air pollution from any activity.
30 TAC 335	Regulates Industrial Solid Waste and Municipal Hazardous Waste; sets forth Risk Reduction Standards (Subchapter S)

TAC = Texas Administrative Code

Section 8
Summary and Conclusions

8. Summary and Conclusions

8.1 Summary

A field investigation was conducted which included the collection of soil and groundwater samples using the USACE's SCAPS. The SCAPS unit consists of a hydraulically driven cone penetometer, which can be used to obtain soil samples. Temporary piezometers were installed in penetrometer holes to collect water samples and measure groundwater elevations.

8.1.1 Soils

The soil sampling conducted by the Tulsa District USACE focused on lead and TPH. Sixty-one samples were analyzed for lead and the extent of contamination was well established. Lead exceeded the RRS No.2 SAI-Ind in two samples and exceeded the RRS No. 2 GWP-Ind in 61 of the samples. Soil samples (19) were collected and analyzed for other metals including arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver. Reported concentrations for metals other than lead were not significantly elevated above median background soil concentrations in Texas (30 TAC 350.54) and are not indicative of site-related contamination. However, because of the low RRS No. 2 GWP-Ind criteria for these metals, criteria exceedences were reported for all metals except silver and selenium.

For organics, 61 samples were collected for TPH and BETX (Method 8020) and 20 samples were collected for VOC (Method 8260) and SVOCs (Method 8270). Volatiles were not detected in either Method 8020 or Method 8260 samples. For the non-volatile TPH fraction, 13 of the 61 samples had concentrations greater than 100 mg/kg. The SVOC results can not be correlated to the TPH results because these analyses were performed on different sample sets. Given that the petroleum hydrocarbons were used on the site and elevated levels of TPH were reported in soil samples, the nature and extent of SVOCs at the site have not been fully addressed.

8.1.2 Groundwater

During the RI fieldwork, 26 groundwater samples were collected by the SCAPS and analyzed for VOCs by Method 8260. One groundwater sample was collected and analyzed for SVOCs (Method 8270) and two samples for TPH (Method 8015). Elevated concentrations of chlorinated solvents as well as benzene, toluene, and xylenes were reported in these samples. The nature and extent of these compounds appears to be well defined by these existing data. However, the nature and extent of SVOC contamination was not adequately addressed.

8.2 Recommendations for Additional Sampling/Analysis

Presently, there is not adequate data to fully characterize the site or support a Risk Assessment. Additional investigations will be required to reach these goals. Following are suggestions for additional sampling and analysis.

8.2.1 Soils

Additional soil sampling at the Fire Training Areas is recommended to address the following issues:

- Confirm the maximum observed concentrations of lead in soils
- Re-evaluate the potential for site soils to impact groundwater by collecting and analyzing soils by the Synthetic Precipitation Leaching Procedure (SPLP) for metals that exceeded RRS No.2 GWP-Ind on a total concentration basis
- Evaluate the nature and extent of SVOCs in the areas of highest reported non-volatile TPH contamination

To confirm the maximum detections of lead, soil samples should be collected in the proximity of the three locations with the highest reported concentrations of lead in the samples. In order to address the potential for metals in soils to impact groundwater, four samples should be collected in the proximity of the locations showing the highest total metal concentrations in the data and analyzed by SPLP. For SVOCs, samples should be collected and analyzed for total and SPLP SVOCs from 10 locations near the highest observed non-volatile TPH contamination.

Recommendations for additional sampling and analysis are summarized in Table 8-1. The corresponding sample locations are shown on Figure 8-1. The analytical methods should follow those used in the fieldwork performed by the Tulsa District USACE in 1996

TABLE 8-1
Recommended Locations for Additional Soil Sampling
Fire Training Areas - Laredo AFB

	SPLP Extraction and Analysis						
Soil Boring	**Arsenic**	**Barium**	**Cadmium**	**Chromium**	**Lead**	**Mercury**	**SVOC**
SL 147							X(a)
SL 152							X(a)
SL 185	X			X			
SL 187		X					
SL 187-5	X		X			X	
SL 218					X(a)		X(a)
SL 219				X			
SL 203-5							X(a)
SL 221		X					
SL 221-5	X		X	X	X(a)	X	
SL 222							X(a)
SL 222-5				X			X(a)
SL 225-5	X	X	X		X(a)	X	
SL 241					X(a)		X(a)
SL 259		X	X				
SL 274						X	
SL 277							X(a)
SL 279							X(a)
SL PI							X(a)

Notes:
Methods are same as used in previous fieldwork
(a) Total and SPLP analyses

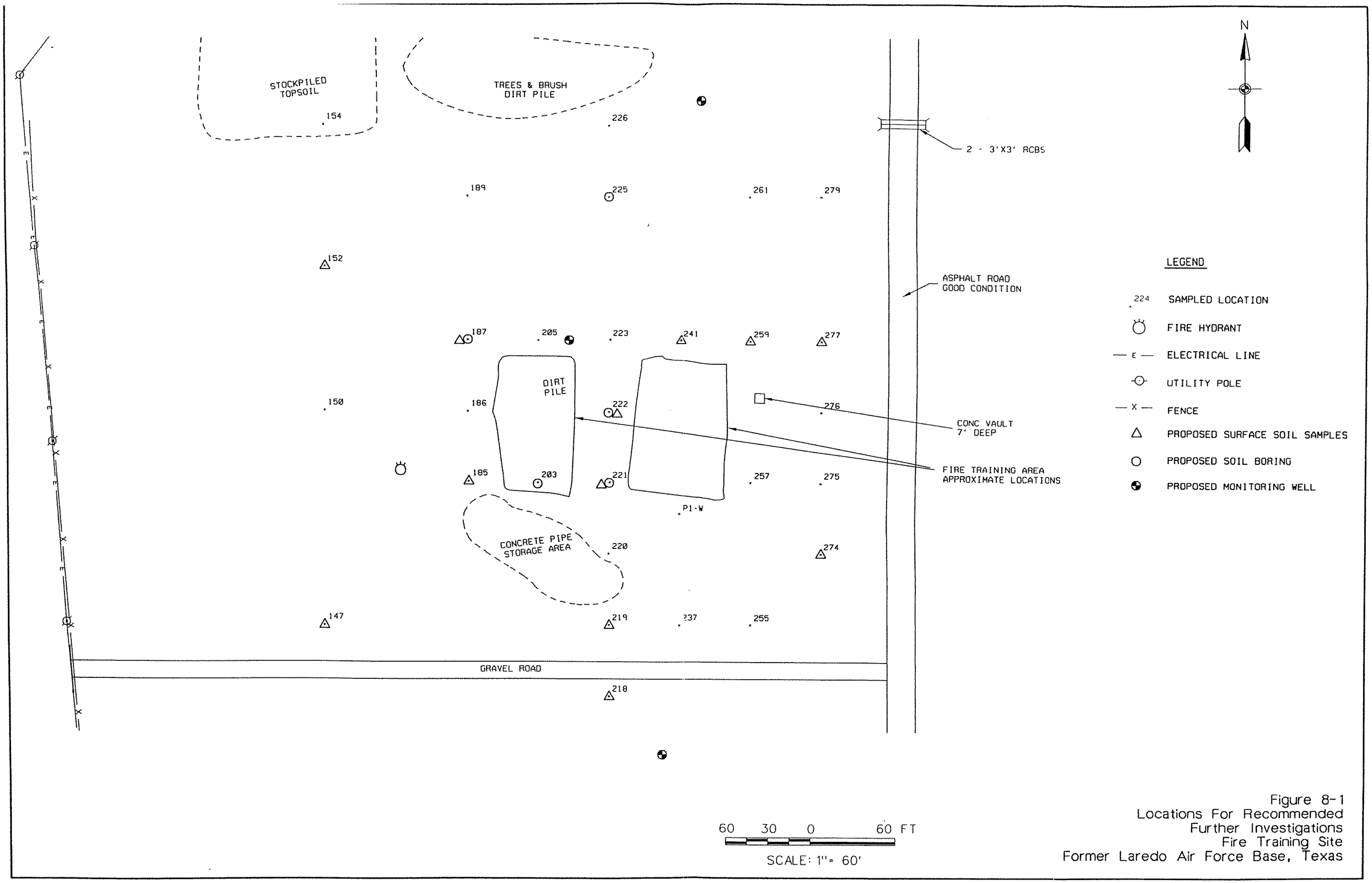


Figure 8-1
Locations For Recommended
Further Investigations
Fire Training Site
Former Laredo Air Force Base, Texas

8.2.2 Groundwater

The nature and extent of SVOC contamination was not adequately addressed during the investigation. Given that TPH was detected in a significant number of soil samples, additional groundwater SVOCs data should be collected.

Existing data for metals in groundwater is limited to two samples collected. Lead exceeded the RRS No. 2 GW-Ind criterion in one of the two samples. Because lead and other metals were frequently detected above the GWP-Ind criteria in site soils, additional data should be collected to assess nature and extent of arsenic, barium, cadmium, chromium, lead and mercury in groundwater. These additional SVOC and metals data should be collected from wells installed in the source areas (as defined by VOCs in groundwater and lead in soil), as well as in the upgradient area and the downgradient area of the site. The proposed locations for the three additional groundwater-monitoring wells are shown on Figure 8-1. Groundwater samples should also be collected and analyzed for the eight RCRA metals, VOCs, and SVOCs using the same methods as in the 1996 fieldwork by the Tulsa District USACE. The groundwater samples should also be collected and analyzed for total dissolved solids (TDS) to determine whether potable or non-potable GW-Ind criteria are appropriate for RRS No. 2 comparisons.

8.2.3 Cost Estimate

An order of magnitude cost estimate for the additional sampling and analysis was prepared and presented in Table 8-2. The cost estimate includes the preparation of workplans, mobilization and demobilization for fieldwork, all fieldwork (drilling, sampling, monitoring well development and sampling), analytical costs, and report preparation. The actual costs will vary depending on the home location of the contractor performing the work, along with other variables. This estimate assumes the work would not necessarily be performed by resources located in Laredo, Texas. This estimate does not include a Risk Assessment.

TABLE 8-2

Cost Estimate

Workplans		$15,000
Field Work		
Analytical	$6,200	
Drilling	8,000	
Equipment	1,600	
Mobil/Demobil	2,000	
Labor	6,000	23,800
Report Preparation		13,000
Total Estimated Cost		**$51,800**

8.3 Recommendations for Risk Assessment

The result of this investigation indicated the presence of contaminants in surface and subsurface soil and in groundwater is at concentrations exceeding TNRCC Risk Reduction Standard criteria. Because of the limited data available, however, the nature and extent of contamination has not been fully determined. It is premature to perform a risk assessment given the data gaps that currently exist. The recommendations for sampling presented in Section 8.2 will fill those data gaps such that adequate chemical characterization data are available to support an assessment of risk.

Future land use for the site has not been firmly established, although paving the entire area for use as a parking lot has been discussed. Paving the site would significantly change the potential for risk associated with the site contamination because several exposure pathways that are possible under current conditions would be eliminated.

- Direct contact of adults or children with surface soil containing contaminants (e.g., lead) would be prevented.
- Infiltration of precipitation, which could potentially result in transport of subsurface contamination away from the source area and possibly beyond the site boundary, would be substantially reduced.

- Volatilization of contaminants (such as the chlorinated solvents or benzene) from groundwater would be significantly reduced.
- Future use of groundwater at the site would be unlikely to occur.

Because paving the site will have a significant impact on the number of pathways to be included in the assessment of risk, the decision about future use of the site should be made as soon as possible. If the area is paved for use as a parking lot, the resulting elimination of exposure pathways could make monitored natural attenuation a reasonable solution for the contamination in groundwater.

It would be beneficial to meet with the regulatory agency (TNRCC) to determine: (1) the likelihood that monitored natural attenuation would be considered, and (2) the data needed to support acceptance of the Corrective Measures Study and Closure Plan. The maximum benefit from such a meeting would likely accrue if it occurs prior to implementing the additional field work required to finish defining the nature and extent of contamination so that any additional data needs (such as field attenuation parameters) can be addressed in a single field effort.

Section 9
References

9. References

The following references were utilized in the preparation of this RI Workplan.

Hydrogeologic, Draft Investigation Report: Site Ownership/Operations History, PRP Investigation and Analysis, Former Laredo Air Force Base, 1998.

USCAE, Final Site Investigation Report, Sanitary Landfill, Former Laredo Air Force Base, Laredo, Texas, US Army Corps of Engineers, Tulsa District, 1998.

USACE, Workplan for the Investigation of the Sanitary Landfill at Former Laredo, AFB, US Army Corps of Engineers, Tulsa District, April, 1997.

USACE, Draft RI Report, Fire Training Area, Formerly Used Defense Site-Laredo Air Force Base, Laredo, Texas, US Army Corps of Engineers, Tulsa District, (no date).

Appendix A
Scope of Work

Scope of Work

Remedial Investigation Report at the Former Laredo Air Force Base
Fire Training Area (FTA)
Contract No. DACA56-97-D-0010

Task Order 16

1.0 **GENERAL.** The A-E shall furnish all services, permits, materials, supplies, plant, labor, equipment, disposal, studies, superintendence, travel, and any and all other services as required in connection with the site investigation as contained in this Scope of Work (SOW). The A-E, its subcontractor (s) and appropriate employee (s) of each, hereinafter collectively called the "A-E" or the "contractor", shall be responsible for obtaining and maintaining any registration or certification as required by the various Federal, State, and Local regulatory agencies, and any other registrations, certifications, licenses, permits, warrants, certificates, or other credentials or permissions required to perform these tasks. The contractor shall obey all laws and regulations of the United States, the State of Texas and the local governments having jurisdiction over the activities in this SOW. The contractor is responsible for determining which laws and regulations apply to a particular task although the Contracting Officer Representative (COR) may require additional legal/regulatory compliance as that person may determine is required.

2.0 **CONTRACT DURATION.** The duration of this contract is anticipated to be approximately 4 months.

3.0 BACKGROUND INFORMATION.

3.1 **Project Location.** The Former Laredo Air Force Base (FLAFB) is located in Webb County, in the northeast area of the City of Laredo, Texas. The Fire Training Area is located on the existing Laredo International Airport (LIA). The location of the FTA is shown on Figure 1.

3.2 **Site History.** On 7 May 1942, the U.S. Government acquired 2,085.43 acres for the construction of Laredo Army Air Corps Base (now known as former Laredo Air Force Base). The Government constructed runways and numerous facilities from 1942 to 1974. The main mission of the base was gunnery and gunnery maintenance training. The Base was initially deactivated on 17 June 1947; however, it was reactivated during the Korean conflict (1952). The former Base was again deactivated on 29 March 1974. Approximately 309 acres were either deeded or sold to other federal, state and county agencies, or private firms. The remainder of the Base was deeded to the City of Laredo. Historical aerial photographs and records of the former Laredo Air Force Base show that an area northwest of the existing LIA was used as a FTA during DOD and City of Laredo possession.

3.3 **Previous Studies.** A Preliminary SI was conducted by the City of Laredo at the FTA and a SI report was developed in April 95. The Tulsa District conducted a Phase I RI in September 1996, and a draft report has been developed. The Sanitary Landfill Site, adjacent to the FTA, was investigated in 1997, and a SI report has been completed.

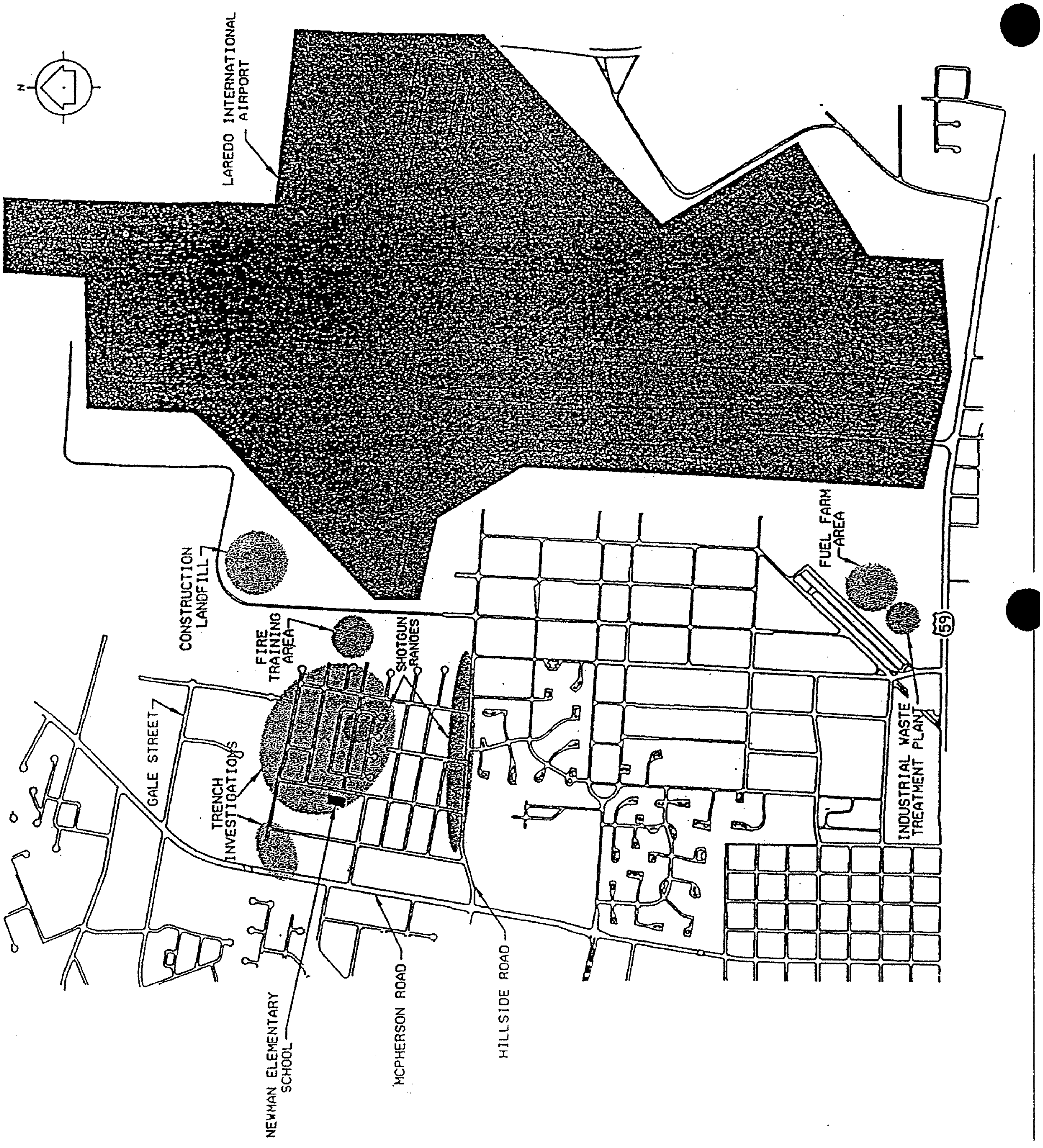

N
LAREDO INTERNATIONAL AIRPORT
CONSTRUCTION LANDFILL
FIRE TRAINING AREA
SHOTGUN RANGES
GALE STREET
TRENCH INVESTIGATIONS
NEWMAN ELEMENTARY SCHOOL
MCPHERSON ROAD
HILLSIDE ROAD
FUEL FARM AREA
59
INDUSTRIAL WASTE TREATMENT PLANT

FIGURE 1

4.0 OBJECTIVE. The primary objective of this SOW is for the AE to write a CERCLA RI/FS and baseline risk assessment report utilizing SI and draft Phase I RI report information.

5.0 REFERENCES. The A-E shall follow the latest version of USACE, Federal, and State of Texas regulations and guidance documents to accomplish the tasks required by this SOW. Where there are conflicts with USACE guidance, the requirements of the regulatory agencies shall prevail.

6.0 A-E SERVICES (Basic). The A-E shall deliver their cost proposal to the government divided into 4 main tasks as follows:

a. **RI Report**
b. **Baseline Risk Assessment**
c. **Comment Resolution Meeting**
d. **Administration of the Contract**

7.0 REQUIRED A-E SERVICES.

7.1 Remedial Investigation (RI) Report. The AE shall prepare and submit a draft and final RI report. The table of contents for the RI report is provided in attachment 1of this SOW and shall be used as guidance in the development of the RI Report. Some information may need to be supplemented by the A-E in order to complete the RI and Baseline Risk Assessment. The report shall discuss and include the following information: the purpose of the report, site history and background, information on the FTA area i.e. field activities associated with the SI and the RI work, physical characteristics of the FTA area, nature and extent of the contamination, contaminant fate and transport, baseline risk assessment, summary and conclusion, identify data gaps and indicate additional information requirements, pathways of possible contaminant migration, Federal/State of Texas specific Applicable or Relevant and Appropriate Requirements (ARARs), the development, screening and analysis of feasible alternatives, and recommended remedial action(s) or additional work. If the RI report indicates that the contamination is within acceptable limits, as defined by the Environmental Protection Agency (EPA) and the TNRCC regulations, or there are no human health populations subject to the contaminants, the RI report shall so indicate and recommend that no further studies be conducted for the remedial investigation at this site. The appendices shall include, but is not limited to, the items shown on attachment 1 along with other pertinent information for this task order.

7.2 Comment Resolution Meeting. A technical review meeting shall be held with the City of Laredo in Laredo, Texas after the draft RI report has been reviewed by the COE, but prior to the final RI Report. For bid purposes, the A-E shall assume 2 people for a meeting (approximately 1-2 hours) with the City to resolve review comments.

7.3 Project Delivery Schedule. The following schedule for delivery of work items to the CO is in calendar days.

Work Item	Work Description	Completion Schedule	Approximate Schedule	Number of Copies
1	Draft RI Report	30 days after notice to proceed	30 Oct 98	5
2	USACE provides review comments	30 days after receipt of draft	30 Nov 98	na

3	AE responses to review comments	4 days after AE receives USACE review comments	4 Dec 98	5
4	Review Comment Resolution Meeting	10 days after AE receives USACE review comments	10 Dec 98	Held in Laredo Texas
5	Final RI Report	7 days after resolution of responses to review comments	17 Dec 98	10 & one disk copy of the report in MS Word format

Assumption: contract is awarded by 30 September 98
na = not applicable

7.4 **Distribution of Submittals.** All submittals shall be provided to the COE Project Engineer, and the COE shall make distribution of all submittals. All copies of submittals, including detailed progress reports, analytical data, confirmation notices, and Draft and Final Reports shall be mailed to:

Tulsa District, Corps of Engineers
ATTN: CESWT-EC-EF (Angela Burckhalter)
1645 South 101st East Avenue
Tulsa, OK 74128-4629

8.0 Special Conditions.

8.1 **Performance of Work.** The A-E, in performance of the work, shall adhere to the following guidelines.

8.1.1 The A-E shall furnish sufficient technical, supervisory and administrative personnel at all times to ensure the work is performed in accordance with the delivery schedule. Professional level skills and management practices are required in the performance of this contract. Accordingly, the A-E shall establish an effective quality control program to assure that the end product meets professional standards and complies with the contract requirements.

8.1.2 Meetings/conference calls shall be held whenever requested by the CO or the A-E for discussion of questions and problems relating to the work required under the contract.

8.1.3 The A-E, its subsidiaries, affiliates or associates shall not release any information regarding the project to technical societies, news media or the general public without obtaining permission from the Contracting Officer.

8.1.4 An A-E performance evaluation shall be completed after the completion of this Task Order or in the interim if the A-E's work is found to be unsatisfactory.

8.2 **Project Management.**

8.2.1 **A-E Project Coordinator or Manager.** The A-E shall appoint a project coordinator or manager to serve as a single point of contact and liaison between the A-E and the CO and/or his representative(s) for all work required under the contract. Upon award of the contract, the A-E shall immediately furnish the name of the designated individual to the CO, in writing. The project coordinator or manager will be responsible for the complete coordination of all work developed under the contract. All work will be accomplished with adequate internal controls and review procedures that will eliminate conflicts, errors and omissions and ensure technical accuracy.

8.2.2 Government Managers. The Government Project Engineer for this project is Angela Burckhalter, Formerly Used Defense Site Section, HTRW Design Center, Tulsa District (918-669-4957, FAX-7508). Any questions regarding the work under this contract should be directed to Ms. Burckhalter. Any questions about contract procedures should be directed to Mr. Bernd Koerber, A-E Contracts Section, Design Branch, Tulsa District (918-669-7025). The Government Project Manager for this project is Ms. Lisa Lawson, Project and Program Management Division, Tulsa District (918-669-7551).

8.3 Document Review.

8.3.1 The deliverable documents described in this SOW shall be considered "Draft" only in the sense that they have not been reviewed and/or approved by the Contracting Officer (CO) or other members of a technical review team which, as determined by the CO, may include reviewers from the US Army Corps of Engineers (USACE), and local, state and federal regulatory agencies. The draft report shall be reviewed and approved prior to proceeding with the final report. In all respects, "Draft" and "Final" reports shall be complete, in proper format, one-sided typed, double-spaced, and be free of grammatical and typographical errors. All documents shall maximize the use of tables and charts, and minimize the data in the appendices. All documents shall bound in a good quality three ring binder, and shall have the project title, site name, site location, type of investigation, state of the report (draft or final), contract number, date, and prepared for the Tulsa District on the cover and the binder. All survey maps and associated survey data shall be provided to the Corps of Engineers, Tulsa District (COE) in an Integraph Microstation CADD (*.DGN) format. All final reports shall also be provided to the CO in MS DOS readable disks in MS Word for Windows.

8.3.2 Review. The A-E shall comply with the review process as outlined in this paragraph. The CO will furnish the A-E review comments on the data and reports submitted for this task order. The A-E shall comply with the review comments in the development of data and reports for the next milestone. If any review comment requires clarification and/or amplification to assure compliance, the A-E shall verbally notify the Project Engineer.

8.3.2.1 The A-E shall submit, in writing, within seventy-two (72) hours of verbal notification, a record of the conversation to the USACE Technical Manager.

8.3.2.2 Changes in any work as a result of review comments will not be considered a change in the contract unless a significant change in scope is involved.

8.3.2.3 After each review, the A-E shall be furnished one set of comments to be annotated and returned to the Government. Comments shall be annotated with a C - Concur, D - Do not concur, E - Exception, or X - Delete. Comments annotated with a D, E or X shall be explained to justify the non-compliance with the comment. The A-E shall furnish these annotated comments to the Government no later than 7 calendar days after receiving USACE's comments.

8.3.2.4 To assist reviewers, a copy of all annotated comments shall be included in each subsequent submittals. These annotations shall, in addition to explanations previously required, include a brief notation for all comments concurred with as to what action was taken and where.

8.4 Government-Furnished Materials (GFE). The following documents shall be furnished to the AE by the USACE:

a. FTA SI Report
b. FTA Preliminary and Draft RI Report
c. FTA Analytical Validation Reports for the Draft RI Report
d. Survey maps of site
e. Sanitary Landfill SI Report

Upon delivery of any government furnished information, the A-E shall inspect and notify (within 3 days) the Technical Manager acknowledging the receipt of the information. If the A-E identifies any conflicts with the GFE in comparison to pre-negotiation minutes, this SOW, or other communications concerning this project, the A-E shall notify the CO in writing, within 5 days of the discovery of the conflict. Any Government-furnished aerial photographs, topographic mapping, reproducible drawings, other various reports shall be returned to the Technical Manager prior to the completion of the Task Order.

8.5 Confirmation Notices. The A-E shall provide a record of all conferences, meetings, discussions, verbal directions, telephone conversations, etc., participated in by the A-E and/or his representative(s) on matters relative to the contract and the work. The records, entitled "CONFIRMATION NOTICES"(CNs), shall be numbered sequentially and shall fully identify participants, subject discussed and any conclusions reached. The A-E shall forward to the CO and the Technical Manager, within 72 hours, a reproducible copy of each confirmation notices. The A-E, upon COE request, shall perform any additional distribution of CNs as necessary.

8.6 Subcontractors. The A-E shall insert appropriate provisions in all subcontracts relating to this SOW to ensure fulfillment of all contractual provisions by the subcontractors. If for sufficient reason, at any time during the process of this contract, the CO determines that any subcontractor is unsatisfactory or is not performing in accordance with the contract, the A-E shall be informed in writing accordingly, and immediate steps shall be taken by the A-E to obtain acceptable performance or for cancellation of such subcontract. Subletting by subcontractors shall be subject to the same requirements. Nothing contained in this contract shall be construed to create any contractual relations between any subcontractor and the Government.

8.7 Meetings and Conferences.

8.7.1 Meetings. Meetings shall be held whenever requested by the CO or the A-E for discussion of questions and problems relating to the work required under the contract.

8.7.2 Conferences. The A-E shall be required to attend and participate in all conferences pertinent to the services and work required under the contact as directed by the CO.

8.7.3 Site Visits. The A-E or his representatives, including consultants, shall visit and inspect the project site as necessary and required during the preparation and accomplishment of the work described in this SOW. All travel, costs, and expenses incurred by the A-E or his representatives, including consultants, for such site visits shall be included in the lump sum price of the delivery order.

9.0 General Conditions.

9.1 Initiation of Work. The Contractor shall not mobilize or initiate any work item of this Task Order prior to receipt of approval by the CO to initiate the respective work item or receipt of a contract modification initiating additional contract work. Any work done without being directed to do so by the CO shall be at the Contractor's expense.

9.2 Monthly Progress Reports and Payment Requests. The contractor shall prepare monthly progress reports that summarize the project activities which have occurred during that month, highlight any problems or potential problems which have become apparent regarding technical data adequacy, manpower, schedules, etc. and provide an estimated project completion status (%). The percent claimed shall coincide with the progress report. The report shall be deliver no later than the <u>5th day</u> of the following month for the previous month's activities.

The payment request with progress reports shall be mailed to:
Tulsa District, Corps of Engineers
ATTN: A-E Contracts and Documents Section (CESWT-EC-DA)
1645 South 101st East Avenue
Tulsa, OK 74128-4629

The progress reports shall be faxed to:
Tulsa District, Corps of Engineers
CESWT-EC-EF (Angela Burckhalter)
1645 South 101st East Avenue
Tulsa, OK 74128-4629

9.3 Completion of the Work. Work under this task order shall not be considered complete until the Final RI report has been submitted and approved by the CO. If the delivery order is modified, the CO will consider completion of the modified delivery schedule to constitute completed work. A retainage of up to 10 percent of the total fee will be withheld until the CO determines the contract complete.

REMEDIAL INVESTIGATION REPORT TABLE OF CONTENTS

Attachment 1

Attachment 1

Appendix B
PSA Report

PRELIMINARY
SITE ASSESSMENT
OF FIRE TRAINING AREA
LAREDO
INTERNATIONAL AIRPORT

TABLE OF CONTENTS

APPENDICES

PRELIMINARY SITE ASSESSMENT
OF FIRE TRAINING AREA
LAREDO INTERNATIONAL AIRPORT

DESCRIPTION OF SITE

The subject site is located on the north side of the Laredo International Airport grounds, just west of the airport runways and west of Daugherty Street. This area contains two known surface impoundments used for fire training practice pits. One fire training pit is covered and one is exposed. The exposed pit was the one used by the City of Laredo from 1975 to 1992. The City of Laredo used the pit for fire practice training once every quarter. Diesel and gasoline fuel were used as accelerants when the Laredo Fire Department used the pit (named as Fire Training Pit #1). The military also used Fire Training Pit #1 and Fire Training Pit #2, and used spent oil and gasoline as accelerants, although it is not known if other accelerants were also used. One 10,000 gallon tank which contained one large hole and several small holes, was removed from the Fire Training Pit #1 area.

On the north end of the Fire Training Pit #1, there is a valve and a short discharge area where possible contaminated storm water from rain water was discharged. Also, a possible line coming from the southeast to the pit, perhaps was used to fuel the fire training pit. Also, MoVac removed free product and water from the pit. Approximately 2,772 gallons of product and water were removed on 1/17/95.

SITE ACTIVITIES

During the removal of the 10,000 gallon tank, a test hole was excavated in the area of Fire Training Pit #2, the covered impoundment. The excavated was around

5.0' (feet) deep. Approximately 2.0' (feet) below the existing surface, there was a layer of black material from 1.5' (feet) to 2.0' (feet) in thickness, and then below that a brown, silty clay.

TAC Environmental was asked to complete a preliminary investigation of the sites soils in and near the fire training pits. The total of five (5) borings were made within and around the fire training pits. The soil borings were made to a depth of 5.0' (feet). Three (3) samples were taken per boring, one (1) at the surface, one (1) and 1.0' (foot) in depth, and the last sample at 5.0' (feet). (See Site Sketch for boring locations).

Samples were placed in VOA bottles, and immediately placed in a cooler containing ice packs, and then were shipped to CasChem Laboratories.

Borings No. 1, No. 2, and No. 4 indicated high levels of hydrocarbons present from the surface to the depth of 5.0' (feet). Borings No. 3 and No. 5, however, did not indicate the presence of hydrocarbons. The impacted soils are a brown silty clay with a plastic index believed to be greater than twelve. The average TPH (Total Petroleum Hydrocarbons) of the impacted soils determined from borings No. 1, No. 2, and No.4 is 6,615 mg/kg TPH.

SUMMARY

The preliminary site assessment did indicate the levels of hydrocarbons contamination to a depth of 5.0' (feet), and generally located the impacted soil areas in and throughout Fire Training Pit #1 and Pit #2, also at the discharge (north) end of Pit #1. However, the precise delineation was not defined vertically and only somewhat horizontally. Also, a TCLP analysis should be completed on the soils from

Training Pits No. 1 and No. 2. The analysis will determine if the soils contain hazardous components and possibly may make the soil a hazardous waste.

Obviously soils within the fire training pits need to be excavated and remediated. Upon completion of the TCLP analysis of the contaminated soils, a determination could then be made to excavate and treat the soils on site. Soils within the existing pits could be excavated to a depth of 7.0' (feet) to 8.0' (feet) in depth, within the boundaries of the pits.

RECOMMENDATIONS

Initiate with instructing the laboratory to run a TCLP analysis in the impacted areas located at Borings No. 1, No. 2, and No. 4, with the minimum of one (1) complete TCLP analysis as a composite sample. Upon completion of the TCLP analysis, there is an option to remove and treat the soil from the impoundments to begin with the worst and obvious contaminated soils.

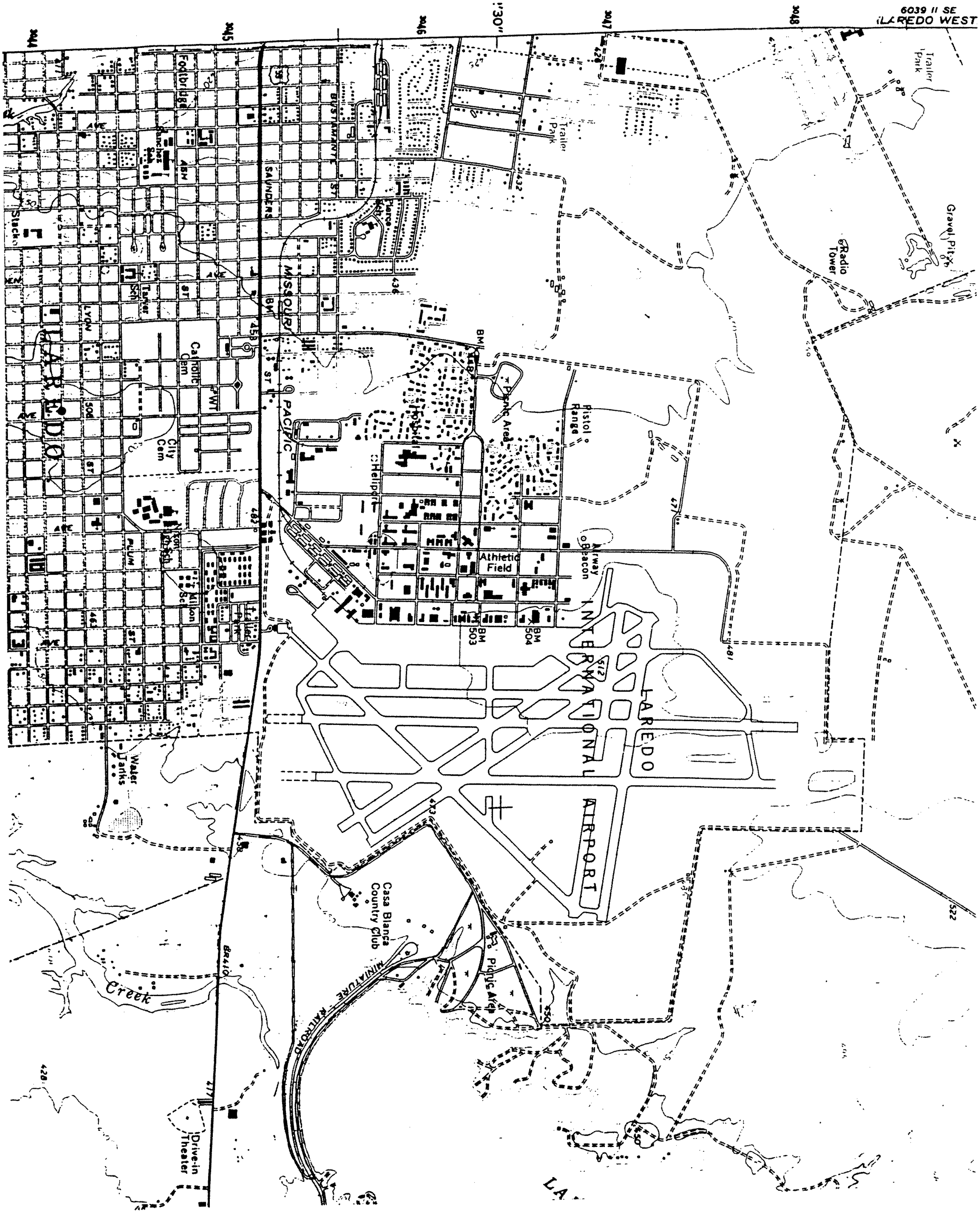
It is also recommended that a minimum of three (3) borings be completed to a maximum depth of 25.0' (feet) vertically, so the extent of the vertical contamination can be determined. Borings that encounter groundwater before ending at the depth of 25.0' (feet) should be developed into monitor wells. Soils should be continuously screened with a PID or OVM, and those readings recorded on Boring Logs.

The minimum of three (3) monitor wells should be constructed upon encountering groundwater. The wells should be developed and sampled for BTEX and TPH, and depending on the TCLP analysis, other analysis could be required. Groundwater Gradient Maps, along with BTEX and TPH Isopachs should be completed to determine any groundwater impacted, if groundwater is encountered.

APPENDIX A

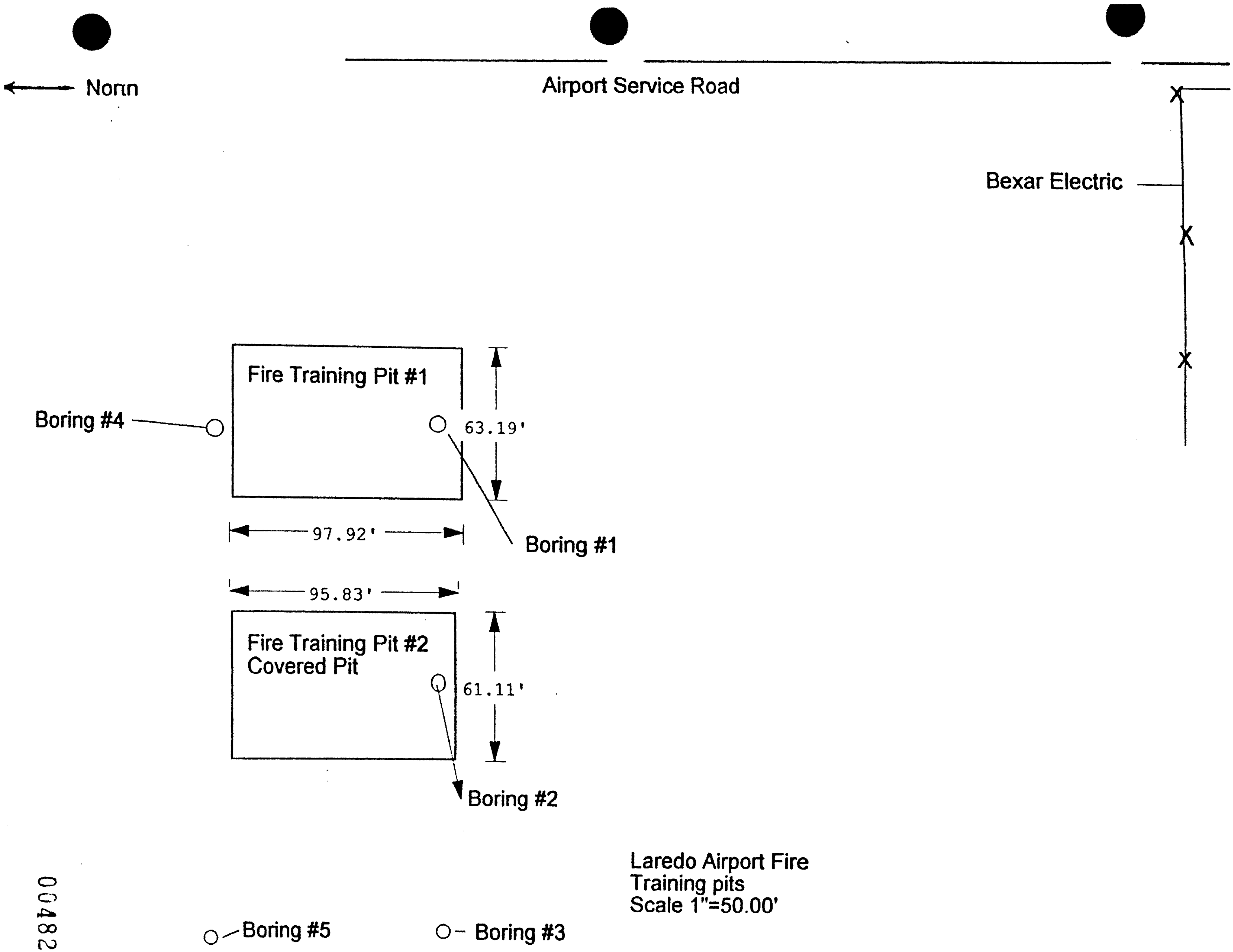
LOCATION MAP


LAREDO
CASA BLANCA LAKE
L.I.F.E. Downs Racetrack
Casa Blanca County Park
Laredo International Airport
Casa Blanca Country Club & Golf Course
International Airport Industrial Park
City Cemetery
Catholic Cemetery
SAUNDERS
MC PHERSON
HILLSIDE RD
CASA BLANCA RD
59


6039 II SE
LAREDO WEST
3044
3045
3046
30"
3047
3048
LAREDO
INTERNATIONAL AIRPORT
LAREDO
MISSOURI PACIFIC
SAUNDERS
BUSTAMANTE ST
Footbridge
Sanchez Sch
Tarver Sch
Catholic Cem
City Cem
Nixon High Sch
Milton Sch
Trailer Park
Trailer Park
Hospital
Heliport
Picnic Area
Pistol Range
Athletic Field
Airway Beacon
BM 503
BM 504
Radio Tower
Gravel Pit
Water Tanks
Casa Blanca Country Club
Picnic Area
MINIATURE RAILROAD
Creek
Drive-in Theater
LA

APPENDIX B

SITE MAP



Laredo Airport Fire
Training pits
Scale 1"=50.00'

TAC Environmental

APPENDIX C

SUMMARY OF ANALYSIS

LAREDO INTER[illegible]IONAL AIRPORT
"FORMER FIRE TRAINING FACILITY"
Preliminary Soil Assessment
of Fire Training Pits

SAMPLE LOCATION	BENZENE ug/kg	TOLUENE ug/kg	ETHYL BENZENE ug/kg	XYLENES ug/kg	BTEX ug/kg	TPH mg/kg
BORING #1- SURFACE	<2	8.01	<2	<6	8.01 (<18.01)	1800
BORING #1- 1' DEEP	5.51	5.71	<2	<6	11.22 (<19.22)	7300
BORING #1- 5' DEEP	<40	<40	112	173	285 (<365)	7340
BORING #2- SURFACE	<4	<4	57.4	80.9	138.3 (<146.3)	456
BORING #2- 1' DEEP	<2	<2	<2	<6	(<12)	2564
BORING #2- 5' DEEP	<2	<2	<2	<6	(<12)	3682
BORING #3- SURFACE	<2	<2	<2	<6	(<12)	(<10)
BORING #3- 1' DEEP	<2	<2	<2	<6	(<12)	(<10)
BORING #3- 5' DEEP	<2	<2	<2	<6	(<12)	(<10)
BORING #4- SURFACE	<2	<2	<2	<6	(<12)	29900
BORING #4- 1' DEEP	<2	<2	<2	<6	(<12)	373
BORING #4- 5' DEEP	<2	<2	<2	<6	(<12)	6120
BORING #5- SURFACE	<2	<2	<2	<6	(<12)	(<10)
BORING #5- 1' DEEP	<2	<2	<2	<6	(<12)	(<10)
BORING #5- 5' DEEP	<2	<2	<2	<6	(<12)	(<10)

APPENDIX D

LABORATORY RESULTS

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OH 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#1 COMPOSITE B-1/SURFACE

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Comment:

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:00

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations:

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503463					
	BETX(8020)TPH(9071,418.1)		DRY	WEIGHT	
	BETX CAL.02-24-95				
	BENZENE	<2	ug/kg	2 ug/kg	03/08/95
	TOLUENE	8.01	ug/kg	2 ug/kg	03/08/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/08/95
	XYLENES	<6	ug/kg	6 ug/kg	03/08/95
	TOTAL PETROLEUM HYDROCARBONS	1,800	mg/kg	30 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:12:53

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#2 COMPOSITE B-1/1'DOWN

Comment:

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:10

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations:

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503464					
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
	BENZENE	5.51	ug/kg	2 ug/kg	03/08/95
	TOLUENE	5.71	ug/kg	2 ug/kg	03/08/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/08/95
	XYLENES	<6	ug/kg	6 ug/kg	03/08/95
	TOTAL PETROLEUM HYDROCARBONS	7,300	mg/kg	90 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:13:23

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/16/95

Laboratory Analysis Report

Client ID: 7129

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#3 COMPOSIT B-1/5'DOWN

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Comment:

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:22

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations: *BTEX:MATRIX INTERFERENCE*

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503465					
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
	BENZENE	<40	ug/kg	40 ug/kg	03/13/95
	TOLUENE	<40	ug/kg	40 ug/kg	03/13/95
	ETHYLBENZENE	112	ug/kg	40 ug/kg	03/13/95
	XYLENES	173	ug/kg	120 ug/kg	03/13/95
	TOTAL PETROLEUM HYDROCARBONS	7,340	mg/kg	30 mg/kg	03/10/95

DATE REPORTED:03/16/95 TIME REPORTED:10:29:31

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129
Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#7 COMPOSITE B-2/SURFACE

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Comment:

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:32

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations: 2X TFT LOW MATIRX INTERFERENCE

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503471					
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
	BENZENE	<4	ug/kg	4 ug/kg	03/10/95
	TOLUENE	<4	ug/kg	4 ug/kg	03/10/95
	ETHYLBENZENE	57.4	ug/kg	4 ug/kg	03/10/95
	XYLENES	80.9	ug/kg	12 ug/kg	03/10/95
	TOTAL PETROLEUM HYDROCARBONS	456	mg/kg	10 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:16:21

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129
Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#8 COMPOSITE B-2/1'DOWN

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Comment:

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:34

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations:

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503469			DRY	WEIGHT	
	ETX(8020)TPH(9071,418.1) BETX CAL.02-24-95				
	BENZENE	<2	ug/kg	2 ug/kg	03/10/95
	TOLUENE	<2	ug/kg	2 ug/kg	03/10/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/10/95
	XYLENES	<6	ug/kg	6 ug/kg	03/13/95
	TOTAL PETROLEUM HYDROCARBONS	2,564	mg/kg	30 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:14:54

#8 CO

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#9 COMPOSITE B-2/5'DOWN

Comment:

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:38

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations: RUN 2X TFT LOW

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503470					
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
	BENZENE	<2	ug/kg	2 ug/kg	03/10/95
	TOLUENE	<2	ug/kg	2 ug/kg	03/10/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/10/95
	XYLENES	<6	ug/kg	6 ug/kg	03/10/95
	TOTAL PETROLEUM HYDROCARBONS	3,682	mg/kg	30 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:15:44

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#10 COMPOSITE B-3/SURFACE

Comment:

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:41

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations:

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503472					
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
	BENZENE	<2	ug/kg	2 ug/kg	03/10/95
	TOLUENE	<2	ug/kg	2 ug/kg	03/10/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/10/95
	XYLENES	<6	ug/kg	6 ug/kg	03/10/95
	TOTAL PETROLEUM HYDROCARBONS	<10	mg/kg	10 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:17:03

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129
Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#4 COMPOSITE B-4/SURFACE

Comment:

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:25

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations: RAN 2X TFT LOW

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503466					
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
	BENZENE	<2	ug/kg	2 ug/kg	03/10/9
	TOLUENE	<2	ug/kg	2 ug/kg	03/10/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/10/95
	XYLENES	<6	ug/kg	6 ug/kg	03/10/95
	TOTAL PETROLEUM HYDROCARBONS	29,900	mg/kg	300 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:13:45

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#11 COMPOSITE B-3/1'DOWN

Comment:

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:43

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations:

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503473					
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
	BENZENE	<2	ug/kg	2 ug/kg	03/10/95
	TOLUENE	<2	ug/kg	2 ug/kg	03/10/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/10/95
	XYLENES	<6	ug/kg	6 ug/kg	03/10/95
	TOTAL PETROLEUM HYDROCARBONS	<10	mg/kg	10 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:17:30

#11 C

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#12 COMPOSITE B-3/5'DOWN

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Comment:

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:47

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations:

Lab Number Test Description	Result	Unit	LOD	TEST DATE
9503474				
BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
BENZENE	<2	ug/kg	2 ug/kg	03/10/
TOLUENE	<2	ug/kg	2 ug/kg	03/10/95
ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/10/95
XYLENES	<6	ug/kg	6 ug/kg	03/10/95
TOTAL PETROLEUM HYDROCARBONS	<10	mg/kg	10 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:18:18

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#5 COMPOSITE B-4/1'DOWN

Comment:

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:28

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations:

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503467					
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
	BENZENE	<2	ug/kg	2 ug/kg	03/08/95
	TOLUENE	<2	ug/kg	2 ug/kg	03/08/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/08/95
	XYLENES	<6	ug/kg	6 ug/kg	03/08/95
	TOTAL PETROLEUM HYDROCARBONS	373	mg/kg	10 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:14:21

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/16/95

Laboratory Analysis Report

Client ID: 7129
Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#6 COMPOSITE B-4/5'DOWN

Comment:

ƷSIE AQUERO
: ENVIRONMENTAL COMPANY
; AA MINES ROAD
ₐEDO TX 78043

Date Sampled:03-08-95
Time Sampled:15:30

rchase Order No.:

:e Received:03/09/95 Time Received:12:15

screpancies or Deviations:

o Number Test Description	Result	Unit	LOD	TEST DATE
9503468				
BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
BENZENE	<2	ug/kg	2 ug/kg	03/13/95
TOLUENE	<2	ug/kg	2 ug/kg	03/13/95
ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/13/95
XYLENES	<6	ug/kg	6 ug/kg	03/13/95
TOTAL PETROLEUM HYDROCARBONS	6,120	mg/kg	30 mg/kg	03/10/95

TE REPORTED:03/16/95 TIME REPORTED:10:29:40

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#13 COMPOSITE B-5/SURFACE

Comment:

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:15:55

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations:

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503475					
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
	BENZENE	<2	ug/kg	2 ug/kg	03/09/95
	TOLUENE	<2	ug/kg	2 ug/kg	03/09/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/09/95
	XYLENES	<6	ug/kg	6 ug/kg	03/09/95
	TOTAL PETROLEUM HYDROCARBONS	<10	mg/kg	10 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:18:51

#13 C

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#14 COMPOSITE B-5/1'DOWN

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Comment:

Purchase Order No.:

Date Sampled:03-08-95
Time Sampled:16:00

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations:

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503476					
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95		DRY	WEIGHT	
	BENZENE	<2	ug/kg	2 ug/kg	03/08/95
	TOLUENE	<2	ug/kg	2 ug/kg	03/08/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/08/95
	XYLENES	<6	ug/kg	6 ug/kg	03/08/95
	TOTAL PETROLEUM HYDROCARBONS	<10	mg/kg	10 mg/kg	03/10/95

DATE REPORTED:03/14/95 TIME REPORTED:12:20:07

#14 C

CASCHEM LABORATORIES, INC.
1712 IRA TURPIN WAY NE
CANTON, OHIO 44705-1415
Phone (216) 588-TEST FAX:(216) 588-8412

03/14/95

Laboratory Analysis Report

Client ID: 7129

Sample ID:CITY OF LAREDO
Sample Matrix: SOIL
Sample Description:
#15 COMPOSITE B-5/5'DOWN

Comment:

JESSIE AQUERO
TAC ENVIRONMENTAL COMPANY
276 AA MINES ROAD
LAREDO TX 78043

Date Sampled:03-08-95
Time Sampled:16:07

Purchase Order No.:

Date Received:03/09/95 Time Received:12:15

Discrepancies or Deviations:

Lab Number	Test Description	Result	Unit	LOD	TEST DATE
9503477			DRY	WEIGHT	
	BETX(8020)TPH(9071,418.1) BETX CAL.02-24-95				
	BENZENE	<2	ug/kg	2 ug/kg	03/08/95
	TOLUENE	<2	ug/kg	2 ug/kg	03/0[illegible]/95
	ETHYLBENZENE	<2	ug/kg	2 ug/kg	03/08/95
	XYLENES	<6	ug/kg	6 ug/kg	03/08/95
	TOTAL PETROLEUM HYDROCARBONS	<10	mg/kg	10 mg/kg	03/10/95

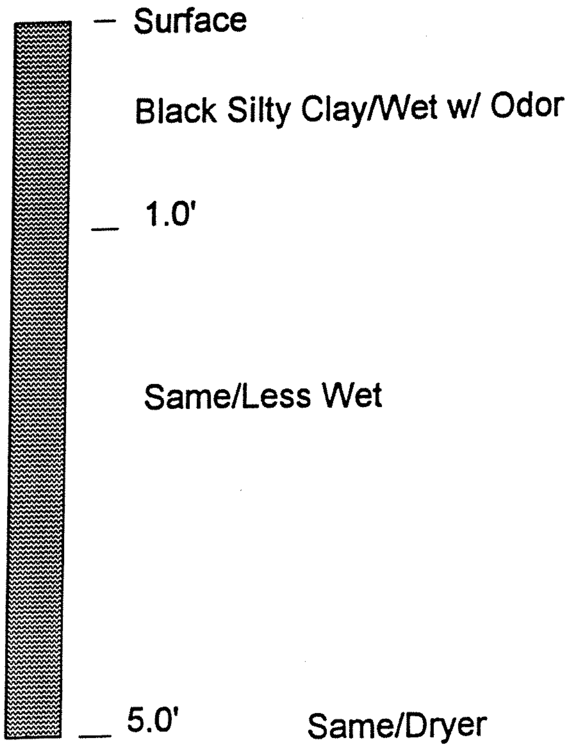
DATE REPORTED:03/14/95 TIME REPORTED:12:20:23

#15 C

APPENDIX E
BORING LOGS

Laredo Airport/City of Laredo Fire Trainin
Surface Impoundments
Boring Log
Boring No. 1

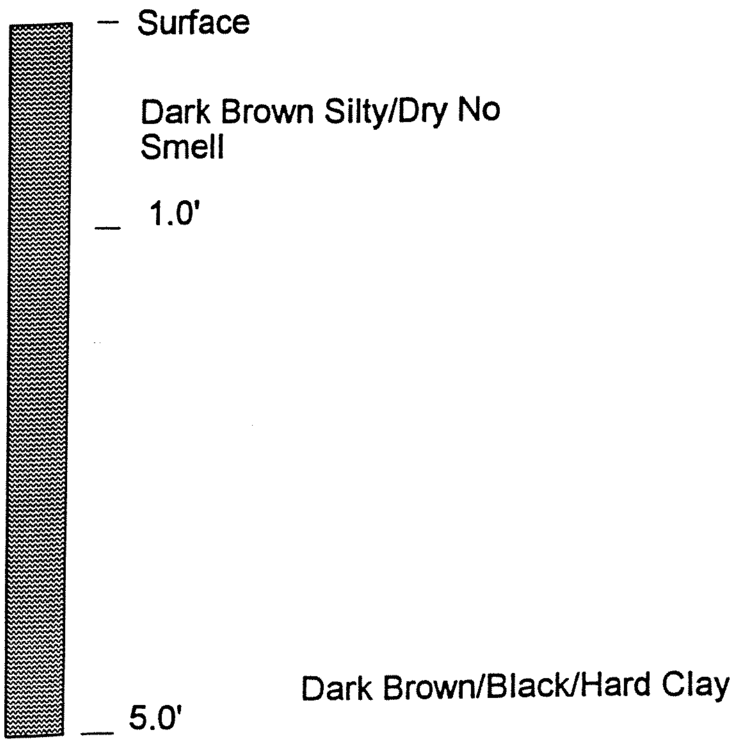
Boring #1



Boring #2

Laredo Airport/City of Laredo Fire Training Surface Impoundments

Boring Log Boring No. 2



Boring #3

Laredo Airport/City of Laredo Fire Training Surface Impoundments

Boring Log Boring No. 3

— Surface

Dark Brown/Hard Clay
No Odor

— 1.0'

Greenish Brown/Hard Clay
No Odor

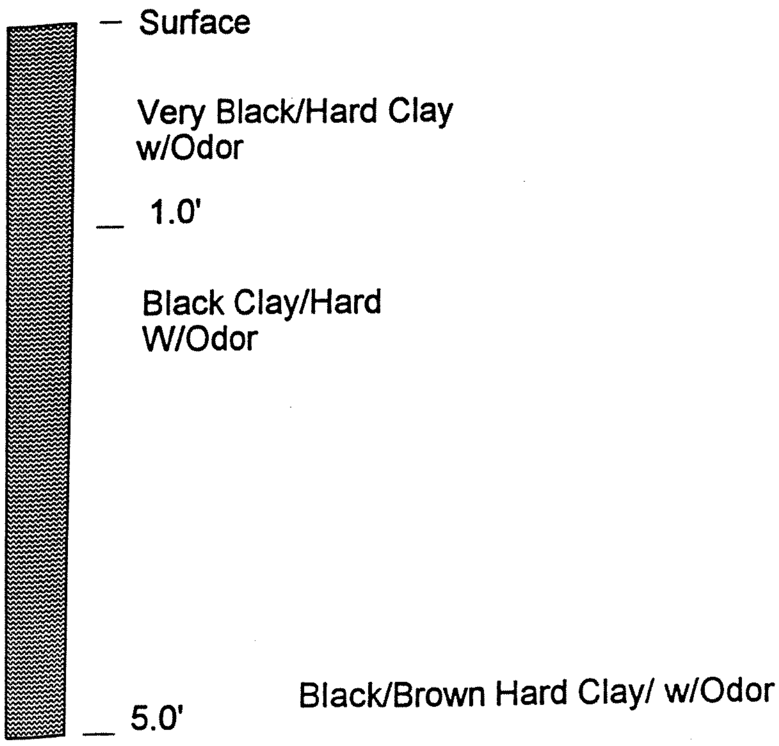
— 5.0'

Greenish Brown/Hard Clay
No Odor

Laredo Airport/City of Laredo Fire Training
Surface Impoundments

Boring #4

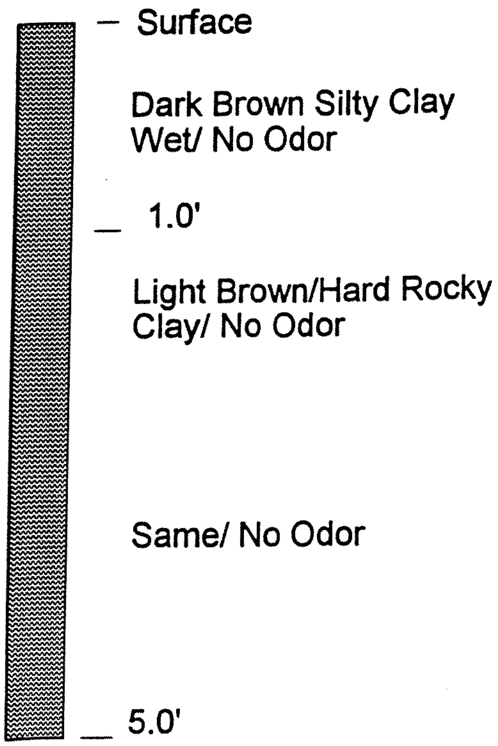
Boring Log Boring No. 4



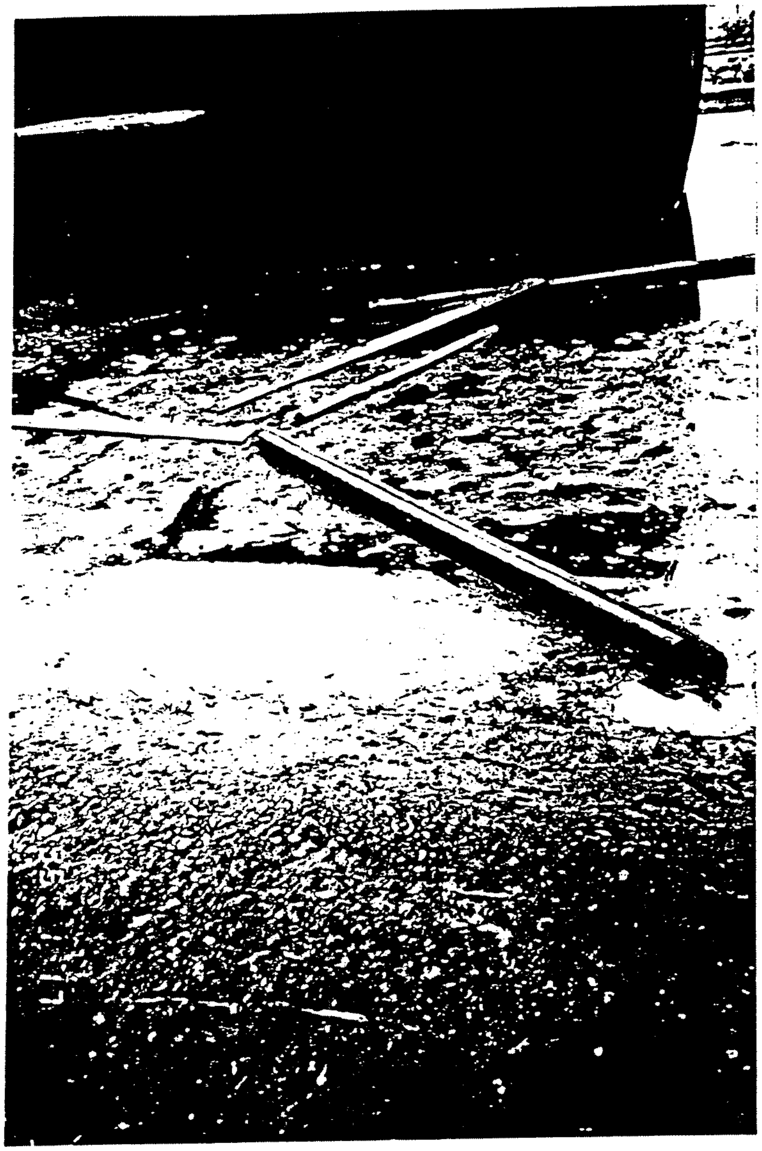
Laredo Airport/City of Laredo Fire Training
Surface Impoundments

Boring #5

Boring Log Boring No. 5



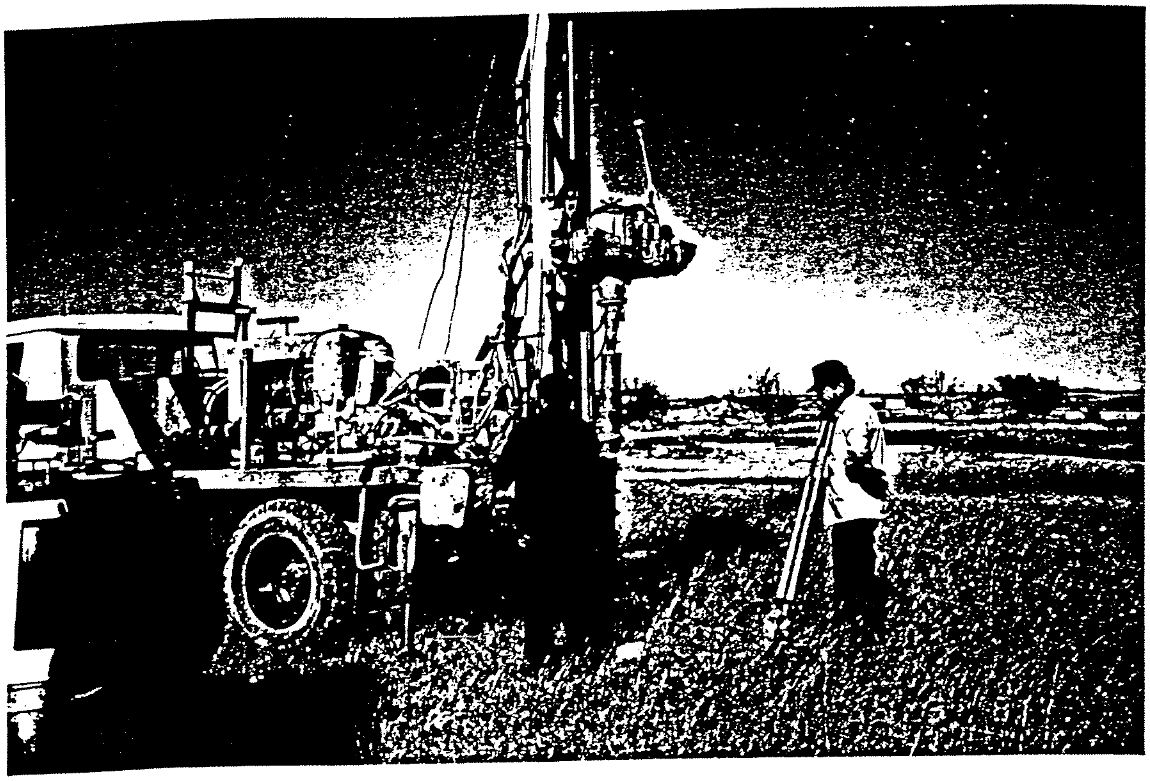
APPENDIX F
PHOTOGRAPHS



PHOTOGRAPH NO. 1: VIEW OF PIT NO. 1 AND THE 10,000 GALLON TANK AND THE LARGE OPENING IN THE TANK. ALSO, VIEW OF ACCELLERANTS ON THE CONTAMINATED GROUND.

PHOTOGRAPH NO. 2: ALTERNATE VIEW OF PIT NO. 1.

PHOTOGRAPH NO. 3: VIEW OF PIT NO. 1 AND THE TANK, VIEWING NORTH, NORTHWEST. PIT NO. 2, THE COVERED PIT IS TO THE WEST OF PIT NO. 1.



PHOTOGRAPH NO. 4: VIEW OF DRILLING PROCESS OF BORINGS DONE TO CHECK FOR EXTENT OF THE CONTAMINATION.

APPENDIX G

CHAIN OF CUSTODIES

Ca hem
Labor ries
Incorporated

1712 - 11th Street N.E.
Canton, OH 44705

CHAIN CUSTODY FORM

588-TEST
800-6052
(FAX) 216-588-8412

Project #:

Project Name & Address: [illegible] Canton

Samplers (Signature):

Customer Name and Address: [illegible] TX

Analytical Method

Sta. #	Date	Time	Comp	Grab	Station Location	No. of Containers	TPH (418.1)	BTEX	TPH (8015) GRO	LEAD	PNA	TPH (8015) DRO	Remarks	Lab #
#1	[illegible]	3pm			B-1 / surface	1	X	X						
#2	3/3/95	[illegible]	x		B-1 / 1' down	1	X	✓						
#3	3/3/95	[illegible]	x		B-1 / 5' down	1	X	✓						
#4	3/3/95	[illegible]	x		B-4 / surface	1	X	✓						
#5	3/3/95	[illegible]	x		B-4 / 1' down	1	X	X						
#6	3/3/95	[illegible]	x		B-4 / 5' down	1	X	✓						
#8	3/3/95	[illegible]	x		B-2 / 1' down	1	X	✓						
#9	3/3/95	[illegible]	x		B-2 / 5' d	1	X	X						
#7	3/3/95	[illegible]	x		B-2 / surface	1	X	X						
#10	3/3/95	[illegible]	x		B-3 / surface	1	X	✓						
#11	3/3/95	[illegible]	x		B-3 / 1' down	1	X	✓						
#12	3/3/95	[illegible]	x		B-3 / 5' down	1	X	X						

Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)	Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)
	3/3/95 6pm				

Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)	Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)

Relinquished by: (Sig.)	Date/Time	Received for Lab by:	Date/Time	Sample Containers Cleaned by:	Date

Special Notes: Please also fax results to JBL [illegible] (210) 717 3009

Containers & Mailers Assembled by:

Date

CUSTOMER: KEEP PINK COPY, RETURN WHITE AND CANARY COPIES WITH SAMPLES

Laboratories Incorporated

1712 - 11th Street N.E.
Canton, OH 44705

800-800-6052
(FAX) 216-588-8412

Project #:

Project Name & Address: City of Toledo Training (Airport Center)

Samplers (Signature): Julye Rn / X Alvarez

Customer Name, and Address: TMC Environmental Co [illegible]

Sta. #	Date	Time	Comp	Grab	Station Location	No. of Containers	TPH (418.1)	BTEX	TPH (8015) GRO	LEAD	PNA	TPH (8015) DRO						Remarks	Lab #
#13	3/8/95	3:55	x		B-5 / surface	1	X	X											
#14	3/8/95	4½ p	x		B5 / 1' down	1	X	X											
#15	3/8/95	4½ p	x		B5 / 5' down	1	X	X											

Relinquished by: (Sig.) Julye Rn	Date/Time 3/8/95 - 6PM	Received by: (Sig.)	Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)
Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)	Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)
Relinquished by: (Sig.)	Date/Time	Received for Lab by:	Date/Time	Sample Containers Cleaned by:	Date
Special Notes:				Containers & Mailers Assembled by:	Date

CUSTOMER: KEEP PINK COPY, RETURN W‥TE AND CANARY COPIES WITH SAMPLES

APPENDIX H

QA/QC PLAN

QA/QC PLAN FOR INVESTIGATION & SAMPLING OF SOILS AND GROUNDWATER

INTRODUCTION

JBL GROUP, INC., is a professional consulting firm which provides hydrogeologic, engineering, microbiologic, and related testing services for comprehensive abatement and remediation of groundwater and environmental contamination.

This QA/QC Plan documents investigative procedures for accurate and consistent collection of groundwater and environmental data with an emphasis on environmental impacts resulting from inadvertent losses of petroleum products. The specific quality control procedures outlines are based upon the Groundwater Monitoring Technical Environmental Guidance Document (EPA/530/SW-86/055), and Practical Guide to Groundwater Sampling (EPA/600/2-85/104).

SAMPLE SITE SELECTION

Selection of Monitor Well Locations

In general, many of the samples collected by JBL GROUP, INC., are from monitor wells. Various criteria is used to determine the selection of the sampling site. These include areas where losses are suspected to have occurred, or near structures that are subject to leaks or failure. Additional monitor wells will be installed in areas from the suspected contamination areas to delineate the contaminant plumes. This would include placement of monitor wells upgradient, downgradient, and outside the perimeter of the contaminant plumes.

Selection of Surface Water Locations

Surface waters are usually sampled when groundwater is being discharged from a site into a nearby surface water body such as a pond, stream, or ditch. When surface waters are sampled, samples will be collected at or near the point of discharge into the surface water body. A determination then can be made whether the discharged water is contaminating the surface water body.

SAMPLING PROCEDURES

Drilling Methods

Drilling Equipment Decontamination

Prior to commencing work, drilling equipment is cleaned to avoid introduction of foreign materials onto the site. The equipment subject to decontamination may include augers, drilling tools, sampling tools, and the rig itself. Material used to construct the wells, casing and screens are also decontaminated prior to installation. The methods used are site and parameter specific, and are outlined below:

Detergent Wash - using trisodiumphosphate or Alconox type detergent with clean water

Chemical Wash - using water super surfactant solvent; EFFF or Hazcleanser with clean water rinse

Water Rinse - a distilled water rinse is used to remove chemical or detergent residue. In the case of a contaminant which is water soluble, a clean water rinse may be sufficient without other methods.

Steam cleaning - when contaminants are easily volatilized or persistent residues need to be removed. Steam cleaning is particularly useful when cleaning large or bulky equipment such as drilling rigs, augers, etc.

Decontamination and rinse water is generally disposed of on site. Collection and disposal of decontaminated water is required. The water is containerized and stored on site while waste characterization and proper disposal is arranged.

SOIL BORINGS

Soil borings are advanced with a rotary auger drilling rig using hollow stem or solid stem augers. The augers are turned into the soil in five foot sections. Continuous auger flights move soils cuttings from the drill bit to the surface. This procedure, using hollow augers, produces affectively a cased open hole to the end of the drill string, to facilitate sampling or other testing. When using solid augers, the auger must be removed to provide an open uncased hole for sampling, well installation, or other activities.

Other drilling methods which may be used include hand auguring and excavation with shovels, post hole diggers, or other manual methods. Hand boring methods are useful when soil types and conditions permit easy penetration to the required depth. Hand methods normally are not used for soil borings below the water table.

Following completion of borings, the bore hole is plugged by various methods. Normally drill cuttings are hauled and disposed of properly off site. After completion of the borings, bore holes are plugged with soil bentonite mixtures, or bentonite and/or cement grout. As required, contaminated drill cuttings are containerized and stored on site. The materials are characterized and properly disposed of.

MONITOR WELL INSTALLATION

Monitor wells are installed by auger drilling methods. Drilling equipment consists of B40 and B50 or other typical rotary auger rigs. The rig is used to drill a string of continuous flight augers into the ground to create a bore hole. The selected well casing is installed in the open hole by one of two methods.

The primary method of well installation is used with hollow stem augers. The augers are again drilled to total depth providing a cased open hole. The well casing is placed inside the hollow auger to the required depth and the augers removed. As the augers are pulled , the well remains at the required depth and natural material can collapse around the screen. Gravel or sand pack, is required, is placed through the augers during removal. The rate of filter pack application is matched to the-rate of auger withdrawal so that uniform filter zone is created. The filter pack is placed up to one to two feet above the screen to provide isolation from the well seal materials. The annular space is backfilled by approved methods which can include bentonite or a low permeability grout. Grout, when required, can consist of various mixtures of cement, and/or bentonite. Grout is generally tremied through the augers during removal. Well sealing and grouting methods are designated based on the soil and groundwater conditions in the boring.

The secondary method is used with solid augers. The augers are drilled to total depth and withdrawn from the hole. The specified well casing and screen is placed in the bore hole and pushed or driven to the proper depth. The annular space between casing and the bore hole can be backfilled with native soil or a low permeability mixture of cement and/or bentonite.

Well materials are selected based on the geologic conditions and groundwater sampling goals for each well. Casing types can consist of stainless steel and PVC. Both threaded coupled or flush threaded joints are used. Well screens consist of stainless steel continuous slot wire wound or PVC sawed slot construction. Stainless steel materials are typically used when free product are expected, while PVC materials are used for all other applications. Wells completed above grade are protected by a steel outer casing with a manhole with a hinged lockable cover. The outer casing is set in concrete which is shaped to promote drainage away from the well. Wells which are finished flush with the existing grade are set in a sealable casting which is cemented to the existing surface. Inside the casing the well is sealed with an expandable locking plug. Concrete pads where wells are placed in asphalt or concrete are 2.0' x 2.0'. All other areas, concrete pads are 4.0' x 4.0'.

Following installation, the wells are developed to remove fines from within the well and the aquifer material adjacent to the screen. This is done so that the produced water is sediment free and to provide good hydraulic connections with the aquifer. Well development methods include pumping and bailing, over surging and swabbing.

Vertical Sampling of Aquifers

Several methods are available for vertically sampling the aquifer. The choice of any given method is dictated by the specific conditions and objective of a particular investigation.

Two options are available using hollow stem augers. The first method utilized is a screened auger. In this method the augers penetrate to any required depth and a water sample is obtained, using a clean stainless steel bailer. The second hollow stem method involved the use of a plugged lead auger. The auger string is inserted to total depth, which is determined on a site specific basis. A stainless steel screen (3 to 5 feet in length), and two (2) inch stainless steel casing are placed inside the augers to the top of the plug, which is removed, and the augers are withdrawn. As the augers are removed, the formation materials collapse about the well screen. The temporary well is then developed using any of the techniques described previously. This is called a piezometer.

The method using solid stem augers is similar to the second hollow stem method, except that the augers are removed from the boring and the screen and casing are driven to a total depth.

After completing sampling, the in-place well screen is pulled to the desired interval and redeveloped. Intervals are generally selected so that three (3) to five (5) feet of every nine (9) feet are sampled. The sampling interval and screen length can varied to provided sampling of greater or lesser portion of the aquifer.

Preliminary Preparation For Sampling

All sampling events to be conducted will be scheduled with the analyzing laboratory to make sure the laboratory can accept the samples. The laboratory will be informed of the approximate number of samples to be collected and the tentative date and the time of sample arrival.

Prior to the sampling trip any equipment which will be used shall be cleaned, calibrated, and in good working order. The sample bottle supply will also be verified to ensure containers are available.

Field sampling kits will be inspected to be sure that all items necessary are present. A standard sampling kit will contain the following items:

- a teflon squirt bottle with methanol or acetone
- alconox/TSP soap
- a sufficient supply of distilled water for rinsing

- disposable gloves
- a waterproof pen
- an appropriate amount of sample containers and labels
- the proper purging and sampling device
- nylon rope
- ice packs and cooler
- appropriate site and safety manuals
- organic full face mask
- safety glasses

Sample Collection

Soil Sampling Procedures

Soil samples are taken during drilling with hollow stem augers by split barrel sampling methods. The split barrel sampler is a two (2) inch O.D. divided tube sampling device 18 to 24 inches in length. The sampler is driven into undisturbed soil in advance of the augers. The sampler is driven using a 140 hammer with a 30 inch free fall. The hammer blows are recorded for each of three 6 inch increments. The blows for the final two increments are summed and described at the standard penetration "N", which is a measure of the relative density of cohesionless soils. The sample is retrieved, opened and an intact sample of the soil strata is provided. The soils are classified and also contained, preserved, and shipped as outlined previously.

Decontaminated procedures are site and parameter specification are outlined in the decontamination section. Decontamination of sampling tools is done prior to the start and between each sampling event.

Sampling frequency is normally specified based on the objectives of each investigation. Typically for split barrel sampling the interval is at 2.5 feet to the water table then at two foot intervals thereafter. On deeper borings where uniform soils are encountered, the interval may be extended as the depth increases. Grab samples are collected at preselected intervals or at locations as site conditions warrant.

Water Sampling Procedures

Prior to monitor well purging and sampling, the water level in each well will be measured. The electronic tape or wetted tape method will be used for measurement. Once static water levels are known, the volume of water in the wells will be determined for well purging.

Prior to the collection of a groundwater sample, the standing water in the well casing will be purged to ensure that a representative sample of the formation water is collected for analysis. Samples will not be collected before a minimum of three well volumes have been evacuated or before specific conductance has established. To ensure that the groundwater sample is collected from the zone to be monitored, a maximum of five (5) well volumes will be bailed dry and then sampled within 24 hours.

Once a well has been properly purged, samples will be collected in the following manner:

1. Rinse a clean teflon or stainless steel bailer at least five times with a sample water.

2. Transfer the sample into the vial, filling the vial to overflowing, and avoiding turbulence and bubbling as much as possible. Water should

stand above the top of the vial forming a convex meniscus. Carefully but quickly slip the cap onto the vial and tighten. Once the cap is tightly in place, invert the vial and gently tap against your hand to assure there are no bubbles inside. If bubbles are present, open the vial, and repeat the process.

3. Collect a duplicate sample.

4. Label the sample vials. Labels will include the project number, sample identification number, preservatives, date and time of sample collection, type of analysis required, and the name of the sampler.

5. Fill out the chain-of-custody form, include preservation techniques in the remarks section.

6. Check to make sure the vial caps are tight, then place the labeled sample and duplicate on ice immediately.

7. Transport the sample set, in a cooler on ice, back to the office for shipment to the analyzing laboratory, maintaining the chain-of-custody.

If it is necessary to obtain samples for water quality analysis from wells with in-place plumbing (purge wells or domestic wells for example), samples will be collected from the most pump-proximal cold water tap available. The system will be allowed to flush until temperature or conductivity has stabilized. Flow will be reduced to approximately 500ml/minute, (a stream about the width of a pencil), or less for sample collection. The method for sample collection will follow those previously stated.

Surface water blank shall be collected in accordance with the above mentioned methodology. Care will be exercised to allow for minimum disturbance of bottom sediment.

One equipment blank will be collected for each sample set. The blank sample will be collected at a random time. during the work period. The blank will be collected by filling the decontaminated sampling device with distilled or deionized water. Collect a sample of the water utilizing the already described methods.

Sample Preservation and Handling

Soil sample preservation will be provided by immediately placing the containerized samples on ice in a darkened environment, typically in a cooler, to cool the sample to approximately four degrees Celsius, approximately 40 degrees F.

Water samples to be analyzed for dissolved inorganic parameters will be filtered and preserved in the field. They will be preserved by acidifying the samples with the samples with the appropriate acid (either nitric or sulfuric) to lower sample pH to less than two (2), and cooling to four degrees Celsius. Water samples to be analyzed for volatile organics may be preserved in the field with hydrochloric acid, sodium azide, or mercuric chloride.

Acid preservation will be done in a well ventilated area. The tip of the acid bottle will not be allowed to come in contact with sample. If it does, the tip will be flushed five (5) times with distilled water and twice with acid before the next sample is acidified. Samples will remain on ice or be refrigerated at approximately four degrees Celsius until they are analyzed.

After samples have been collected, sample sets will be sent to the laboratory as quickly as possible in sealed coolers packed with fresh ice and chain-of-custody documentation.

Measures to Avoid Cross-Contamination of Samples

To avoid cross-contamination during soil sampling decontamination procedures discussed in the section under Drilling Equipment Decontamination will be followed between each sample interval.

To avoid cross-contamination during well water sampling the following guidelines will be followed. Upon arrival at a site the bailer to be used to collect water samples will be rinsed with methanol or acetone, then scrubbed with alconox soap and thoroughly rinsed with tap water, followed by a thorough rinse of desalt water. If water quality data are available for the site the least contaminated well will be sampled first, followed by the wells suspected to be most contaminated.

Between the collection of each sample, the bailer will be scrubbed with alconox soap, followed by a tap water and distilled water rinse. The nylon rope used on the bailer will be replaced. After completion of the round of sampling of the site, the equipment will be decontaminated as previously described.

In case where teflon tubing is used, the tubing will be washed with a solution of tri-sodium phosphate (TSP), and tap water followed by a rinse with a minimum of one gallon of distilled water. The tubing will also be rinsed with at least three liters of sample water prior to sample collection.

METHODS FOR DETERMINING AQUIFER PARAMETERS

Hydraulic Gradient

The hydraulic gradient is calculated by dividing the difference in the static groundwater elevations by the horizontal distance between the same wells.

Horizontal Hydraulic Conductivity

The rising-head falling-head slug test developed by Bouwer and Rice (1976), is generally used to estimate the hydraulic conductivity of an aquifer with a single well. The wells can be partially penetrating and partially screened, perforated, or otherwise open. The test is initiated by causing an instantaneous change in the water level in a monitor well or piezometer through the introduction or removal of a solid cylinder of known volume. The change in water levels is recorded utilizing a pressure transducer and displayed on a sensor display. The sensor display converts voltage output from the pressure transducer to the water level in feet above the transducer.

The method of interpreting the water levels versus time data that arises from the test in based upon the Thies equation which described the relationship between the inflow into the bore hole and the drawdown. An automated numerical algorithm developed by Kemblowski and Klein is utilized to process the slug test data.

Transmissivity

Aquifer transmissivity and storativity are generally determined by performing a pump test. The general set-up procedure is to install a production well five (5) feet from a permanent monitor well and the second temporary observation well fifty feet from the production well.

The production well is pumped at a constant discharge rate, while drawdowns are recorded in the pumping well and adjacent wells with digital electronic water level sensing devices at specified time intervals. Discharge from the pumping well is direct so as to avoid aquifer recharge to the test area. The test is allowed to run for a minimum of four hours at constant discharge rate. upon completion of the pumping period, recover in the observation wells is monitored for a minimum of thirty minutes or until recovery to static water level is reached.

The method of interpreting the drawdown data versus time and/or distance is based on techniques developed by Theis, or those modified for. The Theis method, such as Cooper and Jacob (1946), Hantush (1964), Neuman (1974), or Kahn (1982).

Appendix C
SCAPS Field Data

By AB Date Sep 96 Subject Laredo AFB Sheet No. 2 of 3

Chris,
We pushed 3 LIF holes on the 1st day. The overnight water level in these was 12'. This is what we based the 17.0' depth for our Power Punches on.

We ran elevations on the first nine wells after letting them sit overnight. An assumed elevation of 100.00' was used for take off on top of riser of well # P205.

Surf elev.	pp#	riser elev.	water elev.	depth to water	
481.5	~~P205~~	100.00	90.65	~~9.35~~	8.85
480.9	~~P187~~	99.73	90.63	~~9.10~~	8.6
482.0	~~P186~~	100.38	91.14	~~9.24~~	8.74
482.6	~~P185~~	101.19	91.79	~~9.40~~	8.9
483.5	~~P203~~	101.95	91.30	~~10.65~~	10.15
	✓~~P-1~~	101.55	90.66	~~10.89~~	10.39
482.2	P257	100.94	90.64	~~10.30~~	9.8
481.4	P259	99.93	91.08	~~8.85~~	8.35
481.2	P241	99.71	91.16	~~8.55~~	8.05

Elevations were not taken on the ground. Riser stickups were approx. 0.5'.

Note: A broken water line at the fire hydrant SW of site was repaired two days before these elevations were taken.

ESTIMATE

y ______ Date Sep 96 Subject Laredo AFB Sheet No. 3 of 3

LIF #	Depth	
F-1	17.8	
F257	16.1	
F223	21.8	
F186	19.5	All non-detects
F189	17.7	
F279	21.0	
F271	3.7	
F275	18.7	
F201	13.7	

PowerPunch #	Depth	Soil Sample Depth	
P-1	17.0	5.0-6.5	10.0-11.5
~~P257~~	17.0	5.0-6.5	10.0-11.5
~~P259~~	17.0	5.0-6.5	10.0-11.5
~~P241~~	17.0	~~5.0-6.5~~ 8.0-10.5	
~~P205~~	17.0	5.0-6.5	10.0-11.5
~~P187~~	17.0	5.0-6.5	10.0-11.5
~~P186~~	17.0	5.0-6.5	10.0-11.5
~~P185~~	17.0	5.0-6.5	10.0-11.5
~~P203~~	17.0	5.0-6.5	10.0-11.5
~~P223~~	17.0	5.0-6.5	10.0-11.5
~~P222~~	17.0	5.0-6.5	10.0-11.5
~~P221~~	17.0	5.0-8.0	
~~P220~~	17.0	6.5-7.2	8.0-11.0
~~P219~~	15.1 (refusal)	6.5-8.0	10.0-11.5
~~P237~~	17.0	5.0-6.5	10.0-11.5
P255	17.0	5.0-6.5	10.0-11.5
P274	17.0	5.0-6.5	10.0-11.5
P275	17.0	5.0-6.5	10.0-11.5
P276	17.0	5.0-6.5	10.0-11.5
P277	17.0	5.0-6.5	10.0-11.5
P278	— (refusal @ 4.7)	none	
~~P279~~	17.0	5.0-6.5	10.0-11.5
~~P261~~	17.0	5.0-6.5	10.0-11.5
~~P225~~	17.0	4.0-5.5	10.0-11.5
~~P189~~	17.0	6.5-8.0	10.0-11.5
~~P152~~	16.3 (refusal)	5.0-6.5	10.0-11.5
~~P218~~	16.1 (refusal)	5.0-6.5	10.0-11.5
~~P147~~	13.5 (refusal)	5.0-6.5	9.6-10.4
~~P226~~	17.0	6.5-8.0	10.0-11.5
~~P150~~	12.8 (refusal)	5.0-6.5	10.0-11.5
~~P154~~	15.9 (refusal)	5.0-6.5	10.0-11.5

Laredo International Airport
Fire Training Area Burn Pit Preliminary Investigation
Summary of Sampling Locations and Anomalies

Samples are listed in the order they were collected during the day.

September 19, 1996

Location	Description
SL P1 5'	brown, moderately soft, **clay/soil with intermittant wood shavings**
SL P1 10'	brown, moderately soft, clay with **soil discoloration**
SL P1	tan, dry, soil
SL 257 5'	brown, soft, soil
SL 257 10'	mix of brown (tan) w/ yellow, soft, soil
SL 257	tan, dry, soft, soil
SL 259 5'	brown, soft, soil
SL 259 10'	grey, moderately soft, clay
SL 241 5'	**burn pit debris encountered, no sample retrieved**
SL 241 10'	**burn pit debris encountered, no sample retrieved**
SL 241 8'	**black and tan, soft, clay w/ staining and burn debris (ashes)**

Septmeber 20, 1996

Location	Description
SL 205 5'	tan, dry, moderately soft, clay
SL 205 10'	brown (tan), dry, firm, clay/soil
SL 187 5'	tan, slightly moist, moderately firm, clay, silty
SL 187 10'	tan, dry, hard, sandy, clay
SL 186 5'	brown, dry, moderately soft, clay
SL 186 10'	dry, soft, clay/silt
SL 185 5'	colored layers (yellow, red, tan), firm, dry, clay
SL 185 10'	grey and tan, dry, hard, clay
SL 203 5'	grey, firm, dry, clay
SL 203 10'	grey, firm, dry, clay

September 21, 1996

Location	Description
SL 223 5'	brown, firm, dry, clay
SL 223 10'	grey, firm, dry, clay
SL 222 5'	**black, soft, dry, sandy/clay with burn pit debris**
SL 222 10'	brown (tan), firm, dry, clay
SL 221 5'	**black, soft, dry, sandy/clay with burn pit debris**
→ SL 220 5'	brown, soft, dry, clay (not enough sample retrieved)
SL 220 8'	grey, firm, dry, clay
→ **SL 219 6'**	**grey, firm, clay with burn debris (5') and ashes**
SL 219 10'	grey, firm, dry, clay
SL 237 5'	**grey and black, firm, dry, clay with burn debris**
SL 237 10'	grey, hard, dry, clay
SL 255 5'	brown, hard, dry, clay
SL 255 10'	grey, hard, dry, clay
SL 274 5'	grey and tan, hard, dry, clay
SL 274 10'	tan, hard, dry, clay

September 22, 1996

Location	Description
SL 259	tan, hard, dry, soil
SL 241	tan, hard, dry, soil w/ sand and ashes
SL 205	tan, soft, dry, soil w/ gravel
SL 187	tan, soft, dry, sand w/ gravel
SL 186	tan, hard, dry, sand w/ gravel
SL 185	brown, soft, dry, soil
SL 203	tan, soft, dry, sand
SL 223	tan, hard, dry, sand w/ gravel
SL 222	**black, hard, dry, oil/asphalt cap (0.2' thick) with sand and gravel**
SL 221	tan, soft, dry, sand w/ gravel
SL 220	tan, hard, dry, sand w/ gravel
SL 219	tan, hard, dry, sand w/ cobbles
SL 237	tan, hard, dry, sand w/ gravel
SL 255	tan, hard, dry, soil
SL 274	brown, hard, dry, soil