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FINAL OIL WATER SEPARATOR ASSESSMENT REPORT WITH TRANSMITTAL LETTER
NAS FORT WORTH TX
11/1/1995
LAW ENGINEERING AND ENVIRONMENTAL



**NAVAL AIR STATION
FORT WORTH JRB
CARSWELL FIELD
TEXAS**

**ADMINISTRATIVE RECORD
COVER SHEET**

AR File Number 272

01010

11-3517-0121

INSTALLATION RESTORATION PROGRAM (IRP)
OIL/WATER SEPARATOR ASSESSMENT REPORT

Naval Air Station Fort Worth, Joint Reserve Base, Carswell Field
Fort Worth, Texas

August 1995
Reissued November 1995
Final



PREPARED FOR

AIR FORCE BASE CONVERSION AGENCY (AFBCA/OL-H)
NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE, CARSWELL FIELD
FORT WORTH, TEXAS 76127-5000

UNITED STATES AIR FORCE
AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
ENVIRONMENTAL RESTORATION BASE REALIGNMENT & CLOSURE DIVISION (ERB)
BROOKS AIR FORCE BASE, TEXAS 78235-5328

CONTRACT NO.: F33615-90-D-4008

DELIVERY ORDER 0021

11-3517-0121



29 Nov 95

Mr. Charles A. Rice, Team Chief
Air Force Center for Environmental Excellence
HQ AFCEE/ERB
3207 North Road, Bldg. 532
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Subject: **Final Oil/Water Separator Assessment Report**
Contract No. F33615-90-D-4008, Delivery Order No. 0021
Naval Air Station Fort Worth Joint Reserve Base, Carswell Field

Dear Mr. Rice:

Law Environmental, Inc. is pleased to submit the enclosed nine copies of this re-issuance of the Final Oil/Water Separator Assessment Report to the Air Force Center for Environmental Excellence (AFCEE).

If you have questions or comments, please contact us at 770-499-6800.

Sincerely,

LAW ENVIRONMENTAL, INC.

James R. Forbes, P.E.
Project Manager

E. Fred Sharpe, Jr. P.E.
Principal

GOVERNMENT SERVICES DIVISION

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ONE OF THE LAW COMPANIES

**INSTALLATION RESTORATION PROGRAM (IRP)
FINAL OIL/WATER SEPARATOR ASSESSMENT REPORT**

FOR

**NAVAL AIR STATION FORT WORTH,
JOINT RESERVE BASE, CARSWELL FIELD
FORT WORTH, TEXAS 76127-5000**

**AUGUST 1995
REISSUED NOVEMBER 1995**

Prepared by:

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United States Air Force
Air Force Center for Environmental Excellence (AFCEE/ERB)
Brooks Air Force Base, Texas 78235-5328
Contract No. F33615-90-D-4008
Delivery Order 0021

00000000

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect on this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE AUGUST 1995	3. REPORT TYPE AND DATES COVERED FINAL	
4. TITLE AND SUBTITLE INSTALLATION RESTORATION PROGRAM OIL/WATER SEPARATOR ASSESSMENT REPORT			5. FUNDING NUMBERS CONTRACT NO. F33615-90-D-4008/0021	
6. AUTHOR(S) LAW ENVIRONMENTAL, INC. (LAW)				
7. PERFORMANCE ORGANIZATION NAME(S) AND ADDRESS(ES) LAW ENVIRONMENTAL, INC. GOVERNMENT SERVICES DIVISION 114 TOWNPARK DR. KENNESAW, GA 30144			8. PERFORMING ORGANIZATION REPORT NUMBER (N/A)	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE ENVIRONMENTAL RESTORATION DIRECTORATE BASE CLOSURE RESTORATION DIVISION (ERB) ENVIRONMENTAL RESTORATION BASE REALIGNMENT & CLOSURE DIVISION BROOKS AIR FORCE BASE, TEXAS 78235-5000			10. SPONSORING/MONITORING AGENCY REPORT NUMBER (N/A)	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) <p>LAW ENVIRONMENTAL, INC. (LAW), UNDER THE AIR FORCE INSTALLATION RESTORATION PROGRAM (IRP), CONDUCTED ASSESSMENTS OF 11 OIL/WATER SEPARATORS FOR CARSWELL AFB. THE 11 OIL/WATER SEPARATORS WERE LOCATED THROUGHOUT THE NAVAL AIR STATION FORT WORTH (FORMERLY CARSWELL AFB) FACILITY. PROJECT OBJECTIVES INCLUDED ASSESSING ABSENCE OR PRESENCE OF CONTAMINANTS, EVALUATION OF OPERATIONAL STATUS, RECOMMENDATIONS OF REPAIRS OR REPLACEMENT, AND RECOMMENDATIONS CONCERNING USE OF EACH OIL/WATER SEPARATOR.</p> <p>LAW OBTAINED INFORMATION FOR THE ASSESSMENT THROUGH RECORDS REVIEW, INTERVIEWS WITH BASE PERSONNEL, VISUAL INSPECTION OF EACH OIL/WATER SEPARATOR, AND ANALYSIS OF SOIL SAMPLES COLLECTED FROM THE PERIMETER OF EACH OIL/WATER SEPARATOR. THE SOIL SAMPLES WERE ANALYZED TO EVALUATE WHETHER RELATED CONTAMINANTS WERE RELEASED INTO THE SURROUNDING SOIL VIA SPILLS OR LEAKAGE.</p>				
14. SUBJECT TERMS OIL/WATER SEPARATOR ASSESSMENT			15. NUMBER OF PAGES 100	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UL	

PREFACE

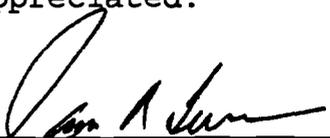
Law Environmental, Inc., (LAW) was contracted by the U.S. Air Force Center For Environmental Excellence (AFCEE) to perform 11 Oil/Water Separator Assessments at the Naval Air Station Fort Worth, Joint Reserve Base, Carswell Field (NAS Fort Worth) (formerly Carswell Air Force Base, Texas). The 11 Oil/Water Separators investigated are adjacent to and previously operated in association with the following buildings:

1. Unnamed Stream (former location of Building 38A)
2. Truck Refueling Station (Building 1064)
3. Machine Shop (Building 1060)
4. Aircraft Wash Rack (Building 1027)
5. Engine Test Cell (Building 1015)
6. Bomb Assembly (Building 4210)
7. Generator Maintenance (Building 1414)
8. Auto Hobby Shop (Building 1145)
9. Hazardous Waste Storage Area (Building 1190)
10. Vehicle Maintenance Shop (Building 1191)
11. Fuel Truck Repair (Building 1194)

The primary objectives of this investigation were to:

1. Assess the presence or absence of contamination and assess the types and quantities of detected contamination
2. Evaluate the operational status of each oil/water separator under study and recommend any repair and/or replacement needs
3. Provide a written report discussing the evaluation and recommended future use of each oil/water separator under study by this delivery order

This Assessment Report was prepared by the LAW project team for NAS Fort Worth and reviewed by Mr. James R. Forbes and Mr. E. Fred Sharpe, Jr. The efforts of Captain Joe Feaster, formerly AFCEE Team Chief, and personnel at NAS Fort Worth are greatly appreciated.


James R. Forbes, P.E.
Project Manager


E. Fred Sharpe, Jr., P.E.
Principal

DISCLAIMER NOTICE

This Final Assessment Report has been prepared for the United States Air Force by Law Environmental, Inc., (LAW) for the purpose of aiding in the implementation of a final remedial action plan under the Air Force Installation Restoration Program (IRP). As the report relates to actual or possible releases of potentially hazardous substances, its release prior to an Air Force final decision on remedial action may be in the public's interest. The limited objectives associated with this assessment and the ongoing nature of the IRP, along with the evolving knowledge of site conditions and chemical effects on the environment and human health, must be considered when evaluating this document. Also, subsequent facts may become known which may make this document premature or inaccurate. Acceptance of this document in performance of the contract under which it is prepared does not mean that the United States Air Force adopts the conclusions, recommendations or other views expressed herein, which are those of the contractor only and do not necessarily reflect the official position of the United States Air Force.

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EXECUTIVE SUMMARY

Law Environmental, Inc., (LAW) was contracted by the U.S. Air Force Center for Environmental Excellence (AFCEE) to provide assessments for 11 oil/water separators at the Naval Air Station Fort Worth, Joint Reserve Base, Carswell Field (NAS Fort Worth) (formerly Carswell Air Force Base), located in Tarrant County, Texas. The assessments were conducted in response to the Statement of Work (SOW) dated August 3, 1993, under Delivery Order No. 0021, AFCEE Contract No. F33615-90-D-4008. The primary objectives of this investigation are listed below:

- Assess the presence or absence and the types and quantities of contamination at each of the 11 separator units
- Evaluate the operational status of each of the 11 oil/water separator units and recommend repair and/or replacement needs (if required)
- Recommend future use for each of the 11 oil/water separators evaluated

LAW obtained information for each separator unit through records review, interviews with base personnel, visual observation of the separator units, and analysis of soil samples collected from the perimeter of each oil/water separator. Soil samples were analyzed for volatile organic compounds and metals to evaluate whether or not the separator unit had released contaminants into the surrounding soil.

A limited number of background soil samples were collected from five soil borings located across the NAS Fort Worth facility to

establish a representative background concentration range for surface and subsurface soils.

A risk evaluation was prepared to compare the appropriate Texas Natural Resource Conservation Commission (TNRCC) Risk Reduction Standards (TNRCC, 1993) to the positive results of soil samples collected at each separator unit. The selection of appropriate Texas Risk Reduction Standards was based on available analytical data and the understanding that the land use associated with the oil/water separators is currently, and would remain, industrial.

Based on visual observations and information evaluated for each of the oil/water separators studied, there were no apparent structural or operational deficiencies requiring major repairs or replacement. During the investigation, the base was undergoing realignment and activities at the base appeared to be greatly reduced. The majority of the oil/water separators were not receiving influent. Therefore, a reevaluation of the oil/water separators for operational deficiencies is recommended which should include an dye trace study under the full range of flow conditions. It is also recommended that the oil/water separator at the Unnamed Stream be evaluated after increasing the flow through the unit, with additional sampling of the effluent being released into the Unnamed Stream.

None of the soil samples analyzed contained volatile organics above Texas Risk Reduction Standards. However, based on the limited background data, the soils in the immediate area of each of the 11 oil/water separators were contaminated with metals above Texas Risk Reduction Standards. Because the background data were limited, we recommend a comprehensive background study, and subsequent evaluation of the results of site-specific metals analyses to the comprehensive background data. If indicated by this reevaluation, we recommend the collection and analyses of additional surface and subsurface soil samples to evaluate the range of concentrations of

naturally occurring metals in the soils. Additionally, we recommend sampling and analysis to assess the vertical and horizontal extent of metals contamination at each oil/water separator.

The table on the following page summarizes the results obtained for metals analyses. In this table, the first value is the number of results above the tentative background levels utilized for this assessment. The second value is the number of results also above the appropriate TNRCC Risk Reduction Standards.

SUMMARY OF METALS RESULTS BY INDIVIDUAL OIL/WATER SEPARATOR

Location	# Samples	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	
Bldg. 38A	5	0/0	0/0	1/1	0/0	0/0	0/0	1/0	0/0	0/0	0/0	0/0	1/1	1/0	2/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Bldg. 1064	4	0/0	0/0	1/1	0/0	0/0	0/0	0/0	0/0	0/0	1/0	0/0	0/0	1/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Bldg. 1060	7	1/0	0/0	1/1	0/0	0/0	0/0	1/0	1/1	0/0	1/0	0/0	0/0	2/0	1/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/0	0/0
Bldg. 1027	9	0/0	0/0	2/2	0/0	0/0	1/1	0/0	0/0	0/0	1/0	0/0	1/1	1/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/0
Bldg. 1015	7	2/0	0/0	1/1	1/0	0/0	0/0	5/0	1/1	0/0	0/0	0/0	0/0	6/0	1/0	0/0	1/1	2/0	0/0	0/0	3/0	0/0	0/0	0/0	1/0
Bldg. 4210	9	0/0	0/0	4/4	0/0	1/1	0/0	0/0	1/1	2/0	0/0	0/0	0/0	0/0	0/0	0/0	3/3	0/0	0/0	0/0	0/0	0/0	2/0	0/0	0/0
Bldg. 1414	6	0/0	0/0	0/0	1/0	3/3	0/0	1/0	0/0	2/0	0/0	0/0	0/0	0/0	0/0	0/0	1/1	0/0	0/0	0/0	5/0	0/0	0/0	0/0	0/0
Bldg. 1145	9	2/0	0/0	2/2	0/0	0/0	0/0	1/0	1/1	0/0	0/0	0/0	1/1	1/0	1/0	0/0	0/0	0/0	0/0	0/0	1/0	0/0	0/0	0/0	0/0
Bldg. 1190	4	0/0	0/0	1/1	0/0	0/0	1/1	0/0	0/0	0/0	0/0	0/0	1/1	0/0	1/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/0
Bldg. 1191	5	0/0	0/0	3/3	0/0	0/0	0/0	3/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Bldg. 1194	6	0/0	0/0	0/0	0/0	1/1	0/0	0/0	0/0	1/0	1/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0

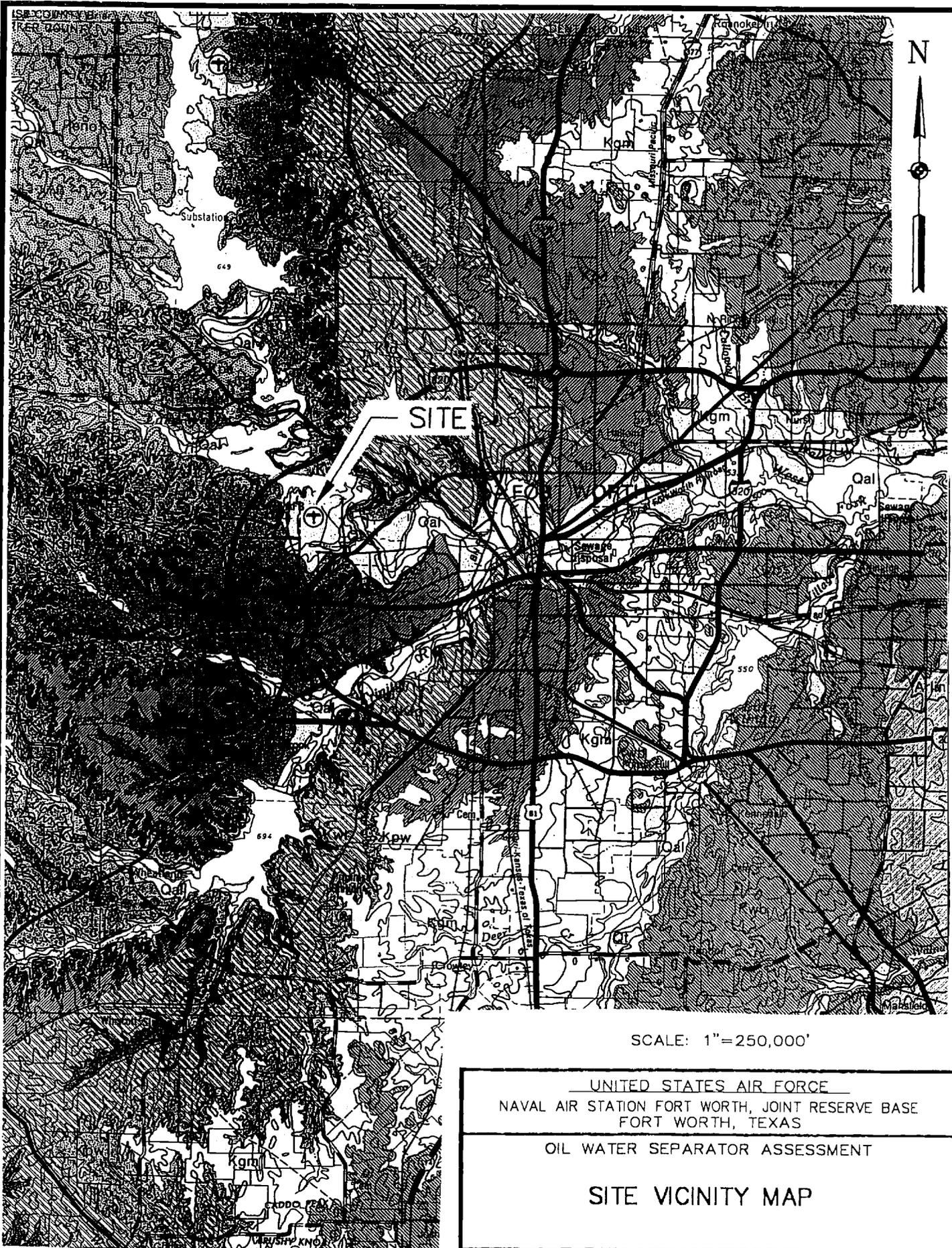
1.0 INTRODUCTION

Law Environmental, Inc., (LAW) was contracted by the U.S. Air Force Center for Environmental Excellence (AFCEE) to perform 11 oil/water separator assessments at the Naval Air Station Fort Worth, Joint Reserve Base, Carswell Field (NAS Fort Worth) (formerly Carswell Air Force Base), located in Terrance County, Texas (Figure 1-1). The assessments were conducted in response to the Statement of Work (SOW) dated August 3, 1993, under Delivery Order No. 0021, AFCEE Contract No. F33615-90-D-4008.

1.1 PROJECT OBJECTIVES

The oil/water separators were assessed to evaluate the environmental condition of each of the 11 oil/water separators under study. Table 1-1 lists the oil/water separators evaluated during this project, and Figure 1-2 identifies the 11 locations. LAW obtained information for the assessment through records review, interviews with base personnel, visual observation of each oil/water separator, and analyses of soil samples collected from the perimeter of each separator unit. The primary objectives of this assessment are listed below:

- Assess the presence or absence of contamination and assess the types and quantities of detected contamination at each of the 11 separator units
- Evaluate the operational status of each of the 11 oil/water separator units and recommend repair and/or replacement needs (if required)
- Recommend future use for each of the 11 oil/water separators evaluated



SCALE: 1"=250,000'

UNITED STATES AIR FORCE
 NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
 FORT WORTH, TEXAS

OIL WATER SEPARATOR ASSESSMENT

SITE VICINITY MAP

PREPARED BY/DATE:	FIGURE NUMBER: 1-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE:		PLOT DATE: 17.AUG.95
APPROVED BY/DATE:		FILE NAME: sitvic.dwg

SOURCE: GEOLOGIC ATLAS OF TEXAS, DALLAS SHEET
 1987, BUREAU OF ECONOMICS GEOLOGY, THE
 UNIVERSITY OF TEXAS - AUSTIN, TEXAS

TABLE 1-1
OIL/WATER SEPARATORS
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

-
- 1) Unnamed Stream (former location of Building 38A)
 - 2) Truck Refueling Station (Building 1064)
 - 3) Machine Shop (Building 1060)
 - 4) Aircraft Wash Rack (Building 1027, SWMU No. 44)
 - 5) Engine Test Cell (Building 1015, SWMU No. 47)
 - 6) Bomb Assembly (Building 4210)
 - 7) Generator Maintenance Building (Building 1414, SWMU No. 41)
 - 8) Auto Hobby Shop (Building 1145)
 - 9) Hazardous Waste Storage Building (Building 1190, SWMU No. 52)
 - 10) Vehicle Maintenance Shop (Building 1191, SWMU No. 37)
 - 11) Fuel Truck Repair Building (Building 1194, SWMU No. 35)
-

00000000

5
4
3
2
1

NOTE:
 LOCATION OF IRP SITES BASED ON DEPARTMENT OF THE AIR FORCE MASTER PLAN IRP SITES-SOIL CONTAMINATION CARSWELL AFB, FORT WORTH, TEXAS, REVISED 1985
 LOCATION OF EXISTING MONITORING WELLS BASED ON REMEDIAL INVESTIGATION REPORT FOR THE EAST AREA, OCTOBER 1991.
 LOCATION OF GROUND-WATER SCREEN GRID, BACKGROUND SOIL SAMPLES AND MONITORING WELLS ARE APPROXIMATE.

LEGEND

- OIL/WATER SEPARATORS
- 1 UNNAMED STREAM (PREVIOUS LOCATION BLDG. 38A)
 - 2 TRUCK RE-FUEL STATION (BLDG. 1064)
 - 3 MACHINE SHOP (BLDG. 1060)
 - 4 AIRCRAFT WASH RACK (BLDG. 1027)
 - 5 ENGINE TEST CELL (BLDG. 1015)
 - 6 BOMB ASSEMBLY (BLDG. 4210)
 - 7 GENERATOR MAINTENANCE (BLDG. 1414)
 - 8 AUTO HOBBY SHOP (BLDG. 1145)
 - 9 HAZARDOUS WASTE STORAGE AREA (BLDG. 1190)
 - 10 VEHICLE MAINTENANCE SHOP (BLDG. 1191)
 - 11 FUEL TRUCK REPAIR (BLDG. 1194)
- IRP SITES
- BACKGROUND SOIL SAMPLING LOCATION
 - A-1-90 GROUND-WATER SCREEN GRID LOCATION
 - LAW MONITORING WELLS (1994)
 - EXISTING MONITORING WELLS
 - NOT DETECTED
 - ESTIMATED QUANTIFICATION-POSSIBLY BIASED HIGH BASED UPON QC DATA
 - ESTIMATED QUANTIFICATION BASED UPON QC DATA

IRP SITES	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13	1-14	1-15	1-16	1-17	1-18	1-19	1-20
ANALYTES	4200	4201	4202	4203	4204	4205	4206	4207	4208	4209	4210	4211	4212	4213	4214	4215	4216	4217	4218	4219
CHLORIDE	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
COBALT	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
COPPER	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CHROMIUM	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
IRON	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
MANGANESE	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
NICKEL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
PERMANGANATE	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
POTASSIUM	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
ZINC	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

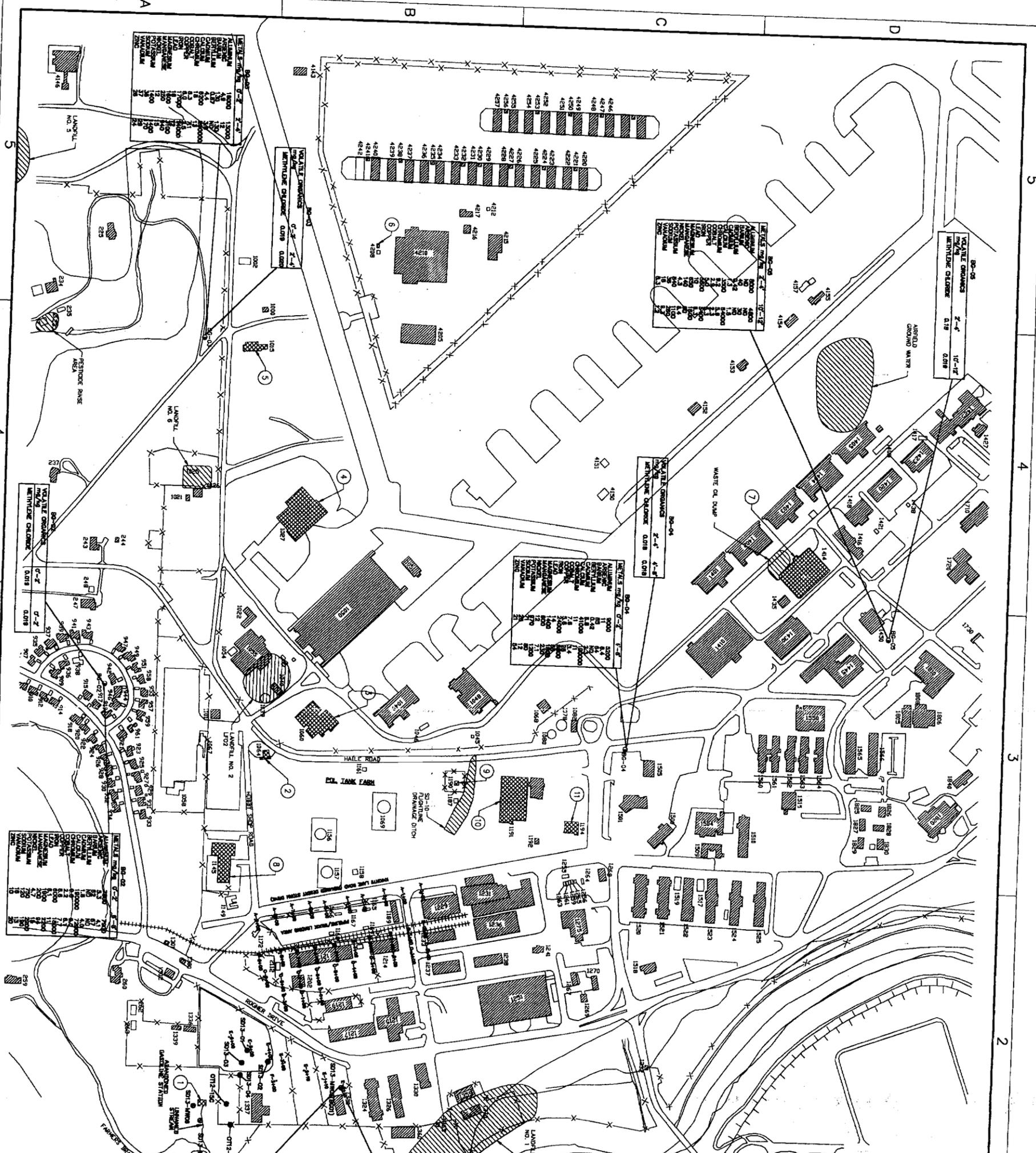
IRP SITES	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13	1-14	1-15	1-16	1-17	1-18	1-19	1-20
ANALYTES	4200	4201	4202	4203	4204	4205	4206	4207	4208	4209	4210	4211	4212	4213	4214	4215	4216	4217	4218	4219
CHLORIDE	0.14	0.098	0.014	0.0092	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
COBALT	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
COPPER	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
CHROMIUM	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
IRON	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
MANGANESE	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
NICKEL	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
PERMANGANATE	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
POTASSIUM	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
ZINC	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002

SCALE IN FEET

UNITED STATES AIR FORCE
 NAVAL AIR STATION
 FORT WORTH, TEXAS

BACKGROUND LOCATION
 POSITIVE ANALYTICAL RESULTS

DATE: 6 JUNE 94
 PROJECT NO: 11-3517-0121
 SOURCE MAP: BASE COMPREHENSIVE PLAN
 FROM NUMBER:
 FIGURE 5-1



1.2 PROJECT APPROACH

The project was performed in general accordance with the project-specific Health and Safety Plan (LAW, 1994a), Work Plan Addendum (LAW, 1994b), and Sampling and Analysis Plan Addendum (LAW, 1994c). The approaches utilized and activities conducted during the course of these assessments were implemented in three stages, as follows:

1. Site visits were made to review available documents, and interviews were conducted with NAS Fort Worth personnel regarding oil/water separator construction, maintenance, and operating history. Visual observations were made by LAW to obtain information on the general condition and visually obvious structural deficiencies of the 11 oil/water separators.
2. Soil borings were advanced at each oil/water separator to collect soil samples for chemical analysis. Soil samples were analyzed for volatile organic compounds (VOCs) and metals to assess whether or not oil/water separator-related contaminants were released to adjacent soil via oil/water separator leakage.
3. Compilation and assembly of Information obtained from the above activities was compiled and assembled to evaluate the environmental condition of each of the 11 oil/water separators and to generate this assessment report.

1.3 ORGANIZATION OF REPORT

This report has been prepared to assemble and integrate data obtained during this oil/water separator assessment. The report is arranged accordingly:

EXECUTIVE SUMMARY - Summarizes the purpose, approach, and results of the assessment.

1.0 INTRODUCTION - Discusses the project objective, approach and report organization.

2.0 SITE SETTING - Discusses the physical characteristics of the areas under study.

3.0 PROJECT ACTIVITIES AND METHODOLOGIES - Describes the tasks performed during this environmental assessment.

4.0 COMPARISON OF ANALYTICAL DATA WITH REGULATORY STANDARDS - Discusses the general rationale and approach used to evaluate site conditions based on comparisons between chemical constituents detected at the site and the Texas Risk Reduction Standards.

5.0 BACKGROUND - Discusses the rationale and utilization of soil samples collected for comparison of detected concentrations to background.

6.0 to 16.0 SPECIFIC OIL/WATER SEPARATORS - Discusses the site-specific background information, investigative results, conclusions, and recommendations obtained from the assessment of each oil/water separator.

17.0 CONCLUSIONS AND RECOMMENDATIONS - Provides a summary of conclusions and recommendations with respect to the

environmental condition of the site based on information
obtained during the oil/water separator assessments.

3517-0121.15

2.0 SITE SETTING

This section summarizes the general setting of the Naval Air Station Fort Worth, Joint Reserve Base, Carswell Field (NAS Fort Worth) (formerly Carswell Air Force Base), which includes the areas of the 11 oil/water separators investigated.

2.1 GEOLOGY

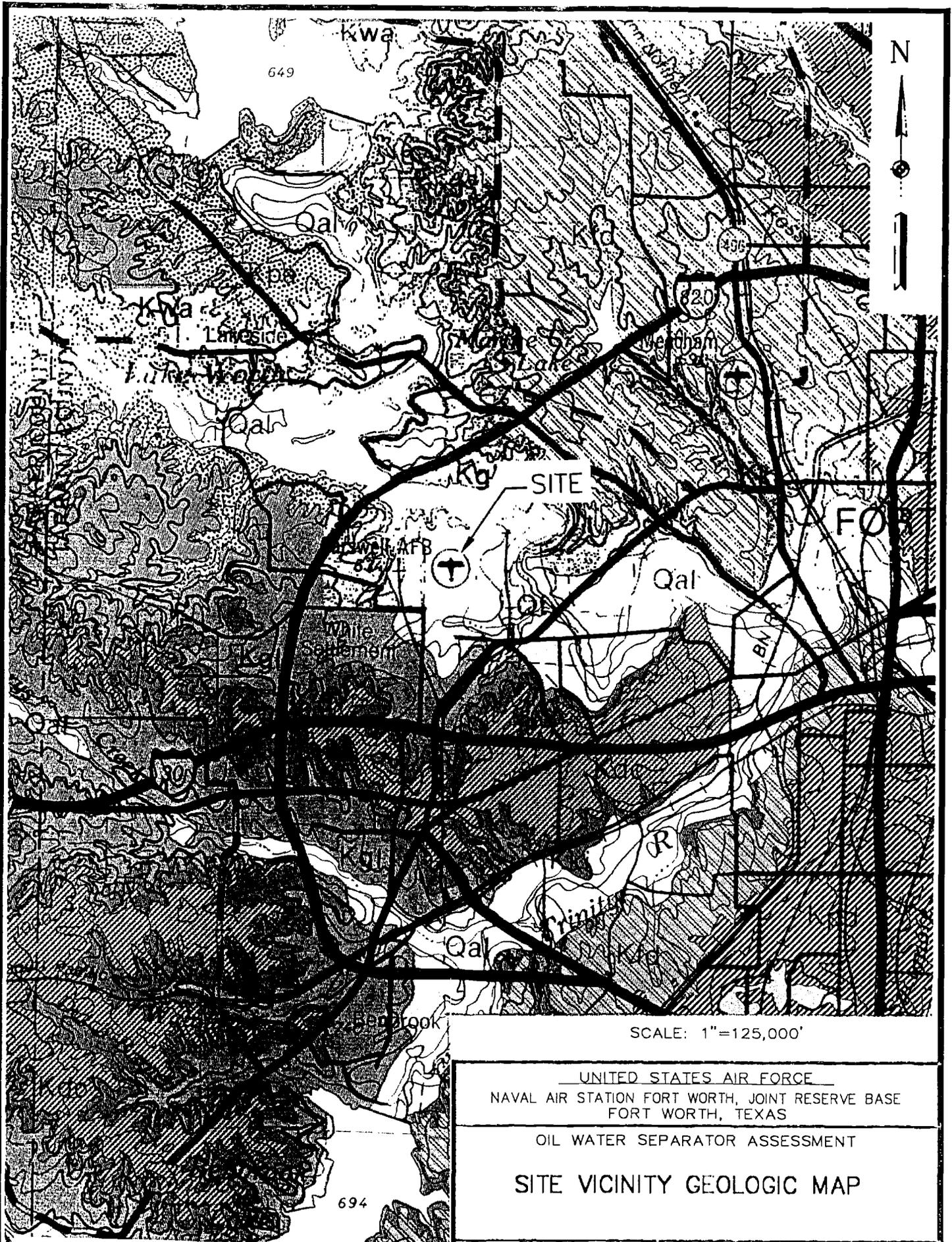
The majority of the base is covered by Quaternary terrace deposits of the Trinity River (Figures 2-1 and 2-2). The terrace deposits are composed of sand, silt, clay and gravels of variable thickness and lateral extent. These deposits are underlain by Cretaceous limestones. The uppermost formation in the southeastern portion of the base is the Goodland Formation. The Goodland Formation is a chalky white fossiliferous limestone and marl. The Goodland Formation outcrops approximately 200 feet east of the 1337 Storage Yard in the Farmers Branch Creek. Beneath the Goodland Formation is the Walnut Formation, a coquina limestone with variable quantities of clay and shale. Underlying the Walnut Formation is the Paluxy Formation, a fine to coarse-grained sand with minor quantities of clay, sandy clay, pyrite, lignite, and shale. The regional dip of the rocks in the vicinity of NAS Fort Worth ranges from 35 to 40 feet per mile to the east and southeast.

2.2 HYDROGEOLOGY

The three uppermost hydrogeological units identified at NAS Fort Worth are as follows:

- A perched water zone occupying the Quaternary terrace deposits of the Trinity River

3517-0121



SCALE: 1"=125,000'

UNITED STATES AIR FORCE
 NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
 FORT WORTH, TEXAS

OIL WATER SEPARATOR ASSESSMENT

SITE VICINITY GEOLOGIC MAP

SOURCE: GEOLOGIC ATLAS OF TEXAS, DALLAS SHEET
 1987, BUREAU OF ECONOMICS GEOLOGY, THE
 UNIVERSITY OF TEXAS - AUSTIN, TEXAS

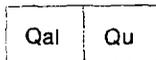
PREPARED BY/DATE:	FIGURE NUMBER: 2-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE:		PLOT DATE: 17.AUG.95
APPROVED BY/DATE:		FILE NAME: sitvic.dwg

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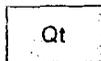


LEGEND

Pleistocene Holocene

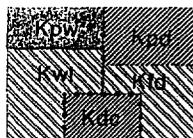


Alluvium and Quaternary deposits undivided



Fluviatile terrace deposits

QUATERNARY



Pawpaw Formation, Weno Limestone, Denton Clay, Fort Worth Limestone, and Duck Creek Formation



Kiamichi Formation



Edwards Limestone, Comanche Peak Limestone, and Goodland Limestone

Lower Cretaceous



Walnut Clay



Paluxy Sand



Glen Rose Formation



Twin Mountains Formation

UNITED STATES AIR FORCE
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
FORT WORTH, TEXAS

OIL WATER SEPARATOR ASSESSMENT

GEOLOGIC MAP LEGEND

SOURCE: GEOLOGIC ATLAS OF TEXAS, DALLAS SHEET
1987, BUREAU OF ECONOMICS GEOLOGY, THE
UNIVERSITY OF TEXAS - AUSTIN, TEXAS

PREPARED BY/DATE:

CHECKED BY/DATE:

APPROVED BY/DATE:

FIGURE
NUMBER:

2-2

FILE DATE:

20 JANUARY 94

PLOT DATE:

17.AUG.95

FILE NAME:

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- An aquitard consisting of predominantly unsaturated limestone of the Goodland and Walnut Creek Formations
- The Paluxy Sands

The Quaternary terrace deposits which form the perched-water zone are composed of sand, silt, clay, and gravel. Ground water is first encountered within the perched water zone at depths ranging from approximately 5 to 15 feet below the ground surface. Annual ground-water fluctuations are typically on the order of 5 feet. Recharge to the perched water zone is from rainfall and infiltration from stream channels and drainage ditches.

The perched water zone in the Quaternary terrace deposits is separated from the underlying aquifers by the low permeability limestone and shale of the Goodland and Walnut formations. Although primarily dry, drillers in the area have reported small quantities of water in the Walnut Formation, indicating that ground water may move through the Goodland and Walnut Formations along fractures and bedding planes. The thickness of the Goodland/Walnut formations is approximately 25 feet or greater beneath most of the base. However, the top of the formations is an erosional surface, and weathering may locally reduce the thickness of the formations. In areas of greater erosion, the Quaternary alluvium may be in contact with the Paluxy Formation.

The Paluxy Formation forms the shallowest bedrock aquifer beneath NAS Fort Worth. Ground water within the Paluxy Formation normally occurs under confined conditions beneath the aquitard of the Goodland/Walnut formations at depths of approximately 100 feet below ground surface (450 feet above mean sea level) along the eastern portion of the base. Extensive pumping of ground water in the Fort Worth area has lowered the potentiometric surface within the Paluxy Aquifer beneath the top of the formation, resulting in unconfined conditions of the aquifer in the area of NAS Fort Worth.

The Paluxy Formation is divided into upper and lower sand members, and the aquifer is likewise divided into upper and lower aquifers. The upper sand is fine grained and shaley, while the lower sand is coarser; therefore, most water production wells are screened in the lower section of the aquifer (USACE, 1991). In the vicinity of NAS Fort Worth, the Paluxy Aquifer is recharged from surface outcrops of the formation west of NAS Fort Worth and from outcrops north of the base located under Lake Worth.

3.0 PROJECT ACTIVITIES AND METHODOLOGIES

This section describes the tasks performed during this environmental assessment.

3.1 PURPOSE OF FIELD ACTIVITIES

Field activities associated with the assessment of 11 oil/water separators at NAS Fort Worth were conducted to obtain information and evaluate the environmental condition of each oil/water separator. The field activities included records review, personnel interviews, visual observations, and soil analyses. Records review and personnel interviews were conducted to gain information on the operational history of each oil/water separator and to identify the physical characteristics and the type of maintenance performed. Law Environmental, Inc., (LAW) made visual observations to identify the existing condition of each oil/water separator, including obvious structural deficiencies, missing parts, and visible soil staining or other indications that the separator unit is not functioning properly. Soil borings were advanced near each oil/water separator to collect soil samples for chemical analysis. Soil samples were analyzed for volatile organic compounds (VOCs) and metals which were used as indicator parameters to evaluate whether the oil/water separator had released contaminants into the surrounding soil.

3.2 FIELD ACTIVITIES AND METHODOLOGIES

This section of the report discusses the field activities and methods used during this project to assess each oil/water separator and collect soil samples for chemical analysis.

3.2.1 Soil Boring Program

This section describes the procedures used to advance soil borings and to sample soil from the perimeter of each oil/water separator.

3.2.1.1 Soil Boring Installation - Soil borings were advanced around the perimeter of each oil/water separator following procedures outlined in the project work plans (LAW, 1994a, 1994b) and approved by the U.S. Air Force Center for Environmental Excellence (AFCEE). Soil boring procedures included advancing soil borings with 6.25-inch inner diameter (ID) augers and obtaining continuous samples using 3-inch ID split spoon samplers with California Brass Rings. To reduce the volume of investigation-derived wastes (i.e. soil cuttings), LAW and AFCEE agreed to modify soil boring techniques by eliminating the use of hollow stem augers and pushing the split spoon sampler with the California Brass Rings directly into the soil. Because the split spoon sampler was pushed into the soil, standard penetration tests were not conducted.

Between April 21 and 27, 1994, a total of 38 soil borings were advanced in the vicinity of the 11 oil/water separators and in four background locations. Each boring was advanced to the saturated zone or to refusal. The depths of the borings ranged from 2 feet below the ground surface (1190-SB02) to 16 feet below the ground surface (4210-SB02). The soil boring operations were observed by an on-site geologist. The geologist logged the subsurface soils encountered in the borings and recorded the information on soil boring logs (Appendix A). The soils were classified using the Unified Soil Classification System (ASTM D 2488-69).

3.2.1.2 Soil Sampling and Analysis - Due to inaccessibility to a truck-mounted drill rig, soil borings at the Hazardous Waste Storage Area (1190-SB01, 1190-SB02, and 1190-SB03) were advanced using hand augering techniques. The remaining soil borings were advanced using a 24-inch long, carbon steel split barrel sampler

which encased four 6-inch long California Brass Rings. In each soil boring, a decontaminated split spoon sampler was advanced 2 feet, the split spoon sampler was then removed from the boring, placed on aluminum foil, and opened. The brass rings were spaced approximately 2 inches apart and initial photoionization detector (PID) readings were obtained from the space between each brass ring. The soils encountered were logged by the on-site geologist, the upper most brass ring was removed, and the remaining brass rings were wrapped in aluminum foil. After approximately 15 minutes, a second set of PID readings was obtained from the lowermost ring. A decision was made in the field to record the second set of PID readings, because the initial readings were very low, generally zero, and the second set of readings was deemed to be more representative of actual conditions. After the soil samples were field screened, the brass rings were sealed with a Teflon liner and a plastic cap encasing the soil in the brass rings. The sampling activities were repeated at each boring location until saturated soils or refusal was encountered.

Typically two sets of soil samples were retained from each soil boring for chemical analysis. The soil samples retained included the sample interval with the highest PID reading and the soil sample from the boring termination interval. For each of the soil samples retained for laboratory analysis, the middle 6-inch brass ring was sent to the laboratory for VOC analysis. One of the two remaining brass rings was submitted to the laboratory for metals analysis.

The soil samples were transported under chain-of-custody protocol via overnight courier to Law Environmental National Laboratories in Pensacola, Florida. The soil samples were analyzed for metals by EPA Method SW3050/SW6010 and for VOCs by EPA Method SW8240. Additional information on the laboratory methodology is presented in Section 3.3. The results of the laboratory analyses for each individual oil/water separator are presented in Sections 6.0 through 16.0. The sampling equipment was decontaminated prior to

each use in accordance with the Project Sampling and Analysis Plan (SAP) Addendum (LAW, 1994b).

3.2.2 Management of Investigation-Derived Waste

Soil investigation activities conducted for this project generated investigation-derived waste (IDW) including soil cuttings from soil boring activities and wash water from equipment decontamination. IDW material generated during the field investigation was placed in 55-gallon storage drums and labelled with the following information:

- Date accumulation began
- Site identification
- Drum contents

IDW generated by this delivery order was classified according to the standards set forth in Subchapter R of the Texas Administrative Code. It was then transported and disposed along with IDW generated by other NAS Fort Worth environmental projects. Wash water was vacuumed into a tanker truck and disposed at Effluent Treatment Services, Inc., located at 1401 Bradley, Halton City, Texas. Soil drums were disposed at the Laidlaw Landfill, located at A Minnis Drive, Fort Worth, Texas.

3.3 LABORATORY AND DATA ACQUISITION ACTIVITIES

Assessment data were collected at each of the 11 oil/water separators to determine if a possible release of contaminants of concern occurred. Four soil borings were planned for each oil/water separator, excluding Building 1190. Based on site conditions and drill rig access, three hand auger borings were planned for Building 1190. Two samples were selected from each boring for chemical analysis. Due to inadequate sample recovery, some boring samples were not collected, as detailed in the

following sections. A total of 70 samples [field samples and associated Quality Assurance/Quality Control (QA/QC) samples] were collected for chemical analysis. Descriptions of the data quality objectives (DQOs), analytical methodologies, analytical quality control requirements, and an evaluation of the quality of the data with respect to presence or absence of contaminants are presented in the following sections.

3.3.1 Data Quality Objectives

DQOs were established and data were gathered to determine the presence or absence of contamination in soils around each of the 11 oil/water separators. Precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters were evaluated as described in Section 1.4 of the SAP Addendum (LAW, 1994b). AFCEE, NAS Fort Worth, and LAW used the data generated to determine presence or absence of contamination at each of the 11 oil/water separator sites. Based on the results and recommendations of this investigation, NAS Fort Worth and AFCEE will decide on what further action will be taken at each oil/water separator.

3.3.2 Analytical Methodologies

The analytical methods used for the assessment are listed below.

- Volatile Organic Compounds SW8240
- ICP Screen for Metals SW3050/SW6010

The methods were selected to assess whether constituents of concern had been released from the 11 oil/water separators. Analytical procedures are described in Section 1.8 of the SAP Addendum (LAW, 1994b).

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3.3.3 Analytical Quality Control

The quality control requirements and the reporting limits applicable to volatile organic and metal analyses are listed in Appendix A of the SAP Addendum (LAW, 1994b).

3.3.4 Data Quality Evaluation

Data quality was evaluated through the collection and analysis of field QC samples, including trip blanks, equipment rinsates, duplicate samples, and ambient condition blanks. An ambient condition blank was not collected every day, but was collected at sites where samples were collected downwind of possible volatile organic compounds such as active runways or engine test cells. Field QC samples were collected at a frequency of one per day, with the exception of trip blanks which require one trip blank per container of volatile samples. In most cases, two sites were completed in one day and as a result, had trip blanks, equipment blanks, ambient condition blanks and duplicate samples in common. In addition, method-specific laboratory QC criteria, including method blanks, matrix spike (MS) and matrix spike duplicate (MSD) samples, surrogate recoveries (for volatile organics), internal standard recoveries (for VOCs), laboratory control samples (LCS), extraction and analytical hold times and calibration data for each sample were evaluated. The results of these data quality procedures were then reviewed with respect to the DQOs established in the SAP Addendum (LAW, 1994b) and the usability of the data was determined. The analytical data summary tables for each site are presented in Appendix B.

3.3.4.1 Data Quality Evaluation of Volatile Organic Compounds -

Volatile organic compounds were analyzed by EPA Method SW 8240. Table 3-1 summarizes the method-specific laboratory QC and the field QC acceptances and outliers.

TABLE 3-1

VOLATILE ORGANIC COMPOUND ACCEPTANCES AND OUTLIERS
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

SITE	BG	1190	1060	1414	1145	38A	1191	1194	1064	4210	1015	1027
LAB DATA												
MS/MSD Recoveries	X	X	X	X	X	X	X	X	X	X	X	X
Surrogate Recoveries	X	X	X	X	X	X	X	X	X	X	X	X
Internal Standard Recoveries	X	X	X	X	X	X	X	X	X	X	X	X
LCS Recoveries	X	X	X	X	X	X	X	X	X	X	X	X
Sample Preparation	X	X	X	X	X	X	X	X	X	X	X	X
Analysis Type	X	X	X	X	X	X	X	X	X	X	X	X
Method Blanks	X	X	X	X	X	X	X	X	X	X	X	X
Hold Time Analysis	X	X	X	X	X	X	X	X	X	X	X	X
Initial Calibration/Tune	X	X	X	X	X	X	X	X	X	X	X	X
Continuing Calibration	β	β	β	β	β	β	β	β	β	β	β	β
FIELD DATA												
Equipment Blanks	X	X	X	X	X	X	X	X	X	X	X	X
Trip Blanks	X	X	X	X	X	X	X	X	X	X	X	X
Duplicates	X	X	X	X	X	X	X	X	X	X	X	X
Ambient Blanks	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

BG - Background
 NS - Not Sampled
 β - Outliers
 X - Acceptable

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Overall, the laboratory QC was acceptable, including MS/MSD recoveries, surrogate recoveries, internal standards, LCS recoveries, and sample preparation and analysis. Hold times were met for each sample analyzed. However, data were qualified based on the outlying method blanks and continuing calibrations (Table 3-1). Methylene chloride was detected in a few method blanks analyzed in conjunction with the field samples collected at Building 1190, Building 1064, Building 1015 and Building 1027. Associated positive analytical results for methylene chloride which are less than ten times the value detected in the method blank were flagged "JB" (estimated quantitation - possible biased high or false positive based upon blank data).

Methylene chloride and acetone are common laboratory contaminants. Laboratory quality control requires that one method blank is analyzed with each batch of samples. In the event that methylene chloride or acetone is detected in the method blank, the positive results in the batch of samples for the above compounds are qualified as estimated. However, in the event that the method blank results for methylene chloride and acetone are nondetect, positive results in that batch of samples will not be qualified. The continuing calibration percent difference for a few volatile compounds (2-chloroethyl vinyl ether, methyl ethyl ketone, and 2-hexanone) were outside of acceptance criteria range for most analytical batches (Table 3-1). The analytical results for impacted compounds were flagged "J" (estimated based on QC data).

To evaluate the field sampling accuracy and precision, equipment blanks, trip blanks, ambient blanks and field duplicate samples were collected. In general, equipment blanks and ambient condition blanks were free of target volatile organic compounds and field duplicate samples were in good agreement. Methylene chloride was detected in one trip blank (Table 3-1). Associated positive results for methylene chloride, which were less than five times the value detected in the trip blank, were flagged "JH" (estimated

quantitation - possibly biased high based on QC data). For specifics refer to the descriptions of the outliers for each building listed below and the data summary tables included in Appendix B.

Background Samples

The continuing calibration percent difference for 2-chloroethyl-vinyl-ether was outside of acceptance criteria range. All 2-chloroethyl-vinyl-ether analytical results were flagged "J" (estimated based on QC data).

Building 1190

The continuing calibration percent difference for 2-chloroethyl-vinyl-ether was outside of acceptance criteria range. All 2-chloroethyl-vinyl-ether analytical results were flagged "J" (estimated based on QC data). Methylene chloride was detected below the detection limit at 0.89J $\mu\text{g}/\text{kg}$ in the method blank associated with the samples from Building 1190. Associated positive analytical results for methylene chloride which are less than ten times the value detected in the method blank were flagged "JB" (estimated quantitation - possible biased high or false positive based upon blank data).

Building 1060

The continuing calibration percent difference for 2-chloroethyl-vinyl-ether and methyl ethyl ketone (MEK) were outside of acceptance criteria range. All 2-chloroethyl-vinyl-ether and MEK analytical results were flagged "J" (estimated based on QC data).

Building 1414

The continuing calibration percent difference for 2-chloroethyl-vinyl-ether and MEK were outside of acceptance criteria range. All 2-chloroethyl-vinyl-ether and MEK analytical results were flagged "J" (estimated based on QC data).

Building 1145

The continuing calibration percent difference for 2-chloroethyl-vinyl-ether was outside of acceptance criteria range. All 2-chloroethyl-vinyl-ether analytical results were flagged "J" (estimated based on QC data).

Building 38A

The continuing calibration percent difference for 2-chloroethyl-vinyl-ether was outside of acceptance criteria range. All 2-chloroethyl-vinyl-ether analytical results were flagged "J" (estimated based on QC data).

Building 1191

The continuing calibration percent difference for 2-chloroethyl-vinyl-ether was outside of acceptance criteria range. All 2-chloroethyl-vinyl-ether analytical results were flagged "J" (estimated based on QC data).

Building 1194

The continuing calibration percent difference for 2-chloroethyl-vinyl-ether was outside of acceptance criteria range. All 2-chloroethyl-vinyl-ether analytical results were flagged "J" (estimated based on QC data).

3517-0121

Building 1064

The continuing calibration percent difference for 2-chloroethyl-vinyl-ether was outside of acceptance criteria range. All 2-chloroethyl-vinyl-ether analytical results were flagged "J" (estimated based on QC data). Methylene chloride was detected below the detection limit at 1.2 J $\mu\text{g}/\text{kg}$ in the method blank associated with the samples collected from Building 1064. Associated positive analytical results for methylene chloride which are less than ten times the value detected in the method blank were flagged "JB" (estimated quantitation - possible biased high or false positive based upon blank data).

Building 4210

The continuing calibration percent difference for 2-chloroethyl-vinyl-ether was outside of acceptance criteria range. All 2-chloroethyl-vinyl-ether analytical results were flagged "J" (estimated based on QC data).

Methylene chloride was detected in TB1-210494 at 8.1 $\mu\text{g}/\text{L}$. Associated positive results for methylene chloride, which were less than five times the value detected in the trip blank, were flagged "JH" (estimated quantitation - possibly biased high based on QC data).

Building 1015

The continuing calibration percent difference for 2-hexanone and MEK were outside of acceptance criteria range. All 2-hexanone and MEK analytical results were flagged "J" (estimated based on QC data). Methylene chloride was detected at 1.2 $\mu\text{g}/\text{kg}$ in the method blank associated with the samples from Building 1015. Associated positive analytical results for methylene chloride which are less than ten times the value detected in the method blank were flagged

"JB" (estimated quantitation - possible biased high or false positive based upon blank data).

Building 1027

Methylene chloride was detected below the detection limit at a concentration of 0.58J $\mu\text{g}/\text{kg}$ in the method blank associated with the samples collected from Building 1027. Associated positive analytical results for methylene chloride which are less than ten times the value detected in the method blank were flagged "JB" (estimated quantitation - possible biased high or false positive based upon blank data).

3.3.4.2 Data Quality Evaluation of Metals - Metals were analyzed by EPA Method SW 6010. Table 3-2 summarizes the method-specific laboratory QC and the field QC acceptances and outliers. Overall, the laboratory QC was acceptable, including LCS recoveries, analytical and extraction hold times, and sample preparation and analysis. However, metals data were qualified based on MS/MSD recoveries, and one out-of-control method blank. Antimony recoveries for MS and MSD samples were below laboratory-established advisory limits (78 percent to 117 percent). The associated LCSs and post-digestion spikes for antimony were within laboratory-established limits, and the data support matrix interference. Furthermore, the laboratory suggested that the high iron concentration in the samples could have acted as a catalyst to produce antimony pentachloride, which has a boiling point of 79 degrees Celsius. The digestion temperature for EPA Method 3050 is approximately 98 degrees Celsius, resulting in a considerable loss of antimony due to conversion to antimony pentachloride. Antimony was flagged "JL" (estimated quantitation - possibly biased low based on QC data) for the assigned MS and MSD sample only. Other metals were outside of control limits and flagged accordingly. In the event that the sample concentration exceeded four times the spike amount, the metal was not qualified.

TABLE 3-2

METALS ACCEPTANCES AND OUTLIERS
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

SITE	BG	1190	1060	1414	1145	38A	1191	1194	1064	4210	1015	1027
LAB DATA												
MS/MSD Recoveries	NS	NS	β	NS	β	NS	NS	β	NS	β	β	NS
LCS Recoveries	X	X	X	X	X	X	X	X	X	X	X	X
Sample Preparation	X	X	X	X	X	X	X	X	X	X	X	X
Analysis Type	X	X	X	X	X	X	X	X	X	X	X	X
Method Blanks	X	X	X	X	X	X	X	X	X	X	X	X
Hold Time - extraction	X	X	X	X	X	X	X	X	X	X	X	X
Hold Time - analysis	X	X	X	X	X	X	X	X	X	X	X	X
Initial Calibration	X	β	X	X	β	β	β	β	β	X	X	X
Continuing Calibration	X	β	X	β	β	β	β	β	β	X	X	X
FIELD DATA												
Equipment Blanks	X	X	β	β	β	β	β	β	β	β	β	β
Trip Blanks	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Duplicates	β	β	β	β	β	β	β	β	β	β	β	β
Ambient Blanks	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

BG - Background
 NS - Not Sampled
 β - Outliers
 X - Acceptable

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In some cases, initial calibration and continuing calibration checks were acceptable for all metals except thallium and zinc. As a corrective action, the laboratory recalibrated and reanalyzed for both metals. Initial calibration and reanalysis indicated acceptable results, and data did not require qualification. To evaluate the field sampling accuracy and precision, and equipment blank and field duplicate sample were collected. In general, metals which were detected in the equipment blank at concentrations greater than three times the detection limit were qualified "JH" (estimated quantitation - possibly biased high based on QC data). Decontamination procedures were followed as listed in Section 2.1.8 of the SAP Addendum (LAW, 1994b). Although the above metals were detected in equipment blank (EB1-230494), their presence had little or no impact on the sample results due the high concentrations (in most cases 1,000 times above the detection limit) detected in the associated field samples. Field samples and duplicate samples which were not in good agreement, were flagged "J" (estimated quantitation - based on QC data). For specific results, refer to the descriptions of the outliers for each building listed below and the data summary tables located in Appendix B.

Background

No qualifications were needed.

Building 1190

Field sample (1190-01SBA) and its duplicate sample (1190-DPSB1) were in good agreement for all metals except aluminum, barium, cadmium, chromium, copper, lead, potassium, and zinc. Positive analytical results for the metals listed above were flagged "J" (estimated based on QC data) for samples 1190-01SBA and 1190-DPSB1.

Building 1060

Except for antimony, beryllium, manganese and molybdenum, MS/MSD recoveries for all metals analyzed were within acceptable limits. Antimony recoveries for both MS (0 percent) and MSD (0 percent) samples were below laboratory established advisory limits (78 percent to 117 percent). Antimony was flagged "JL" (estimated quantitation - possibly biased low based on QC data) for the assigned MS and MSD sample only. Beryllium recoveries were above the limits; however, the relative percent difference (RPD) was acceptable. Because the analytical results were nondetect, beryllium results were not qualified. Manganese MS and MSD recoveries were outside of control limits; however, the sample (1060-01SBB) result was four times greater than the spike amount. Manganese results were not flagged based on MS and MSD recoveries. Molybdenum MS (62 percent) and MSD (70 percent) recoveries were below laboratory limits of 75 to 125 percent recoveries. The post digestion spike and the associated LCS were within limits indicating matrix effects. Molybdenum was flagged "JL" (estimated quantitation - possibly biased low based on QC data) for the assigned MS and MSD sample only.

Calcium, iron, and zinc were detected in equipment blank EB1-230494 at three times above the detection limit. Associated samples were qualified "JH" (estimated quantitation - possibly biased high based on QC data). Field sample 1060-03SBA and its associated field duplicate sample 1060-DPSB1 were in good agreement for all metal compounds except aluminum, barium, chromium, magnesium and potassium. Positive analytical results for the metals listed above were flagged "J" (estimated based on QC data) for samples 1060-03SBA and 1060-DPSB1.

Building 1414

Calcium, iron, and zinc were detected in equipment blank EB1-230494 at three times above the detection limit. Associated samples were qualified "JH" (estimated quantitation - possibly biased high based on QC data).

Building 1145

A MS/MSD sample was assigned to field sample 1145-03SBE. Antimony recoveries for both MS (0 percent) and MSD (0 percent) samples were below laboratory established advisory limits (78 percent to 117 percent). Antimony was flagged "JL" (estimated quantitation - possibly biased low based on QC data) for the assigned MS and MSD sample only. Molybdenum MS and MSD recoveries were below laboratory limits of 75 percent to 125 percent. The post digestion spike and the associated LCS were within limits indicating matrix effects. Molybdenum was flagged "JL" (estimated quantitation - possibly biased low based on QC data) for the assigned MS and MSD sample only.

Calcium, copper, and zinc were detected in equipment blank EB1-240494 at three times above the detection limit. Associated samples were qualified "JH" (estimated quantitation - possibly biased high based on QC data). Field sample 1145-04SBA and its associated field duplicate sample 1145-DPSB1 were in good agreement for a majority of metal compounds. The metals not in good agreement were flagged "J" - estimated quantitation based on QC data.

Building 38A

Calcium, copper, and zinc were detected in equipment blank EB1-240494 at three times above the detection limit. Associated

samples were qualified "JH" (estimated quantitation - possibly biased high based on QC data).

Building 1191

Calcium and iron were detected in equipment blank EB1-250494 at three times above the detection limit. Associated samples were qualified "JH" (estimated quantitation - possibly biased high based on QC data). Field sample 1191-02SBB and its associated field duplicate sample 1191-DPSB1 were in good agreement for all metals except iron. Positive analytical results for iron were flagged "J" (estimated based on QC data) for samples 1191-02SBA and 1191-DPSB1.

Building 1194

MS and MSD was assigned to field sample 1194-01SBD. Antimony recoveries for both MS (0 percent) and MSD (0 percent) samples were below laboratory established advisory limits (78 percent to 117 percent). Antimony was flagged "JL" (estimated quantitation - possibly biased low based on QC data) for the assigned MS and MSD sample only. Manganese MS and MSD recoveries were outside of control limits; however, the sample (1060-01SBB) result was four times greater than the spike amount. Manganese results were not flagged based on MS and MSD recoveries.

Calcium and iron were detected in equipment blank EB1-250494 at three times above the detection limit. Associated samples were qualified "JH" (estimated quantitation - possibly biased high based on QC data).

Building 1064

Copper and zinc were detected in equipment blank EB1-270494 at three times above the detection limit. Associated samples were

qualified "JH" (estimated quantitation - possibly biased high based on QC data).

Building 4210

Calcium was detected in the method blank at a concentration of 33 mg/kg. All calcium results associated with the method blank were greater than five times the amount detected in the method blank and no sample results were qualified. An MS/MSD sample was assigned to field sample 4210-03SBC. Antimony recoveries for both MS (19 percent) and MSD (13 percent) samples were below laboratory established advisory limits (78 percent to 117 percent). Antimony was flagged "JL" (estimated quantitation - possibly biased low based on QC data) for the assigned MS and MSD sample only. Copper and manganese MS and MSD recoveries were outside of control limits; however, the sample (4210-03SBC) results were four times greater than the spike amount. Neither copper nor manganese results were flagged based on MS and MSD recoveries.

Copper and zinc were detected in equipment blank EB1-210494 at three times above the detection limit. Associated samples were qualified "JH" (estimated quantitation - possibly biased high based on QC data). Field sample 4210-04SBF and its associated field duplicate sample 4210-DPSB1 were in good agreement for all metals except iron. Positive analytical results for iron were flagged "J" (estimated based on QC data) for samples 4210-04SBF and 4210-DPSB1.

Building 1015

MS/MSD was assigned to field sample 1015-03SBC. Except for antimony, beryllium, and manganese, MS/MSD recoveries for all metals analyzed were within acceptable limits. Antimony recoveries for both MS (27 percent) and MSD (37 percent) samples were below laboratory established advisory limits (78 percent to 117 percent). Antimony was flagged "JL" (estimated quantitation - possibly biased

low based on QC data) for the assigned MS and MSD sample only. Beryllium recoveries were below the limits; however, the relative percent difference (RPD) was acceptable as was the associated LCS. Beryllium was flagged "JL" (estimated quantitation - possibly biased low based on QC data) for the assigned MS and MSD sample only. Manganese MS and MSD recoveries were outside of control limits; however, the sample (1015-03SBC) result was four times greater than the spike amount. Manganese results were not flagged based on MS and MSD recoveries.

Zinc was detected in equipment blank EB1-220494 at three times above the detection limit. Associated samples were qualified "JH" (estimated quantitation - possibly biased high based on QC data). Field sample 1015-02SBB and its associated field duplicate sample 1015-DPSB1 were in good agreement for all metals except barium, calcium, iron, magnesium, and vanadium. Positive analytical results for the metals listed above were flagged "J" (estimated based on QC data) for samples 1015-02SBB and 1015-DPSB1.

Building 1027

Zinc was detected in equipment blank EB1-220494 at three times above the detection limit. Associated samples were qualified "JH" (estimated quantitation - possibly biased high based on QC data). Field sample 1027-02SSB and its associated field duplicate sample 1027-DPSB1 were in good agreement for all metals except iron. Positive analytical results for the metals listed above were flagged "J" (estimated based on QC data) for samples 1027-02SSB and 1027-DPSB1.

4.0 RISK EVALUATION METHODOLOGY

4.1 INTRODUCTION

The risk evaluation compares the positive analytical results applicable to each oil/water separator to the regulatory standard appropriate for this investigation. The regulatory standard to apply for this investigation was selected based on available analytical data and LAW's understanding of current land use and probable future land use at the facility.

4.1.1 Regulatory Standards

The Texas Natural Resource Conservation Commission (TNRCC) published its final Risk Reduction Standards in the Texas Register, and these standards were made effective on June 29, 1993 (TNRCC, 1993). The requirements of these standards were written to ensure the protection of human health and the environment from exposure to contaminants released from solid waste management facilities or other areas. Furthermore, the standards apply to closure of facilities used for the storage, processing, or disposal of industrial solid waste or municipal hazardous waste, and to remediation of contaminated media resulting from unauthorized releases from such facilities.

Under these standards, a regulated party may initiate site remediation or closure of a facility where contaminated media may exist by applying Risk Reduction Standard Numbers 1, 2, or 3. Attainment of Risk Reduction Standard Number 1 involves closure or remediation to background, or to the practical quantitation limit (PQL), if the PQL is greater than background. If Standard Number 1 is attained, the responsible party is not required to provide deed certifications as may be required under Risk Reduction Standards 2 and 3.

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Attainment of Risk Reduction Standard Number 2 involves closure or remediation to health risk-based cleanup levels, namely, the medium-specific concentrations (MSCs). The TNRCC has published MSCs for soil and ground water, for both industrial and residential land use. Using Standard Number 2, the responsible party must register specific information in the registry of county deeds. This information includes a certification that closure or remediation of the area was carried out in accordance with this standard. If the facility meets the residential soil requirements, no post-closure care, engineering, or institutional control measures are required. However, if the industrial soil MSCs are used, the deed certification must contain a statement that current or future owners of the facility are required to undertake actions as necessary to protect human health and the environment, in accordance with TNRCC regulations. The responsible party is released from responsibility for post-closure care once the deed certification is accepted by the executive director of the TNRCC.

If Risk Reduction Standard Number 3 is applied to a site, media cleanup levels are proposed based on an assessment of the potential risk to human health and the environment using site-specific conditions. Standard Number 3 provides flexibility for situations where closure or remediation by removal or decontamination would not be practical. This standard also requires deed certification. For this standard, the county deed records must state that remediation was carried out in accordance with this standard, and whether or not continued post-closure care, control, or engineering measures are required.

4.1.2 Environmental Setting

The scope of this site investigation was developed to determine the potential for impact to soil and ground water at the facility and to establish an environmental baseline. Background analytical data

have been obtained for NAS Fort Worth from five soil boring locations included under AFCEE Delivery Orders 0011 and 0021. Due to the heterogeneity of the soil matrix, a range of background concentrations has been applied (Risk Reduction Standard Number 1) for initial comparison of the data. Because site constituent concentrations exceeded background concentrations, the next standard in the hierarchy of the regulation, Risk Reduction Standard Number 2, has also been applied.

4.2 COMPARISON OF DATA TO RISK REDUCTION STANDARD NUMBERS 1 AND 2

Sections 6.0 through 16.0 discuss each site individually and compare positive analytical data to Risk Reduction Standard Numbers 1 and 2.

The evaluated analytical data for metals were first compared to background data and, where background exceedances were noted, were then compared to Risk Reduction Standard Number 2 MSCs for soil. The analytical data for volatile organic compounds were compared to both background data and also to Risk Reduction Standard Number 2 MSCs for soil. Each volatile organic data point was compared to the Risk Reduction Standard Number 2 MSCs for soil, regardless of whether that data point exceeded the background concentration. Common laboratory contaminants flagged "JB" were not included in the sample data used for comparison to the TNRCC standards.

The land use at all 11 sites is now, and is expected to continue to be, industrial. Therefore, the MSCs for soil that were utilized for this site are the Soil/Air and Ingestion Standard for Industrial Land Use (SAI-Ind) and the Industrial Soil-to-Ground Water Cross-Media Protection Concentration (GWP-Ind). The purpose of the GWP-Ind is to establish concentrations of chemicals in soils that if leached downward into ground water, would not result in ground-water concentrations above health-based levels.

According to the requirements of the Risk Reduction Standard for Industrial Soil, the concentration of a contaminant within 2 feet of the surface (surface soils) shall not exceed the SAI-Ind nor the GWP-Ind, whichever is lower. At depths below 2 feet (subsurface soils), concentrations shall not exceed the GWP-Ind (TNRCC, 1993).

5.0 BACKGROUND SOIL SAMPLES

5.1 PURPOSE

In the absence of a comprehensive background study, background samples were collected in order to establish an approximate background concentration range for the surface and subsurface soil at the site. The analytical results from each oil/water separator were compared to background ranges prior to the risk evaluation.

5.2 SITE-SPECIFIC INVESTIGATION ACTIVITIES

In the vicinity of each oil/water separator or group of separators, the area was visually inspected to locate areas that appeared to be free of contamination. Five background soil boring locations were selected. These areas were typically isolated patches of grass that exhibited no obvious signs of soil contamination, such as surface staining, stressed vegetation, or the presence of structures associated with chemical usage (i.e., buildings sheds, storage tanks, dumpsters). In addition to visual inspection, previous environmental reports and historical facility maps were reviewed to identify whether potential background soil boring locations were associated with past chemical releases.

5.3 SITE-SPECIFIC GEOLOGY

The initial background soil sampling location was combined with a background monitoring well location required for AFCEE Delivery Order 0011. The soil boring was drilled to a termination depth of 14 feet below the ground surface and is labelled SD13-MW05. The soil boring location is along Rogner Drive in front of the 1320 Building. The soils encountered in the boring include mixtures of sand and clay and silty fine sand (Table 5-1). Soil boring BG-2 was located in a residential section of the base near the 942

TABLE 5-1

**BACKGROUND SOIL DESCRIPTION
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas**

Location: Background Soil Borings

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
BG-1*	14	0-5	sandy silt and clay	--	1-3
		5-6.5	silty fine sand		3-5
		6.5-12	fine sand		5-7
		12-14	very silty fine sand with gravel		7-9
BG-2	7	0-4	silty fine to coarse sand	--	0-2
		4-7	slightly sandy clay to silt		6-7
BG-3	4	0-4	silty fine to coarse sand	--	0-2 2-4
BG-4	8.5	0-5	silty to clayey fine to coarse sand	--	2-4
		5-8	slightly silty fine sand		4-6
		8-8.5	coarse limestone gravel		
BG-5	14	0-1	silty to clayey fine sand	13	2-4
		1-4	sandy clay		10-12
		4-12	silty to clayey fine to medium sand		
		12-14	slightly silty fine sand		

Note:

(ft) : feet

--: Ground water not observed in boring

* BG-1 was completed as monitoring well SD13-MW05

See Figure 1-2 for boring locations.

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Building. The boring was advanced to refusal at a depth of 7 feet below the ground surface. The soils encountered in the boring included silty fine to coarse sands, slightly sandy silts, and clays. Soil boring BG-3 was located at the edge of the golf course west of the 1015 Building. The boring was advanced to refusal at 4 feet below the ground surface. The soils encountered in the boring was silty fine to coarse sands. Soil boring BG-4 was located south of the 1501 Building. The boring was advanced to refusal at 8.5 feet below the ground surface. The soils encountered included silty to clayey fine to coarse sands. The boring was terminated within a coarse limestone gravel. Soil boring BG-5 was advanced to 14 feet below the ground surface. Ground water was detected at approximately 13 feet below the ground surface. The soils encountered within the boring included sandy clay and silty to clayey fine to medium sand.

5.4 CHEMICAL ANALYTICAL RESULTS

Three background surface soil samples and nine subsurface soil samples were collected for chemical analysis. Positive analytical results for background soil samples are presented in Table 5-2. Sample locations for volatile organic compounds (VOCs) and metals concentrations detected at each soil boring are detailed on Figure 5-1.

Methylene chloride was detected in all soil samples collected as background samples. These positive results were used in the generation of background ranges for the risk evaluation. Eighteen metals were detected in the surface and subsurface soils samples collected as background samples. These positive results were used in the generation of background ranges for the risk evaluation.

TABLE 5-2

POSITIVE RESULTS
BACKGROUND SOIL SAMPLES
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

PARAMETER	Sample Designation: SD13MW05A		Sample Designation: SD13MW05B		Sample Designation: SD13MW05C		Sample Designation: SD13MW05D		Sample Designation: SD13MW05E		Sample Designation: SD13MW05F	
	03/25/94	1-3 ft	03/25/94	3-5 ft	03/25/94	5-7 ft	03/25/94	7-9 ft	03/25/94	0-2 ft	04/26/94	6-7 ft
	Depth:											
Metals (SW6010/SW3050) (mg/kg)												
ALUMINUM	6600	4100	4100	4100	4900	350	7900	7900	7900	7900	7900	7900
ARSENIC	3.7	12	12	6.0	7.5	<3.5	5.3	5.3	5.3	5.3	5.3	4.1
BARIUM	106	110	110	130	120	4.9	62	62	62	62	62	67
BERYLLIUM	0.52	<1.7	<1.7	<1.7	<1.7	<0.17	<1.6	<1.6	<1.6	<1.6	<1.6	<0.18
CADMIUM	1.2	1.5	1.5	0.85	0.76	<0.34	1.8	1.8	1.8	1.8	1.8	4.0
CALCIUM	27000 JH	210000 JH	160000 JH	160000 JH	150000 JH	350 JH	190000	190000	190000	190000	190000	72000
CHROMIUM, TOTAL	6.6	4.4	4.4	3.8	4.9	<0.67	9.6	9.6	9.6	9.6	9.6	9.0
COBALT	3.4	4.4	4.4	2.0	2.5	<1.1	2.2	2.2	2.2	2.2	2.2	6.1
COPPER	21 J	66 JH	44 JH	44 JH	37 JH	20 JH	6.6	6.6	6.6	6.6	6.6	7.7
IRON	8000	8000	4200	4200	4800	543	6000	6000	6000	6000	6000	16000
LEAD	11 JH	6.5	6.1	6.1	6.8	<3.1	6.1	6.1	6.1	6.1	6.1	11
MAGNESIUM	1200	1500	1100	1100	1100	65	1900	1900	1900	1900	1900	2200
MANGANESE	108 JH	340	100	100	94	1.8	200	200	200	200	200	94
NICKEL	7.6	6.2	3.0	3.0	4.2	<2.1	4.7	4.7	4.7	4.7	4.7	15
POTASSIUM	990	420	410	410	540	90	750	750	750	750	750	2200
SODIUM	47	110	80 J	80 J	15 J	<22	120	120	120	120	120	190
VANADIUM	13	16	<8.5	<8.5	<8.4	1.0	16	16	16	16	16	13
ZINC	19 JH	30 JH	24 JH	24 JH	21 JH	10 JH	10	10	10	10	10	20
Volatile Organics (SW9240/SW5030) (mg/kg)												
ACETONE	<0.012	<0.012	0.023	0.023	0.022	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
METHYLENE CHLORIDE	0.014	0.0098	0.014	0.014	0.0092	0.016	0.019	0.019	0.019	0.019	0.019	0.019

J: Estimated quantitation based upon QC data

JH: Estimated quantitation -- possibly biased high based upon QC data

TABLE 5-2

POSITIVE RESULTS
BACKGROUND SOIL SAMPLES
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

PARAMETER	Sample Designation: Sample Date: Depth:	BKGD03SBA 04/26/94 0-2 ft	BKGD03SBB 04/26/94 2-4 ft	BKGD04SBB 04/26/94 2-4 ft	BKGD04SBC 04/26/94 4-6 ft	BKGD05SBB 04/26/94 2-4 ft	BKGD05SBF 04/26/94 10-12 ft
Metals (SW6010/SW3050) (mg/kg)							
ALUMINUM		16000	13000	9000	5200	8000	4800
ARSENIC		4.9	12	11	6.4	<3.5	<3.4
BARIUM		130	130	85	64	40	30
BERYLLIUM		0.87	<1.7	0.42	<0.2	0.42	<0.16
CADMIUM		4.4	3.6	6.8	2.3	1.3	1.5
CALCIUM		6200	20000	41000	100000	3500	89000
CHROMIUM, TOTAL		18	13	11	11	9.2	5.9
COBALT		6.3	7.1	7.6	3.4	2.9	2.3
COPPER		8.0	25	5.6	28	5.0	5.3
IRON		17000	14000	24000	6800	5600	5400
LEAD		16	12	14	88	10	6.3
MAGNESIUM		1600	3100	1400	1800	650	1600
MANGANESE		250	920	600	230	140	60
NICKEL		12	15	12	7.1	4.3	6.4
POTASSIUM		1400	1400	970	1200	840	1100
SODIUM		36	170	71	80	36	260
VANADIUM		37	29	26	12	16	9.3
ZINC		26	24	21	54	8.3	1.2
Volatile Organics (SW8240/SW5030) (mg/kg)							
ACETONE		0.019	0.02	0.018	0.018	0.018	0.019
METHYLENE CHLORIDE							

J: Estimated quantitation based upon QC data
JH: Estimated quantitation - possibly biased high based upon QC data

PREPARED/DATE: DRJ/2 Sep 94
CHECKED/DATE: JFO/2 Sep 94



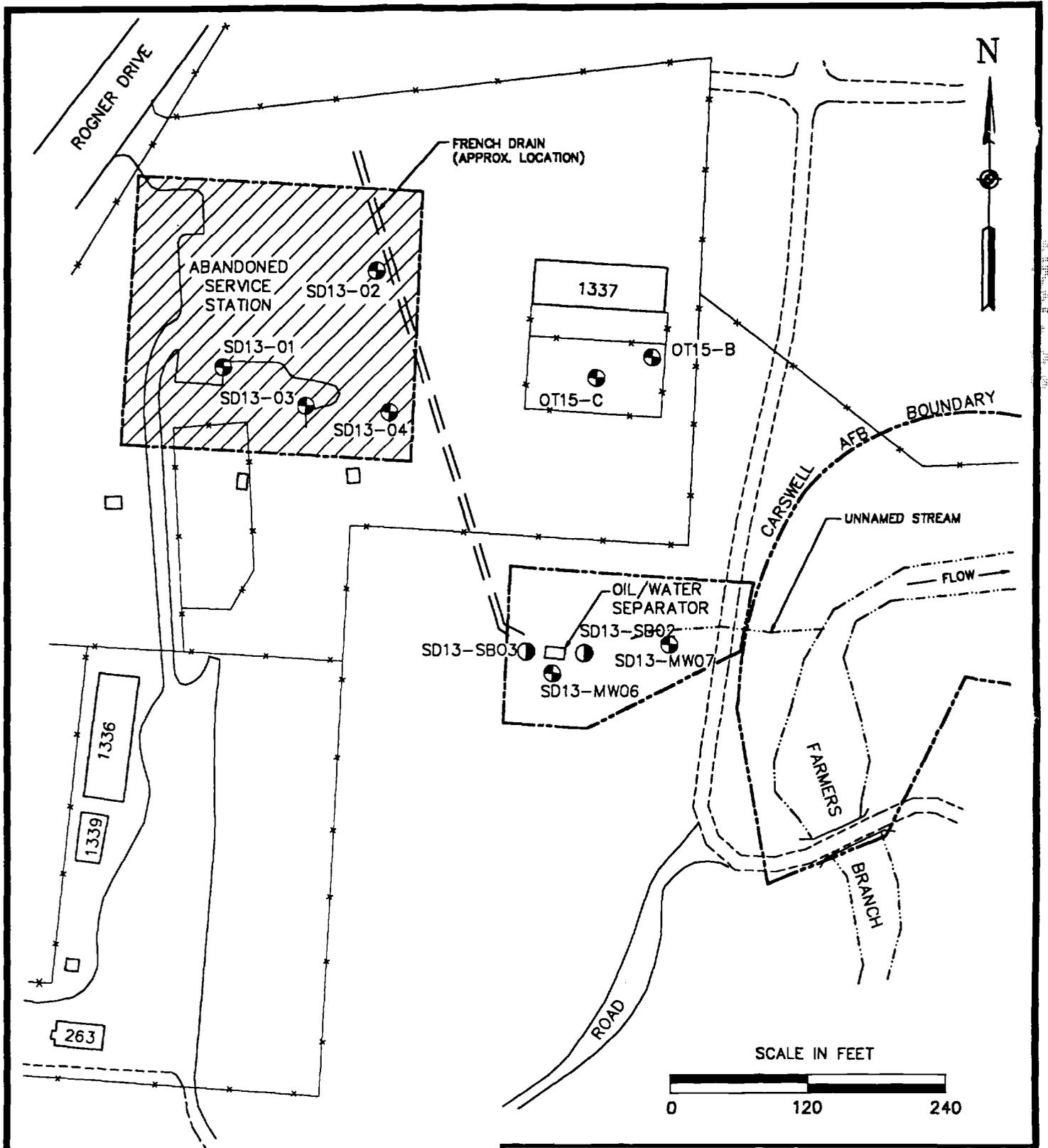
6.0 UNNAMED STREAM (FORMER LOCATION OF BUILDING 38A)

6.1 SITE DESCRIPTION

The oil/water separator at the former location of Building 38A is constructed of reinforced concrete with a sump and a single baffle (Figure 1-2). The age of the separator unit is uncertain; however, base records indicate that the unit existed as early as 1964 and may have replaced a previously existing separator. The influent to the oil/water separator is from the perforated pipe of french drain which extends from the northeast corner of the Abandoned Service Station area to the oil/water separator (Figure 6-1). Effluent discharges flow by gravity from the separator unit and form the Unnamed Stream, a drainage ditch leading from the oil/water separator to Farmer's Branch. Based on site information, visual observations and hydrocarbon odors, the french drain appears to be channeling ground water containing fuel-related constituents into the oil/water separator, and ultimately into the Unnamed Stream. NAS Fort Worth facility drawings indicate that the separator unit may have been installed specifically to receive discharge from the french drain.

6.2 SITE-SPECIFIC INVESTIGATION ACTIVITIES

The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Following the site visit, two soil borings (SD13-SB02 and SB13-SD03) were advanced to the east and west of the oil/water separator. An additional soil boring for monitoring well SD13-MW06 was advanced in March 1994 (Figure 6-1). A fourth soil boring, SD13-01, was planned but was not advanced due to restricted access.



LEGEND

- SOIL BORING LOCATION
- ⊙ MONITORING WELL LOCATION
- *— FENCE

UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT SOIL BORING LOCATION OIL/WATER SEPARATOR FORMER BUILDING 38A		
PREPARED BY/DATE: TDM 26 AUG 94	FIGURE NUMBER: 6-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: <i>JKE 17 AUG 95</i>		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>EXPT 7 AUG 95</i>		FILE NAME: bldg38a.dwg

6.3 SITE-SPECIFIC GEOLOGY

As shown in Table 6-1, fill material was detected from 0 to 6 feet in soil boring SD13-SB02 and from 0 to 4 feet in monitoring well soil boring SD13-SB06. The residual soils included silts and clays, and silty medium sands overlying bedrock (shaley limestone). The bedrock was encountered at depths ranging from 6 to 7 feet below the ground surface. Petroleum odors were detected in the soil samples from the 4- to 6-foot interval in both soil boring SD13-SB02 and SD13-SB03.

Ground water was encountered in soil boring SD13-SB02 at a depth of 6 feet below the ground surface. The stabilized water level in monitoring well SD13-MW06 was measured at approximately 9 feet below the ground surface in March 1994. The higher ground-water elevation detected in the soil boring appears near the elevation of the water level detected in the Unnamed Stream and may be the result of the location of the soil boring adjacent to the Unnamed Stream.

6.4 CHEMICAL ANALYTICAL RESULTS

Two surface and three subsurface soil samples were collected for off-site chemical analysis. Positive analytical results are presented in Table 6-2. Sample concentrations detected at each soil boring for volatile organic compounds (VOCs) are shown on Figure 6-2, and sample concentrations of metals detected at each soil boring are shown on Figure 6-3. Methylene chloride was detected in surface soil sample SD13-02SBA at a concentration of 0.018 mg/kg and in surface soil sample SD13-MW06A at an estimated concentration of 0.0069 mg/kg. In subsurface soil samples SD13-03SBB and SD13-MW06D, methylene chloride was detected at low concentrations: 0.019 and 0.013 mg/kg, respectively. Acetone was detected in one surface soil sample (SD1302SBA) and in one

TABLE 6-1

FORMER BUILDING 38A OIL/WATER SEPARATOR
 SOIL BORING DESCRIPTION
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

Location: Unnamed Stream (Former Building 38a)
 Bottom Depth of Oil/Water Separator: 8 ft

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
SD13-SB02	6	0-6	fill material	6	0-2
SD13-SB03	7	0-2	silty fine sand	--	2-4
		2-6	sandy silt to clay		4-6
		6-7	light gray limestone		
SD13-MW06	11.5	0-4	fill material	9	0-2
		4-6	slightly silty clay		
		6-7	silty medium sand		6-6.9
		7-11.5	weathered shaley limestone		

Note:
 (ft) : feet
 --: Ground water not observed in boring
 See Figure 6-1 for boring locations.

PREPARED/DATE: TDM/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

TABLE 6-2

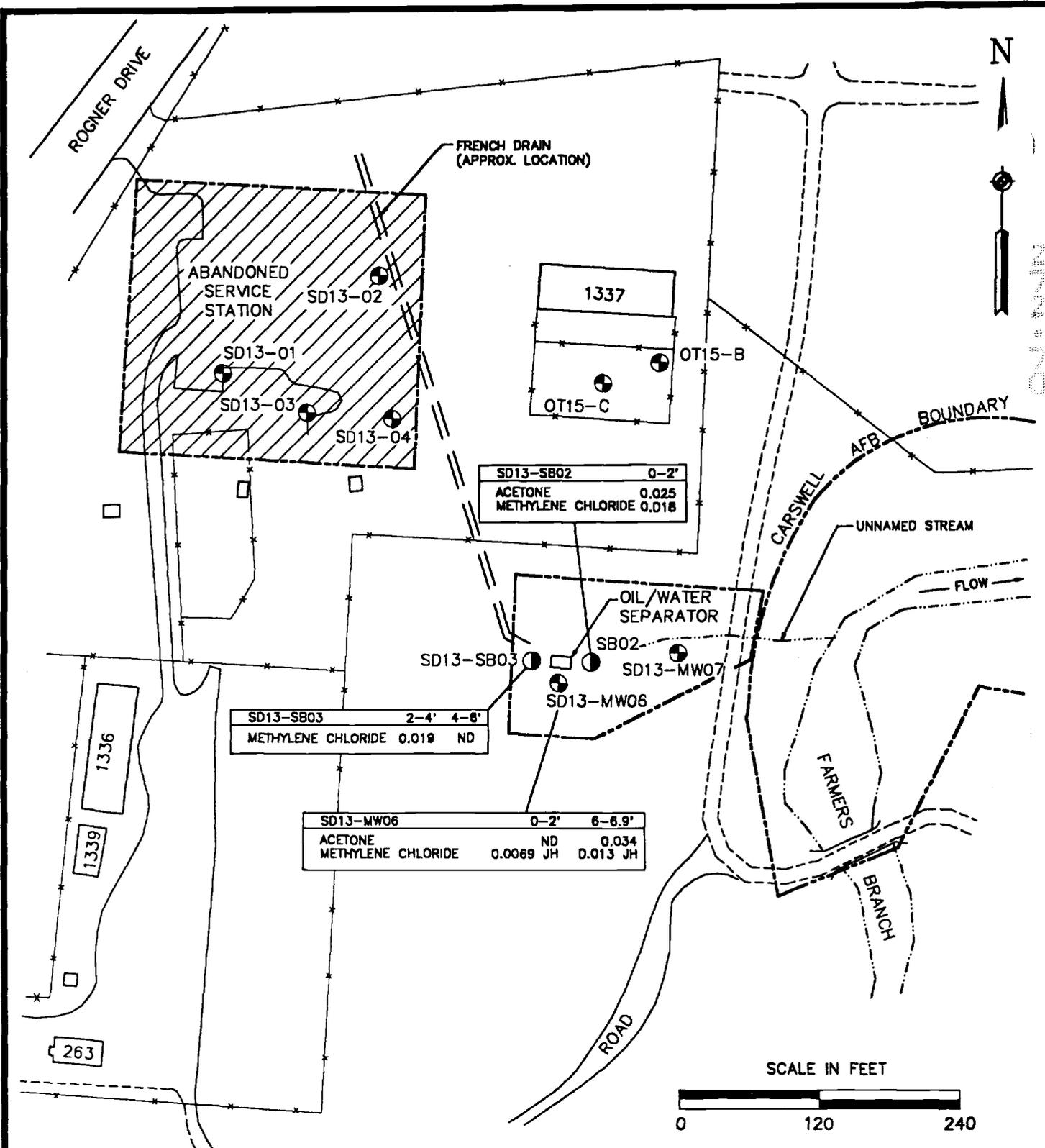
POSITIVE RESULTS - SOIL SAMPLES
 BUILDING 38A
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

PARAMETER	SD1302SBA 04/24/94 0-2 ft	SD1303SBB 04/24/94 2-4 ft	SD1303SBC 04/24/94 4-6 ft	SD13MW06A 03/24/94 0-2 ft	SD13MW06D 03/24/94 6-6.9 ft
Metals (SW6010/SW3050) (mg/kg)					
ALUMINUM	3500	12000	6700	4800	5800
ARSENIC	18	4.6	<3.5	4.6	12
BARIUM	41	120	69	53	100
BERYLLIUM	<1.6	0.16	<0.17	<1.6	<1.6
CADMIUM	1.8	3.9	2.1	1.2	1.2
CALCIUM	260000 JH	86000 JH	100000 JH	87000 JH	10000 JH
CHROMIUM, TOTAL	8.4	12	7.6	9.7	7.9
COBALT	4.1	5.5	3.6	3.9	5.0
COPPER	14 JH	8.2 JH	7.6 JH	19	19
IRON	6300	13000	7200	7800 JH	6900
LEAD	14	13	7.9	36	14
MAGNESIUM	2200	2600	1800	1400	1800
MANGANESE	300	290	100	260	280
NICKEL	6.4	13	6.1	7.8	9.5
POTASSIUM	640	1700	880	720	820
SODIUM	120	68	100	72	110
VANADIUM	16	22	16	14	20
ZINC	15 JH	22 JH	12 JH	21	33
Volatile Organics (SW6240/SW5030) (mg/kg)					
ACETONE	0.025	<0.012	<0.012	<0.011	0.034
METHYLENE CHLORIDE	0.018	0.019	<0.0044	0.0069 JH	0.013 JH

JH: Estimated quantitation - possibly biased high based upon QC data

PREPARED/DATE: DR/J/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

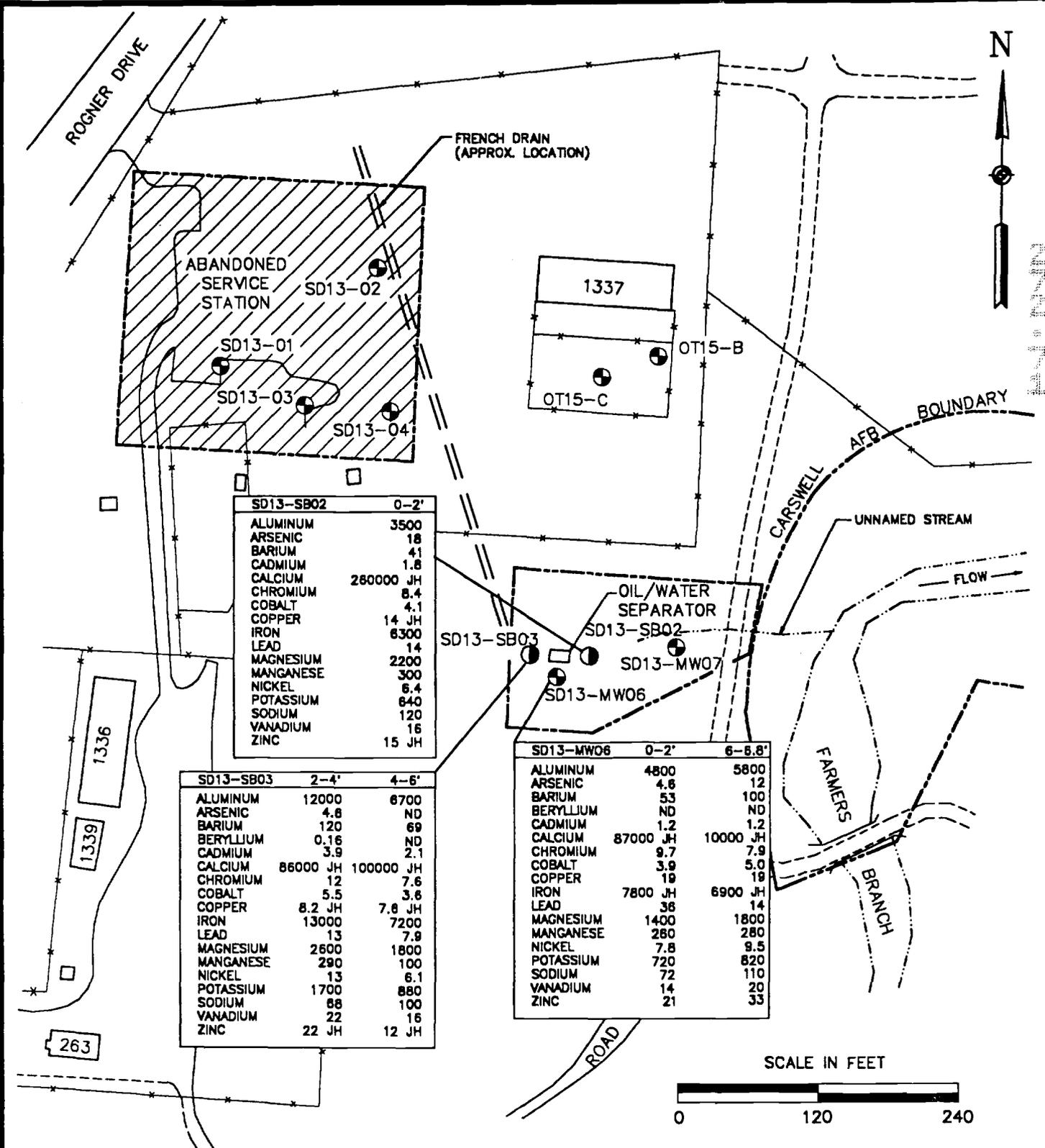
005-111111



LEGEND

- SOIL BORING LOCATION
- ⊕ MONITORING WELL LOCATION
- *— FENCE
- ND NOT DETECTED
- JH ESTIMATED QUANTITATION—POSSIBLY BIASED HIGH BASED UPON QC DATA

UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT POSITIVE ANALYTICAL RESULTS VOLATILE ORGANICS (mg/kg) FORMER BUILDING 38A		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 6-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94	APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95	PLOT DATE: 17.AUG.95
		FILE NAME: bldg38a.dwg



SD13-SB02		0-2'
ALUMINUM		3500
ARSENIC		18
BARIUM		41
CADMIUM		1.8
CALCIUM	280000 JH	8.4
CHROMIUM		4.1
COBALT		14
COPPER	14 JH	6300
LEAD		14
MAGNESIUM		2200
MANGANESE		300
NICKEL		6.4
POTASSIUM		640
SODIUM		120
VANADIUM		16
ZINC		15 JH

SD13-SB03		2-4'	4-6'
ALUMINUM	12000		6700
ARSENIC	4.8		ND
BARIUM	120		69
BERYLLIUM	0.16		ND
CADMIUM	3.9		2.1
CALCIUM	86000 JH	100000 JH	
CHROMIUM	12		7.6
COBALT	5.5		3.6
COPPER	8.2 JH	7.8 JH	
IRON	13000		7200
LEAD	13		7.9
MAGNESIUM	2600		1800
MANGANESE	290		100
NICKEL	13		6.1
POTASSIUM	1700		880
SODIUM	68		100
VANADIUM	22		16
ZINC	22 JH		12 JH

SD13-MW06		0-2'	6-8.8'
ALUMINUM	4800		5800
ARSENIC	4.6		12
BARIUM	53		100
BERYLLIUM			ND
CADMIUM	1.2		1.2
CALCIUM	87000 JH		10000 JH
CHROMIUM	9.7		7.9
COBALT	3.9		5.0
COPPER	19		19
IRON	7800 JH		6900 JH
LEAD	36		14
MAGNESIUM	1400		1800
MANGANESE	280		280
NICKEL	7.8		9.5
POTASSIUM	720		820
SODIUM	72		110
VANADIUM	14		20
ZINC	21		33

LEGEND

- SOIL BORING LOCATION
- ⊕ MONITORING WELL LOCATION
- FENCE
- ND NOT DETECTED
- JH ESTIMATED QUANTITATION—POSSIBLY BIASED HIGH BASED UPON QC DATA

UNITED STATES AIR FORCE
 NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
 FORT WORTH, TEXAS

OIL/WATER SEPARATOR ASSESSMENT
 POSITIVE ANALYTICAL RESULTS
 METALS (mg/kg)
 FORMER BUILDING 38A

PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 6-3	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>SBC 17 AUG 95</i>		FILE NAME: bldg38a.dwg

subsurface sample (SD13MW06D) at 0.025 mg/kg and 0.34 mg/kg, respectively.

A majority of metals analyzed were detected in surface and subsurface soil samples collected from around the perimeter of the oil/water separator unit. Arsenic, calcium, lead, magnesium, and manganese, were detected above background levels.

6.5 RISK EVALUATION

Surface Soil - The analytical results for the surface soil sample were first compared to the surface soil background concentration range for the base. As can be seen on Table 6-3A, arsenic, calcium, magnesium, lead, and manganese exceeded their respective maximum surface soil background concentrations. All other metals were below or within their background ranges. Concentrations of these five metals were also compared to U.S. Geological Service (USGS) data for metals detected in surface soils under ambient conditions in the western United States (USGS, 1984). The detection limit for lead was lower than the minimum concentration reported for ambient conditions. The other four metals fell within the expected range for ambient conditions.

Due to the exceedances of maximum surface soil background concentrations, the analytical results for the metals arsenic, calcium, lead, magnesium, and manganese were compared to the Industrial Soil-to-Ground Water Cross-Media Protection Concentration (GWP-Ind) and the Soil/Air and Ingestion Standard for Industrial Land Use (SAI-Ind) medium-specific concentrations (MSCs) (Table 6-3A). This comparison shows that the GWP-Ind and the SAI-Ind MSCs for arsenic are exceeded in the surface soil sample, SD1302SBA, taken to the west of the oil/water separator. Lead exceeds the GWP-Ind in a surface soil sample collected from SD13-MW06. The other three metals do not have MSCs for comparison.

TABLE 6-3A

SURFACE SOIL CONCENTRATIONS COMPARED TO INDUSTRIAL MSCs BASE BACKGROUND AND AMBIENT CONCENTRATIONS
Building 38A
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

	SD1302SBA	SD13MM06A	MSCs		Surface Soil Background Range (a)	Ambient Concentrations for the Western U.S. (b)
	04/2/94 0-2 ft (mg/kg)	03/24/94 0-2 ft (mg/kg)	GWP-Ind (mg/kg)	SAI-Ind (mg/kg)		
Metals :						
Aluminum	3,500	4,800			6,600 - 16,000	5,000 - 100,000
Arsenic	18	4.6	5	3.27	3.7 - 5.3	<0.10 - 97
Barium	41	53			62 - 130	70 - 5,000
Cadmium	1.8	1.2			1.2 - 4.4	1 - 10 (c)
Calcium	260,000 JH	87,000 JH	--	--	6,200 - 190,000	600 - 320,000
Chromium (total)	8.4	9.7			6.6 - 18	3 - 2,000
Cobalt	4.1	3.9			2.2 - 6.3	<3 - 50
Copper	14 JH	19			6.6 - 21	2 - 300
Iron	6,300	7,800			6,000 - 17,000	1,000 - >100,000
Lead	14	36	1.5	1,000	6.1 - 16	<10 - 700
Magnesium	2,200	1,400	--	--	1,200 - 1,900	300 - >100,000
Manganese	300	260	--	--	108 - 250	30 - 5,000
Nickel	6.4	7.8			4.7 - 12	<5 - 700
Potassium	640	720			750 - 1,400	1,900 - 63,000
Sodium	120	72			36 - 120	500 - 100,000
Vanadium	16	14			13 - 37	7 - 500
Zinc	15 JH	21			10 - 26	10 - 2,100
Volatile Organics :						
Acetone	0.025	<0.011	1,020	4,160	<0.012	--
Methylene Chloride	0.018	0.0069 JH	0.5	13.8	0.014-0.019	--

GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration

SAI - Ind: Industrial Soil/Air and Ingestion Standard

(a) Background data collected from three locations throughout the base

(b) USGS, 1984

(c) USGS, 1975

JH: Estimated quantitation - possibly biased high based upon QC data

MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)

--: no data available

Boxes: Value exceeds maximum surface soil background concentration

Bold: Value exceeds GWP-Ind MSC

Italics: Value exceeds SAI-Ind MSC

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/27 Aug 94
 CHECKED/DATE: JRF/2 Nov 95

Therefore, arsenic and lead were the only metals detected in surface soils at the site to exceed Standard Number 2 MSCs.

Acetone was detected in one surface sample at a concentration exceeding the maximum background concentration.

Methylene chloride and acetone were the only VOCs detected above their practical quantitation limits (PQLs). The concentrations of both methylene chloride and acetone detected were below both their GWP-Ind and SAI-Ind MSCs. Therefore, the soils were in compliance with Risk Reduction Standard 2 for VOCs.

Subsurface Soils - The analytical results for the subsurface soil samples were first compared to the subsurface soil background concentration range for the base. As can be seen on Table 6-3B, the constituents detected at the site for metals were below or within their background ranges.

Acetone and methylene chloride were the only VOCs detected above their practical quantitation limits (PQLs). Acetone was detected in one subsurface sample at a concentration exceeding the maximum background concentration. Detected concentrations of both acetone and methylene chloride were below their GWP-Ind MSCs; therefore, the soils were in compliance with Risk Reduction Standard Number 2 for VOCs. Therefore, subsurface soils were in compliance with Risk Reduction Standard 1.

Risk Evaluation Summary - The analytical results for surface and subsurface soil were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 38A is now, and is expected to continue to be, entirely industrial. Based upon the results of this comparison, the following conclusions were drawn:

TABLE 6-3B

SUBSURFACE SOIL CONCENTRATIONS COMPARED TO BASE BACKGROUND CONCENTRATIONS
 Building 38A
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

	SD1303SBB 04/24/94 2-4 ft (mg/kg)	SD1303SBC 04/24/94 4-6 ft (mg/kg)	SD13MW06D 03/24/94 6-6.9 ft (mg/kg)	MSC GWP-Ind (mg/kg)	Subsurface Soil Background Range (a) (mg/kg)
Metals :					
Aluminum	12,000	6,700	5,800		350 - 13,000
Arsenic	4.6	<3.5	12		<3.4 - 12
Barium	120	69	100		4.9 - 130
Beryllium	0.16	<0.17	<1.6		<0.16 - 0.42
Cadmium	3.9	2.1	1.2		<0.34 - 6.8
Calcium	86,000 JH	100,000 JH	10,000 JH		350 JH - 210,000 JH
Chromium (total)	12	7.6	7.9		<0.67 - 13
Cobalt	5.5	3.6	5.0		<1.1 - 7.6
Copper	8.2 JH	7.6 JH	19		5.0 - 66
Iron	13,000	7,200	6,900 JH		543 - 24,000
Lead	13	7.9	14		<3.1 - 88
Magnesium	2,600	1,800	1,800		65 - 3,100
Manganese	290	100	280		1.8 - 920
Nickel	13	6.1	9.5		<2.1 - 15
Potassium	1,700	880	820		90 - 2,200
Sodium	68	100	110		15 - 260
Vanadium	22	16	20		1 - 29
Zinc	22 JH	12 JH	33		1.2 - 54
Volatile Organics :					
Acetone	<0.012	<0.012	0.034	1,020	<0.012 - 0.023
Methylene Chloride	0.019	<0.0044	0.013 JH	0.5	0.0098 - 0.020

(a) Background data collected from five locations throughout the base

JH: Estimated quantitation - possibly biased high based upon QC data

MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/14 Sep 94
 CHECKED/DATE: JRF/2 Nov 95

- VOCs were detected near the analytical detection limit in surface and subsurface soil samples. However, the detected concentrations did not exceed the MSCs for Risk Reduction Standard Number 2. Therefore, soils were in compliance with the standard for these analytes.
- The concentrations of five metals in the surface soil samples exceeded their maximum surface soil background concentrations. However, on comparing these metals to the MSCs for Risk Reduction Standard Number 2, only arsenic and lead exceeded MSCs. Also, the concentrations in surface soil samples were within the range reported for ambient conditions in the western United States. Metals detected in the subsurface soil samples did not exceed their maximum subsurface soil background concentrations and were therefore in compliance with Standard Number 1.
- No other constituents were detected in soil samples.

An analysis of the findings from this study indicated that there were exceedances of MSCs by arsenic in the surface soil sample, SD1302SBA, and lead in surface soil sample SD13-MW06.

6.6 SITE CONCLUSION

Based on information obtained and visual observations, no obvious structural or operational deficiencies were apparent with the oil/water separator.

During the drilling of the soil borings, petroleum odors were detected in the soil borings. However, analytical results of soil samples from the perimeter of the separator unit did not detect significant subsurface soil contamination. Soil sample analyses did indicate surface soils contain arsenic and lead concentrations above their respective GWP-Ind MSCs. The presence of metals contamination (i.e., arsenic and lead) could have originated from oil/water separator overflows or the metal contamination could remain from past operations conducted at the Former Building 38A location.

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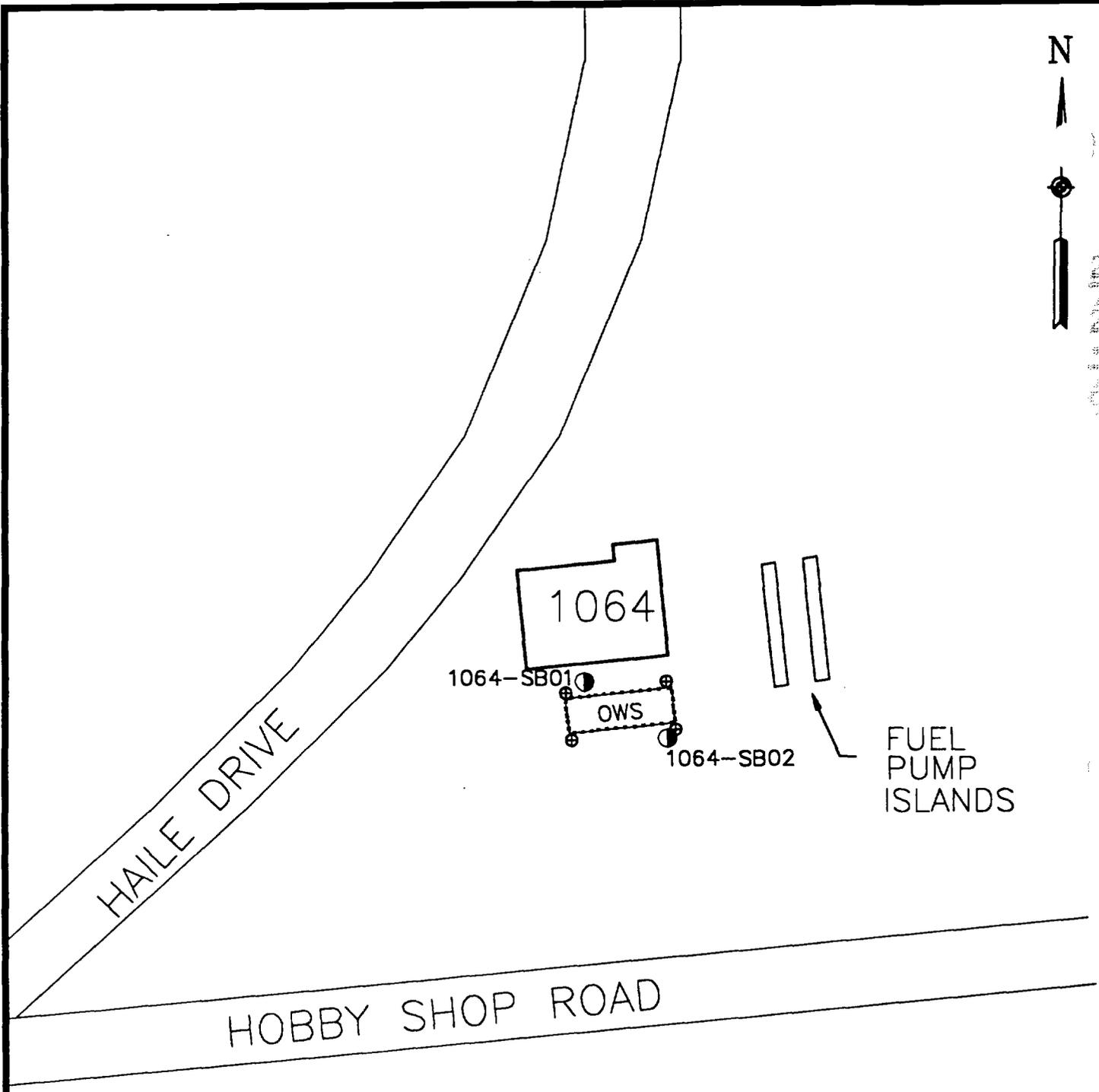
7.0 TRUCK REFUELING STATION (BUILDING 1064)

7.1 SITE DESCRIPTION

The Truck Refueling Station (Building 1064) is south of the Petroleum, Oils, and Lubricants (POL) Tank Farm at the intersection of Haile Road and Hobby Shop Road (Figure 1-2). The adjacent separator unit is a below ground rectangular concrete pit with concrete baffles and is covered by steel grates. The separator unit has an 18,000-gallon capacity and is equipped with a leak detection monitoring well on each corner (Figure 7-1). The oil/water separator was installed in the late 1980s to service Building 1064, which is the Truck Refueling Station where flight line fuel trucks refuel. Influent to the separator unit is from the Building 1064 storm sewer. Influent travels through the separator unit by gravity flow, then passes through the baffle system. Fuel products separate from the flow, and the water is discharged into the storm sewer.

7.2 SITE-SPECIFIC INVESTIGATION ACTIVITIES

The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Following the site visit, four borings were proposed for this location. However, due to the presence of underground utilities (storm sewer, electricity, telecommunications), in addition to underground piping for the refueling station and above ground power lines, only two soil borings were completed (1064-SB01 and 1064-SB02; Figure 7-1). An additional boring was attempted, but the vent lines for the underground storage tanks were encountered, and the boring was terminated.



LEGEND:

- OWS OIL/WATER SEPARATOR
- SOIL BORING LOCATION
- ⊕ LEAK DETECTION WELL

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT SOIL BORING LOCATION OIL/WATER SEPARATOR BUILDING 1064		
PREPARED BY/DATE: TDM 26 AUG 94	FIGURE NUMBER: 7-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: JFO 2 SEPT 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: FFS 9 SEPT 94		FILE NAME: bldg1064.dwg

7.3 SITE-SPECIFIC GEOLOGY

Soil boring 1064-SB01 encountered fill material (silty fine sand and silty gravel) extending from the ground surface to 10 feet below the ground surface (Table 7-1). Neither undisturbed soils nor ground water was encountered within this boring. Borings were not attempted using hand-auger techniques due to the noncohesive nature of the fill material and the apparent depth to ground water. At the request of AFCEE, a ground-water sample was collected from the leak detection well located at the northwestern corner of the oil/water separator. The measured depth of the detection well was 11 feet below the ground surface, and water was measured within the well at 10.7 feet below the ground surface. No evidence of a release from the oil/water separator was detected during the soil sampling activities.

7.4 CHEMICAL ANALYTICAL RESULTS

One surface and three subsurface soil samples were collected at this site. Positive analytical results are presented in Table 7-2. Sample locations showing VOC and metals concentrations detected at each boring are detailed on Figures 7-2 and Figure 7-3, respectively. Analytical data summary tables are presented in Appendix B.

Methylene chloride was detected in all surface and subsurface soil samples collected at Building 1064; however, all methylene chloride results were qualified. Refer to Section 3.0 for discussion of data quality evaluation. No other VOCs were detected.

None of the metals found in the surface soil exceeded background concentrations. Arsenic, calcium, copper, and magnesium were detected in subsurface soil samples at concentrations which exceeded background levels.

TABLE 7-1

TRUCK RE-FUEL STATION (BUILDING 1064)
 SOIL DESCRIPTION
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

Location: Truck Re-Fuel Station (Building 1064)
 Bottom Depth of Oil/Water Separator: 10 ft

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
1064-SB01	10	0-4	fill - silty fine sand	--	6-8
		4-10	fill - sandy fine gravel		8-10
1064-SB02	5	0-5	fill - sandy fine gravel	--	0-2 2-4

Note:

(ft): feet
 --: Ground water not observed in boring
 See Figure 7-1 for boring location.

PREPARED/DATE: TDM/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

1064-SB01

TABLE 7-2

POSITIVE RESULTS - SOIL SAMPLES
 BUILDING 1064
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

PARAMETER	106401SBD 04/27/94 6-8 ft	106401SBE 04/27/94 8-10 ft	106402SBA 04/27/94 0-2 ft	106402SBB 04/27/94 2-4 ft
<u>Metals (SW6010/SW3050) (mg/kg)</u>				
ALUMINUM	1900	3700	4300	1300
ARSENIC	4.3	3.4	<3.2	16
BARIUM	42	48	50	43
CADMIUM	1.7	1.8	1.6	4.0
CALCIUM	110000	27000	84000	210000
CHROMIUM, TOTAL	3.1	6.7	6.0	4.4
COBALT	3.4	2.6	2.7	5.5
COPPER	12 JH	6.5 JH	6.8 JH	87 JH
IRON	6100	6000	5600	13000
LEAD	6.9	11	7.2	8.1
MAGNESIUM	880	5600	1100	1700
MANGANESE	240	130	67	470
NICKEL	5.2	4.7	5.3	7.8
POTASSIUM	350	560	550	200
SODIUM	76	22	43	91
VANADIUM	7.1	12	9.9	13
ZINC	16 JH	13 JH	10 JH	44 JH
<u>Volatile Organics (SW8240/SW5030) (mg/kg)</u>				
METHYLENE CHLORIDE	0.0089 JB	0.0019 JB	0.0051 JB	0.0031 JB

JH: Estimated quantitation - possibly biased high based upon QC data
 JB: Estimated quantitation - possibly biased high or false positive based upon blank data

PREPARED/DATE: DRJ/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

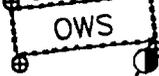


DATE PLOTTED

1064-01 6-8' 8-10'
METHYLENE CHLORIDE 0.0089 JB 0.0019 JB



1064-SB01



1064-SB02



FUEL PUMP ISLANDS

1064-02 0-2' 2-4'
METHYLENE CHLORIDE 0.0051 JB 0.0031 JB

HAILE DRIVE

HOBBY SHOP ROAD

LEGEND:

-  OIL/WATER SEPARATOR
-  SOIL BORING LOCATION
-  LEAK DETECTION WELL
- JB ESTIMATED QUANTITATION: POSSIBLE BIASED HIGH OR FALSE POSITIVE BASED UPON BLANK DATA

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE		
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT		
POSITIVE ANALYTICAL RESULTS VOLATILE ORGANICS (mg/kg)		
BUILDING 1064		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 7-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>SFP 17AUG95</i>		FILE NAME: bldg1064.dwg

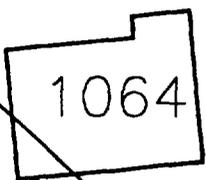


1064-01	6-8'	8-10'
ALUMINUM	1900	3700
ARSENIC	4.3	3.4
BARIUM	42	48
CADMIUM	1.7	1.8
CALCIUM	110000	27000
CHROMIUM	3.1	6.7
COBALT	3.4	2.6
COPPER	12 JH	6.5 JH
IRON	8100	6000
LEAD	8.9	11
MAGNESIUM	880	5600
MANGANESE	240	130
NICKEL	5.2	4.7
POTASSIUM	350	560
SODIUM	76	22
VANADIUM	7.1	12
ZINC	16 JH	13 JH

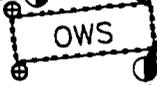
1064-02	0-2'	2-4'
ALUMINUM	4300	1300
ARSENIC	ND	16
BARIUM	50	43
CADMIUM	1.8	4.0
CALCIUM	84000	210000
CHROMIUM	6.0	4.4
COBALT	2.7	5.5
COPPER	6.8 JH	87 JH
IRON	5600	13000
LEAD	7.2	8.1
MAGNESIUM	1100	1700
MANGANESE	67	470
NICKEL	5.3	7.8
POTASSIUM	550	200
SODIUM	43	91
VANADIUM	9.9	13
ZINC	10 JH	44 JH

HAILE DRIVE

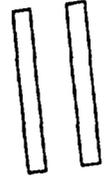
HOBBY SHOP ROAD



1064-SB01



1064-SB02



FUEL PUMP ISLANDS

LEGEND:

-  OIL/WATER SEPARATOR
-  SOIL BORING LOCATION
-  LEAK DETECTION WELL
- ND NOT DETECTED
- JH ESTIMATED QUANTITATION-POSSIBLY BIASED HIGH BASED UPON QC DATA

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT POSITIVE ANALYTICAL RESULTS METALS (mg/kg) BUILDING 1064		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 7-3	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>CA</i> 17 AUG 95		FILE NAME: bldg1064.dwg

One ground-water sample was collected from the northwestern leak detection well adjacent to the oil/water separator at the request of AFCEE oversight personnel. The leak detection well was not installed as a monitoring well, and it contained only a few inches of water. The intended use of the existing well was to indicate a possible release of gross contamination (floating product) due to a leaking oil/water separator. Sample 1064 GW was collected to determine if gross contamination existed in the leak detection well. The sample was collected by dipping a clean sample container into the contents of the well. The contents were analyzed for gasoline components (modified Method SW8015) and benzene, toluene, ethylbenzene, and xylene (BTEX) (Method SW 8020). Neither gasoline components nor BTEX were detected in sample 1064 GW. The analytical data summary table is presented in Appendix B.

The analytical results were evaluated to determine the usability of the data for sample 1064 GW. The laboratory QC was acceptable, including initial calibrations, continuing calibrations, method blanks, surrogates, and laboratory control samples. There were no matrix spike samples analyzed because the sample volume was limited. Holding times were met for both analyses performed. The results are adequate to determine that gross contamination was not present in the leak detection well at the time of sampling.

7.5 RISK EVALUATION

Surface Soil - The analytical results for the surface soil sample were first compared to the surface soil background concentration range for the base. It can be seen on Table 7-3A that none of the metals detected exceeded their respective maximum surface soil background concentrations. The detected concentrations were also below or within the range of ambient concentrations for the western United States. Because base background was not exceeded, surface soils were in compliance with Risk Reduction Standard 1.

TABLE 7-3A

**SURFACE SOIL CONCENTRATIONS COMPARED TO BASE BACKGROUND AND AMBIENT CONCENTRATIONS
BUILDING 1064
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas**

	106402SBA 04/27/94 0-2 ft (mg/kg)	Surface Soil Background Range (a) (mg/kg)	Ambient Concentrations for the Western U.S. (b) (mg/kg)
Metals :			
Aluminum	4,300	6,600 - 16,000	5,000 - 100,000
Arsenic	<3.2	3.7 - 5.3	<0.10 - 97
Barium	50	62 - 130	70 - 5,000
Cadmium	1.6	1.2 - 4.4	1 - 10 (c)
Calcium	84,000	6,200 - 190,000	600 - 320,000
Chromium (total)	6.0	6.6 - 18	3 - 2,000
Cobalt	2.7	2.2 - 6.3	<3 - 50
Copper	6.8 JH	6.6 - 21	2 - 300
Iron	5,600	6,000 - 17,000	1,000 - >100,000
Lead	7.2	6.1 - 16	<10 - 700
Magnesium	1,100	1,200 - 1,900	300 - >100,000
Manganese	67	108 - 250	30 - 5,000
Nickel	5.3	4.7 - 12	<5 - 700
Potassium	550	750 - 1,400	1,900 - 63,000
Sodium	43	36 - 120	500 - 100,000
Vanadium	9.9	13 - 37	7 - 500
Zinc	10 JH	10 - 26	10 - 2,100

(a) Background data collected from three locations throughout the base

(b) USGS, 1984

(c) USGS, 1975

JH: Estimated quantitation - possibly biased high based upon QC data

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/22 Aug 94
CHECKED/DATE: JRF/2 Nov 94

Subsurface Soil - The analytical results for the subsurface soil samples were first compared to the subsurface soil background concentration range for the base. As can be seen on Table 7-3B, the metals arsenic, copper, and magnesium exceeded their maximum subsurface soil background concentrations. All other metals were below or within the background ranges for the site. Due to these exceedances, the analytical results for these metals were compared to the GWP-Ind MSC, as shown in Table 7-3B. A comparison showed that the GWP-Ind MSC for arsenic was exceeded in the subsurface soil sample, 106402SBB, taken at the southeast corner of the oil/water separator at a depth of 2 to 4 feet. MSCs have not been published for the other two metals. Arsenic was the only metal detected in subsurface soils at the site which exceeded its Standard Number 2 MSC.

Risk Evaluation Summary - The analytical results for surface and subsurface soils were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 1064 was entirely industrial and is expected to continue to be entirely industrial in the future. Based upon the results of this comparison, the following conclusions were drawn:

- The concentrations of metals detected in the surface soil sample did not exceed their maximum surface soil background concentrations and were, therefore, in compliance with Standard Number 1. The concentrations of three metals in two of the three subsurface soil samples exceeded their maximum subsurface soil background concentrations. However, when these metals were compared to Risk Reduction Standard Number 2 MSCs, only arsenic exceeded its MSC.

TABLE 7-3B

SUBSURFACE SOIL CONCENTRATIONS COMPARED TO AN INDUSTRIAL MSC AND BASE BACKGROUND CONCENTRATIONS
 BUILDING 1064
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

	106401SBD 04/27/94 6-8 ft (mg/kg)	106401SBE 04/27/94 8-10 ft (mg/kg)	106402SBB 04/27/94 2-4 ft (mg/kg)	MSC GWP-Ind (mg/kg)	Subsurface Soil Background Range (a) (mg/kg)
Metals :					
Aluminum	1,900	3,700	1,300		350 - 13,000
Arsenic	4.3	3.4	16	5	<3.4 - 12
Barium	42	48	43		4.9 - 130
Cadmium	1.7	1.8	4.0		<0.34 - 6.8
Calcium	110,000	27,000	210,000	--	350 JH - 210,000 JH
Chromium (total)	3.1	6.7	4.4		<0.67 - 13
Cobalt	3.4	2.6	5.5		<1.1 - 7.6
Copper	12 JH	6.5 JH	87 JH	--	5.0 - 66
Iron	6,100	6,000	13,000		543 - 24,000
Lead	6.9	11	8.1		<3.1 - 88
Magnesium	880	5,600	1,700	--	65 - 3,100
Manganese	240	130	470		1.8 - 920
Nickel	5.2	4.7	7.8		<2.1 - 15
Potassium	350	560	200		90 - 2,200
Sodium	76	22	91		15 - 260
Vanadium	7.1	12	13		1 - 29
Zinc	16 JH	13 JH	44 JH		1.2 - 54

GWP-Ind - Industrial Soil-to-Groundwater Crossmedia Protection Concentration

JH: Estimated quantitation - possibly biased high based upon QC data

MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)

(a) Background data collected from five locations throughout the base

Boxes: Value exceeds maximum subsurface soil background concentration

Bold: Value exceeds GWP-Ind MSC

--: No data available

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/14 Sep 94
 CHECKED/DATE: JRF/2 Nov 95

No other constituents were detected in soil samples.

An analysis of the findings from this study indicates that there was a sole exceedance of MSCs by arsenic in one subsurface soil sample.

7.6 SITE CONCLUSIONS

Based on visual observations and discussions with NAS Fort Worth maintenance personnel, there was no indication that the oil/water separator unit at Building 1064 required repair or replacement of parts. During the initial site visit and subsequent site visits conducted by LAW at NAS Fort Worth, the separator unit was dry; therefore, the actual operation of the unit was not observed. The Building 1064 oil/water separator appears to be functional and well suited for the current refueling operations of Building 1064.

Surface soil samples collected from around the perimeter of the separator did not contain volatile or metal contamination at levels above background. However, subsurface soil samples were found to contain metal concentrations above background, and arsenic was detected at a concentration above its GWP-Ind MSC. The metal contamination associated with the oil/water separator at Building 1064 may have originated from past separator overflows; however, visual observations and NAS Fort Worth maintenance records do not indicate the unit has overflowed or has leaked. The arsenic contamination above MSCs may have resulted from past site activities or run-off from adjacent facilities that use or store pesticides containing arsenic.

8.0 MACHINE SHOP (BUILDING 1060)

8.1 SITE DESCRIPTION

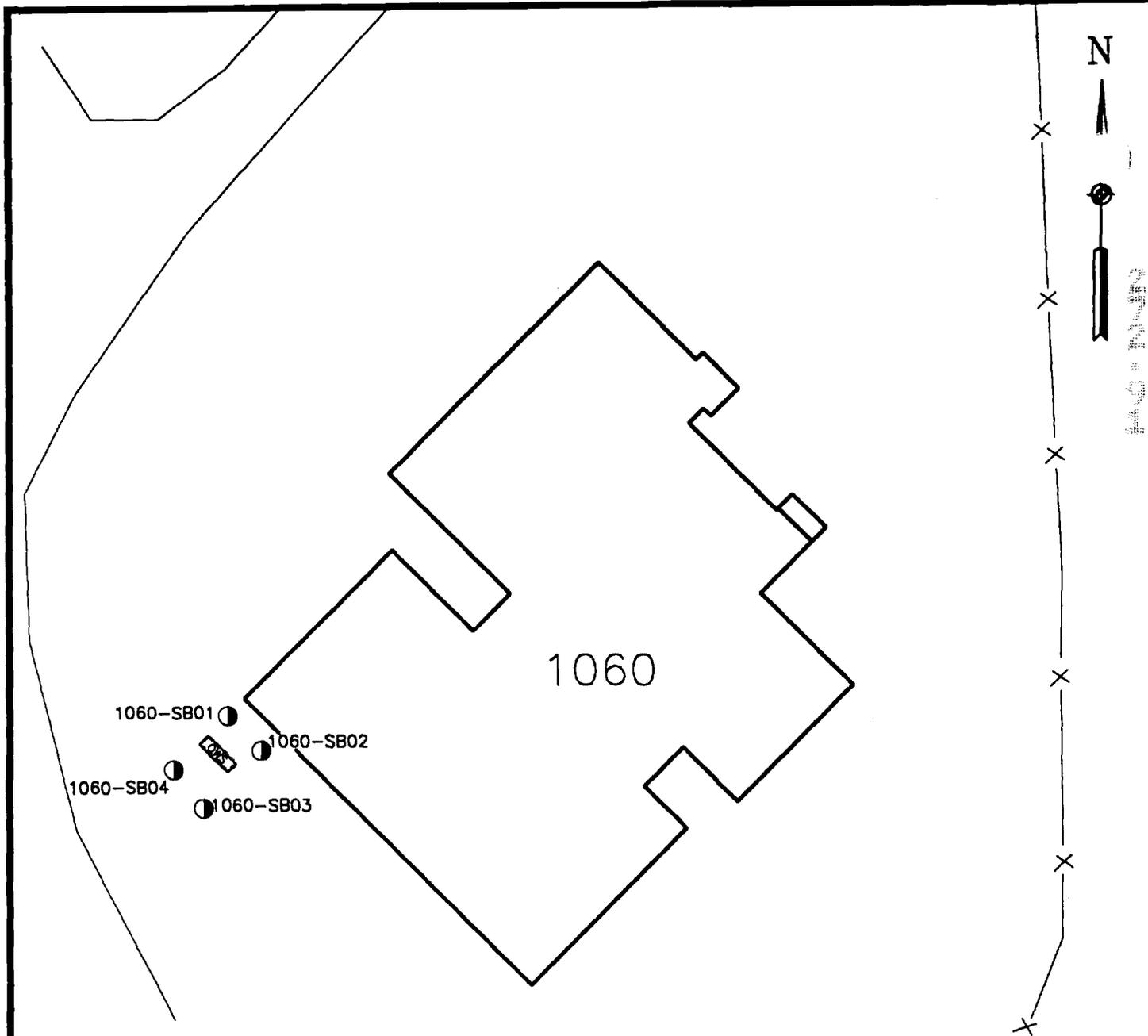
The Machine Shop (Building 1060) oil/water separator is located in the southeastern corner of the controlled area of the flight line, west of the Petroleum Oils and Lubricants (POL) Tank Farm. The separator unit is a 500-gallon capacity belowground steel tank installed to service Building 1060 operations, which include discharge of wash water containing petroleum products (Figure 8-1). The oil/water separator is connected to a 250-gallon belowground overflow tank.

8.2 SITE-SPECIFIC INVESTIGATION ACTIVITIES

The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Following the site visit, four soil borings (1060-SB01 through 1060-SB04) were advanced around the perimeter of the oil/water separator (Figure 8-1). The soil borings were advanced to depths ranging from 10.5 feet (1060-SB02) to 13 feet (1060-SB03) below the ground surface (Table 8-1). Samples for chemical analysis were not collected from 1060-02SB due to low soil recovery.

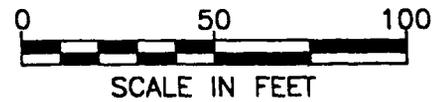
8.3 SITE-SPECIFIC GEOLOGY

Fill material consisting of silty to clayey sand and gravel to concrete debris was encountered to depths up to 10.5 feet below the ground surface. The undisturbed soil beneath the fill included silty fine to coarse sands and gravel in 1060-SB03, and sandy silt and clay in 1060-SB04. Ground water was not encountered in the soil borings at this location. Evidence of a release from the



LEGEND:

-  OIL/WATER SEPARATOR
-  SOIL BORING LOCATION



UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT SOIL BORING LOCATION OIL/WATER SEPARATOR BUILDING 1060		
PREPARED BY/DATE: TDM 26 AUG 94	FIGURE NUMBER: 8-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: JFO 2 SEPT 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: FES 9 SEPT 94		FILE NAME: bldg1060.dwg

TABLE 8-1
MACHINE SHOP (BUILDING 1060)
SOIL DESCRIPTION
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

Location: Machine Shop (Building 1060)
 Bottom Depth of Oil/Water Separator: 10 ft

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
1060-SB01	12	0-4	fill, silty fine sand	--	2-4
		4-10	fill, concrete debris		10-12
		10-12	silty fine sand		
1060-SB02	10.5	0-10	fill, silty to clayey fine sand	--	*
		10-10.5	fill, concrete debris		*
1060-SB03	13	0-4	fill, silty sand and gravel	--	0-2
		4-5	fill, concrete debris		11-13
		5-12.5	silty fine to coarse sand		
		12.5-13	medium to coarse sand and gravel		
1060-SB04	12	0-5	fill, silty fine to medium sand	--	1-3
		5-10	fill, concrete debris		10-12
		10-12	sandy silt to clay		

Note:
 (ft): feet
 --: Ground water not observed in boring
 *: No soil samples collected due to low sample recovery
 See Figure 8-1 for boring location.

PREPARED/DATE: TDM/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

NO. 010

oil/water separator was not detected during the soil sampling activities.

8.4 CHEMICAL ANALYTICAL RESULTS

One surface and five subsurface soil samples were collected for off-site chemical analysis. A duplicate sample was collected from soil boring 1060-03SB. Positive analytical results are presented in Table 8-2. Sample locations with VOCs and metals concentrations detected at each soil boring are detailed on Figures 8-2 and 8-3, respectively.

Methylene chloride was detected in all surface and subsurface soil samples collected at Building 1060. No other VOCs were detected.

Arsenic, calcium, copper, and magnesium exceeded background concentrations for surface sample 1060-03SBA. Five metals (aluminum, chromium, magnesium, manganese, and vanadium) exceeded background concentrations for subsurface samples.

8.5 RISK EVALUATION

Surface Soil - The analytical results for the surface soil sample were first compared to the surface soil background concentration range for the base. Arsenic, calcium, copper, and magnesium exceeded their respective maximum surface soil background concentrations (Table 8-3A). All other metals were below or within their background ranges. Note that the detection limit for metals varies in the data set due to adjustments for percent moisture content. This explains the detection of 0.52 mg/kg beryllium for site background, and the nondetect at 1.7 mg/kg. In addition, these four metals concentrations were compared to USGS data for metals detected in surface soils under ambient conditions in the

TABLE 8-2

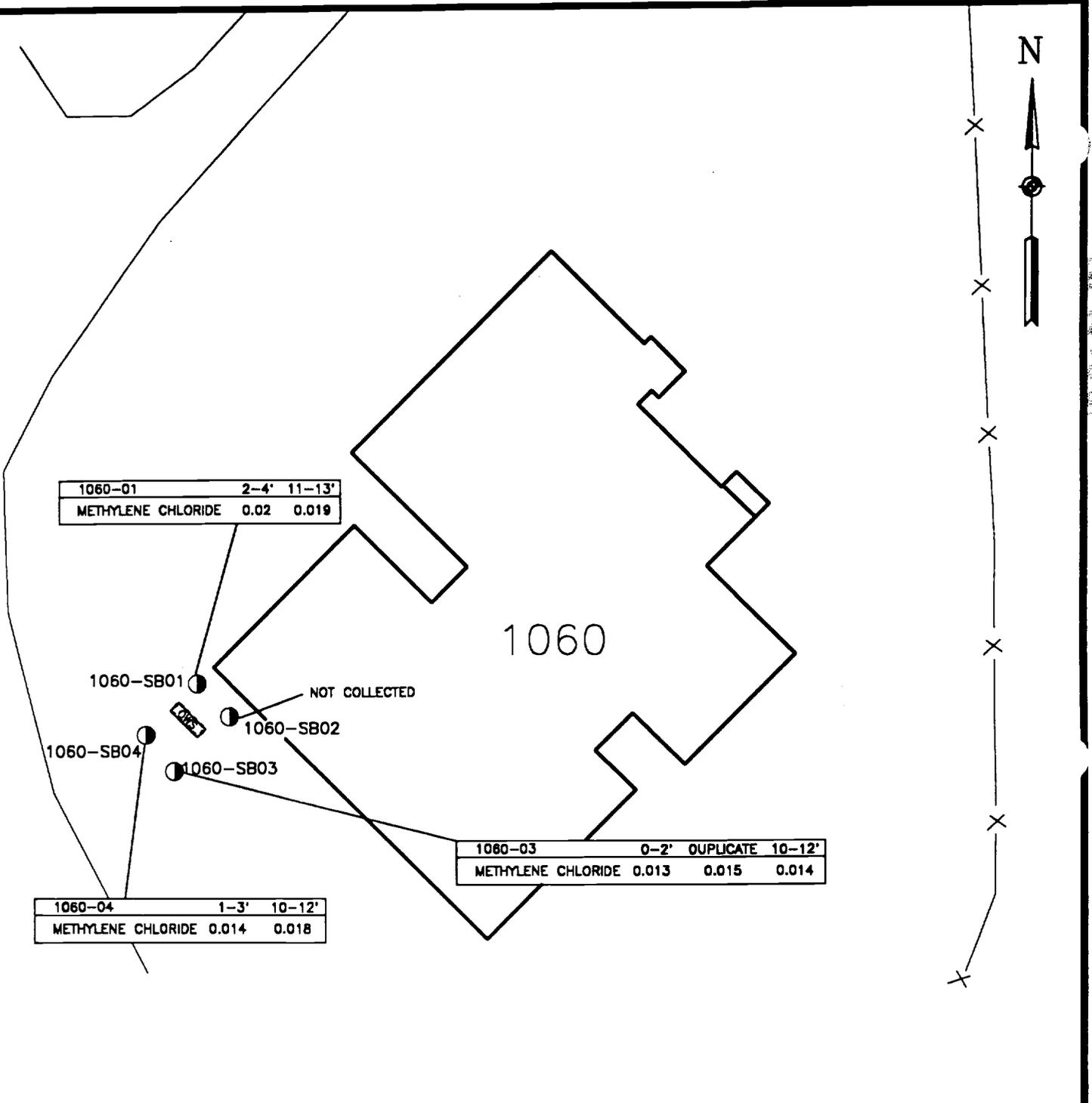
POSITIVE RESULTS - SOIL SAMPLES
 BUILDING 1060
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

PARAMETER	Sample		Duplicate		Sample	Sample		Sample	Sample	Sample
	106001SBB	106001SBF	106003SBA	106003SBB		106003SBF	106004SBB			
	04/23/94	04/23/94	04/23/94	04/23/94	04/23/94	04/23/94	04/23/94	04/23/94	04/23/94	04/23/94
	2-4 ft	10-12 ft	0-2 ft	0-2 ft	0-2 ft	11-13 ft	1-3 ft	10-12 ft	1-3 ft	10-12 ft
	Depth:	Depth:	Depth:	Depth:						
Metals (SW6010/SW3050) (mg/kg)										
ALUMINUM	14000	8000	1900 J	8100 J	1300	6700	11000			
ARSENIC	5.9	12	9.6	8.6	9.5	3.9	11			
BARIIUM	94	56	30 J	56 J	80	50	44			
BERYLLIUM	<1.8	<1.8	<1.5	<1.7	<1.8	0.33	<1.8			
CADMIUM	2.2	1.2	0.74	1.6	1.2	1.6	1.6			
CALCIUM	95000 JH	210000 JH	290000 JH	190000 JH	180000 JH	42000 JH	130000 JH			
CHROMIUM, TOTAL	15	9.2	4.1 J	9.6 J	4.9	10	11			
COBALT	5.6	4.2	2.3	4.0	7.0	4.4	4.7			
COPPER	14	18	30	21	18	8.0	13			
IRON	16000 JH	12000 JH	3100 JH	11000 JH	6600 JH	10000 JH	11000 JH			
LEAD	11	9.0	12	8.6	5.2	12	9.8			
MAGNESIUM	2600	3400	6400 J	2700 J	1800	1300	2600			
MANGANESE	340	280	220	240	1100	230	220			
NICKEL	12	9.1	6.6	8.0	12	9.3	9.3			
POTASSIUM	1500	1200	440 J	930 J	240	1100	1500			
SODIUM	150	170	96	120	100	62	120			
VANADIUM	32	23	6.7	20	19	21	20			
ZINC	29 JH	18 JH	16 JH	18 JH	11 JH	16 JH	18 JH			
Volatile Organics (SW6240/SW5030) (mg/kg)										
METHYLENE CHLORIDE	0.02	0.019	0.013	0.015	0.014	0.014	0.018			

J: Estimated quantitation based upon QC data
 JH: Estimated quantitation - possibly biased high based upon QC data

PREPARED/DATE: DRJ/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

N



1060-01	2-4'	11-13'
METHYLENE CHLORIDE	0.02	0.019

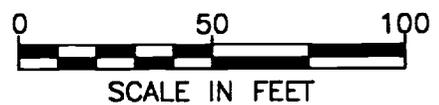
1060-03	0-2'	DUPLICATE	10-12'
METHYLENE CHLORIDE	0.013	0.015	0.014

1060-04	1-3'	10-12'
METHYLENE CHLORIDE	0.014	0.018

LEGEND:

OIL/WATER SEPARATOR

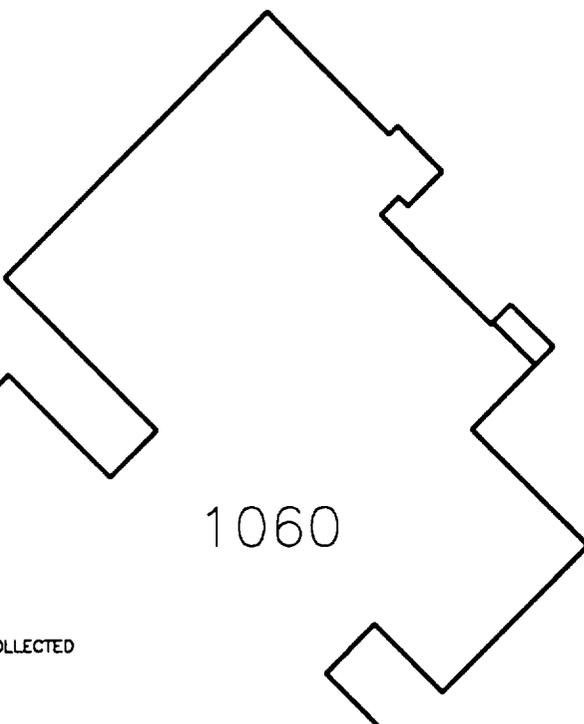
SOIL BORING LOCATION



UNITED STATES AIR FORCE		
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT		
POSITIVE ANALYTICAL RESULTS VOLATILE ORGANICS (mg/kg)		
BUILDING 1060		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 8-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1060.dwg



1060-01	2-4'	10-12'
ALUMINUM	14000	8000
ARSENIC	5.9	12
BARIIUM	94	56
CADMIUM	2.2	1.2
CALCIUM	95000 JH	210000 JH
CHROMIUM	15	9.2
COBALT	5.8	4.2
COPPER	14	18
IRON	16000 JH	12000 JH
LEAD	11	9.0
MAGNESIUM	2800	3400
MANGANESE	340	280
NICKEL	12	9.1
POTASSIUM	1500	1200
SODIUM	150	170
VANADIUM	32	23
ZINC	29 JH	18 JH

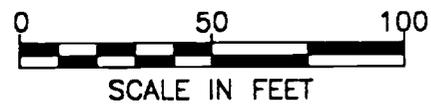


1060

1060-SB01
 1060-SB02 NOT COLLECTED
 1060-SB03
 1060-SB04

1060-04	1-3'	10-12'
ALUMINUM	8700	11000
ARSENIC	3.9	11
BARIIUM	50	44
BERYLLIUM	0.33	ND
CADMIUM	1.6	1.6
CALCIUM	42000 JH	130000 JH
CHROMIUM	10	11
COBALT	4.4	4.7
COPPER	8.0	13
IRON	10000 JH	11000 JH
LEAD	12	9.8
MAGNESIUM	1300	2600
MANGANESE	230	220
NICKEL	9.3	9.3
POTASSIUM	1100	1500
SODIUM	82	120
VANADIUM	21	20
ZINC	16 JH	18 JH

1060-03	2-4'	DUPLICATE	10-12'
ALUMINUM	1900 J	8100 J	1300
ARSENIC	9.6	8.6	9.5
BARIIUM	30 J	56 J	80
CADMIUM	0.74	1.8	1.2
CALCIUM	290000 JH	190000 JH	180000 JH
CHROMIUM	4.1 J	9.6 J	4.9
COBALT	2.3	4.0	7.0
COPPER	30	21	18
IRON	3100 JH	11000 JH	6600 JH
LEAD	12	8.8	5.2
MAGNESIUM	8400 J	2700 J	1800
MANGANESE	220	240	1100
NICKEL	8.6	8.0	12
POTASSIUM	440 J	930 J	240
SODIUM	96	120	100
VANADIUM	6.7	20	19
ZINC	16 JH	18 JH	11 JH



LEGEND:

-  OIL/WATER SEPARATOR
-  SOIL BORING LOCATION
- ND NOT DETECTED
- J ESTIMATED QUANTITATION BASED UPON QC DATA
- JH ESTIMATED QUANTITATION—POSSIBLY BIASED HIGH BASED UPON QC DATA

UNITED STATES AIR FORCE
 NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
 FORT WORTH, TEXAS

OIL/WATER SEPARATOR ASSESSMENT

POSITIVE ANALYTICAL RESULTS
METALS (mg/kg)

BUILDING 1060

PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 8-3	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1060.dwg

TABLE 8-3B

SUBSURFACE SOIL CONCENTRATIONS COMPARED TO AN INDUSTRIAL MSC AND BASE BACKGROUND CONCENTRATIONS
BUILDING 1060
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

	106001SBB 04/23/94 2-4 ft (mg/kg)	106003SBF 04/23/94 10-12 ft (mg/kg)	106004SBB 04/23/94 2-4 ft (mg/kg)	106004SBF 04/23/94 10-12 ft (mg/kg)	MSC GWP-Ind (mg/kg)	Subsurface Soil Background Range (a) (mg/kg)
Metals :						
Aluminum	14,000	8,000	6,700	11,000	--	350 - 13,000
Arsenic	5.9	12	3.9	11	--	<3.4 - 12
Barium	94	56	50	44	--	4.9 - 130
Beryllium	<1.8	<1.8	0.33	<1.8	--	<0.16 - 0.42
Cadmium	2.2	1.2	1.6	1.6	--	<0.34 - 6.8
Calcium	95,000 JH	210,000 JH	42,000 JH	130,000 JH	--	350 JH - 210,000 JH
Chromium (total)	15	9.2	10	11	10	<0.67 - 13
Cobalt	5.6	4.2	4.4	4.7	--	<1.1 - 7.6
Copper	14	18	8.0	13	--	5.0 - 66
Iron	16,000 JH	12,000 JH	10,000 JH	11,000 JH	--	543 - 24,000
Lead	11	9.0	12	9.8	--	<3.1 - 88
Magnesium	2,600	3,400	1,300	2,600	--	65 - 3,100
Manganese	340	280	230	220	--	1.8 - 920
Nickel	12	9.1	9.3	9.3	--	<2.1 - 15
Potassium	1,500	1,200	1,100	1,500	--	90 - 2,200
Sodium	150	170	62	120	--	15 - 260
Vanadium	32	23	21	20	--	1 - 29
Zinc	29 JH	18 JH	16 JH	18 JH	--	1.2 - 54
Volatile Organics :						
Methylene Chloride	0.02	0.019	0.014	0.018	0.5	0.0092 - 0.020

GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration
 JH: Estimated quantitation - possibly biased high based upon QC data
 MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)
 (a) Background data collected from five locations
 Boxes: Value exceeds maximum subsurface soil background concentration
 Bold: Value exceeds GWP-Ind MSC
 --: No data available

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/14 Sep 94
 CHECKED/DATE: JRF/2 Nov 95



western United States (USGS, 1984). The four metals that exceeded background fell within the expected range for ambient conditions.

Due to the exceedances of maximum surface soil background concentrations, the analytical results for arsenic, calcium, copper, and magnesium were compared to the GWP-Ind and SAI-Ind MSCs (Table 8-3A). A comparison shows that the GWP-Ind and the SAI-Ind MSCs for arsenic were exceeded in the surface soil sample, 106003SBA, collected south of the oil/water separator. The other four metals do not have published MSCs. Based on available MSCs, arsenic was the only metal detected in the surface soils at the site to exceed Standard Number 2.

Methylene chloride was the only VOC detected above its PQL. The concentration of methylene chloride detected was below both its maximum background concentration and its GWP-Ind and SAI-Ind MSCs. Therefore, surface soils were in compliance with Risk Reduction Standards 1 and 2 for VOCs.

Subsurface Soil - The analytical results for the subsurface soil samples were first compared to the subsurface soil background concentration range for the base. As shown on Table 8-3B, aluminum, chromium, magnesium, manganese, and vanadium exceeded their maximum subsurface soil background concentrations. All other metals were below or within their background ranges. Due to the exceedances, the analytical results for these five metals were compared to the GWP-Ind MSC (Table 8-3B). This comparison showed that the GWP-Ind MSC for chromium was exceeded in the subsurface soil sample, 106001SBB, taken to the north of the oil/water separator at a depth of 2 to 4 feet. The other four metals do not have published MSCs for comparison. Chromium was the only metal detected in the subsurface soils at the site to exceed its Standard Number 2 MSC. As previously discussed, the sample detection limit for beryllium exceeded the background range due to variations in sample detection limits.

TABLE 8-3A

**SURFACE SOIL CONCENTRATIONS COMPARED TO INDUSTRIAL MSCs
AND BASE BACKGROUND AMBIENT CONCENTRATIONS
BUILDING 1080
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas**

	106003SBA 04/23/94 0-2 ft (mg/kg)	MSCs		Surface Soil Background Range (a) (mg/kg)	Ambient Concentrations for the Western U.S. (b) (mg/kg)
		GWP-Ind (mg/kg)	SAI-Ind (mg/kg)		
Metals :					
Aluminum	8,100 J			6,600 - 16,000	5,000 - 100,000
Arsenic	9.6	5	3.27	3.7 - 5.3	<0.10 - 97
Barium	56 J			62 - 130	70 - 5,000
Beryllium	<1.7			0.52 - 0.87	<1 - 15
Cadmium	1.6			1.2 - 4.4	1 - 10 (c)
Calcium	290,000 JH	--	--	6,200 - 190,000	600 - 320,000
Chromium (total)	9.6 J			6.6 - 18	3 - 2,000
Cobalt	4.0			2.2 - 6.3	<3 - 50
Copper	30	--	--	6.6 - 21	2 - 300
Iron	11,000 JH			6,000 - 17,000	1,000 - >100,000
Lead	12			6.1 - 16	<10 - 700
Magnesium	6,400 J	--	--	1,200 - 1,900	300 - >100,000
Manganese	240			108 - 250	30 - 5,000
Nickel	8.0			4.7 - 12	<5 - 700
Potassium	930 J			750 - 1,400	1,900 - 63,000
Sodium	120			36 - 120	500 - 100,000
Vanadium	20			13 - 37	7 - 500
Zinc	18 JH			10 - 26	10 - 2,100
Volatile Organics :					
Methylene Chloride	0.015	0.5	13.8	0.014 - 0.019	--

GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration

SAI - Ind: Industrial Soil/Air and Ingestion Standard

(a) Background data collected from three locations throughout the base

(b) USGS, 1984

(c) USGS, 1975

JH: Estimated quantitation - possibly biased high based upon QC data

MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)

--: no data available

Boxes: Value exceeds maximum surface soil background concentration

Bold: Value exceeds GWP-Ind MSC

Italics: Value exceeds SAI-Ind MSC

--: no data available

J: Estimated quantitation based upon QC data

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/27 Aug 94

CHECKED/DATE: JRF/2 Nov 95

Methylene chloride was the only VOC detected above its PQL. The concentration of methylene chloride detected was below both the maximum background concentration and the GWP-Ind MSC. Therefore, subsurface soils were in compliance with Risk Reduction Standards 1 and 2 for VOCs.

Risk Evaluation Summary - The analytical results for surface and subsurface soils were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 1060 now, and is expected to continue to be, entirely industrial. Based upon the results of this comparison, the following conclusions were drawn:

- VOCs were detected in surface and subsurface soil samples. However, the detected concentrations did not exceed the MSCs for Risk Reduction Standards Number 1 or 2. Therefore, soils were in compliance with the standard for these analytes.
- The concentrations of four metals in the surface soil sample exceeded their maximum surface soil background concentrations. A comparison of these metals to Risk Reduction Standard Number 2 MSCs shows that only arsenic exceeded its MSCs. The concentrations of five metals detected in three of the five subsurface soil samples exceeded their maximum subsurface soil background concentrations. However, comparison of these metals to the appropriate Risk Reduction Standard Number 2 MSC, indicated that only chromium exceeded its MSC.
- No other constituents were detected in soil samples.

An analysis of the findings from this study indicated that there was an exceedance of MSCs by arsenic in surface soils and by chromium in subsurface soils. These exceedances occurred at different site boring locations.

8.6 SITE CONCLUSION

Information obtained during visual observation, personnel interviews, and record reviews did not indicate that the oil/water separator located at Building 1060 required repair or replacement. Chemical analyses from soil samples collected around the perimeter of the separator units detected arsenic in surface soil above GWP-Ind and SAI-Ind MSCs. Chromium was detected in subsurface soil above GWP-Ind MSCs. It is not known whether the metals detected resulted from the operation of the oil/water separator or from the previous site activities.

9.0 AIRCRAFT WASH RACK (BUILDING 1027, SWMU NO. 44)

9.1 SITE DESCRIPTION

The Aircraft Wash Rack (Building 1027) is located in the southeastern portion of the flight line area (Figure 1-2). The oil/water separator unit is a cylindrical gravity separator with vertical coalescing tubes, designed for a 150-gallon flow rate. The separator unit has a 1,500-gallon capacity, 1,000-gallon oil storage chamber (including separation chamber), and a 500-gallon effluent chamber. The separator was installed in the mid 1980s to receive waste from operations conducted within Building 1027.

9.2 SITE-SPECIFIC INVESTIGATION ACTIVITIES

The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Four soil borings (1027-SB01 through 1027-SB04) were advanced around the perimeter of the oil/water separator following the site visit (Figure 9-1). The soil borings were advanced to depths ranging from 12 feet (1027-SB01 and 1027-SB04) to 14 feet (1027-SB02 and 1027-SB03) below the ground surface.

9.3 SITE-SPECIFIC GEOLOGY

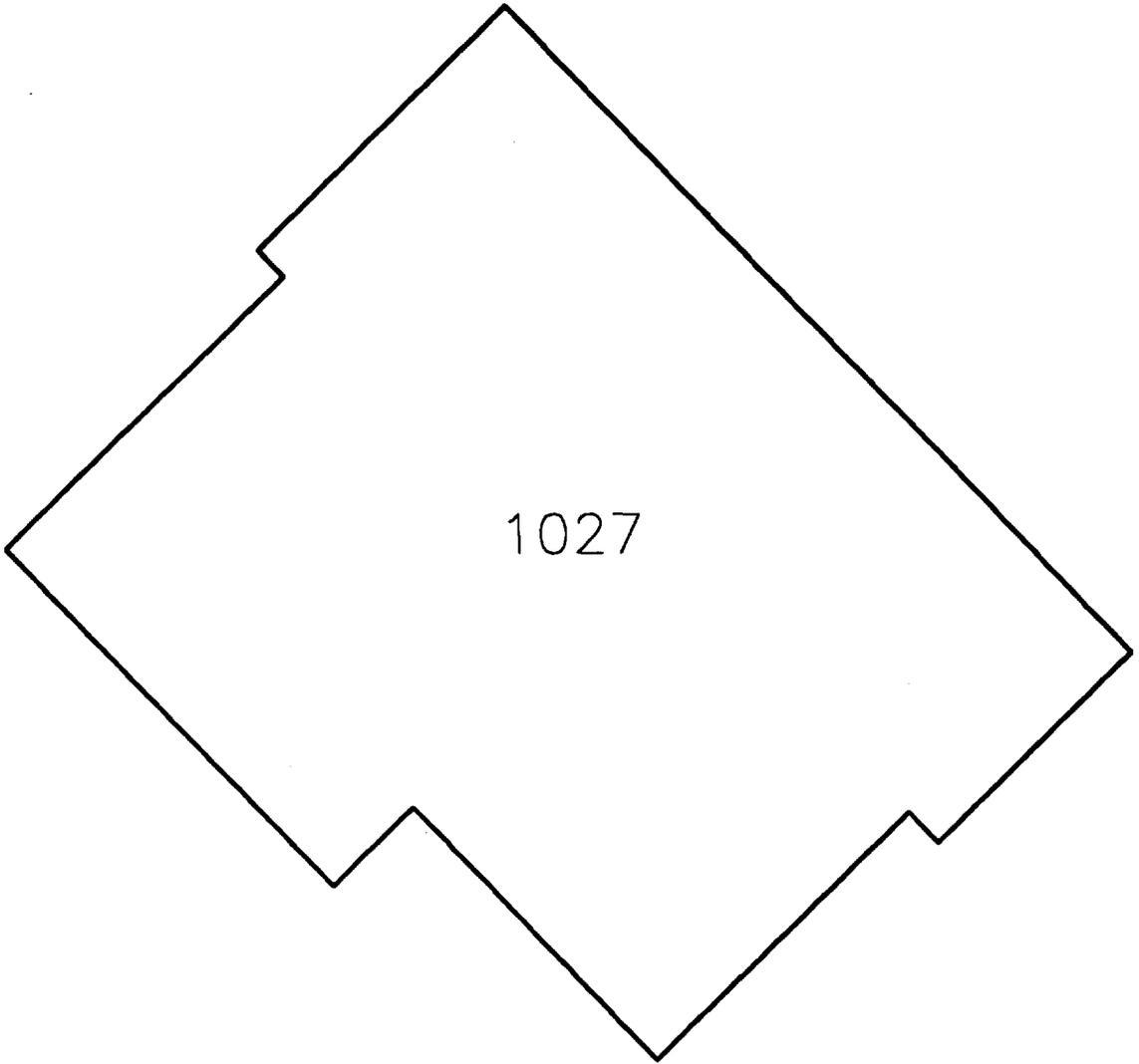
The soils encountered in the soil borings included silty to clayey fine to coarse sands, sandy silt, clay, and silty fine gravel (Table 9-1). Ground water was not encountered in any of the borings at this location. Evidence of a release from the oil/water separator was not detected during the soil sampling activities.

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1027

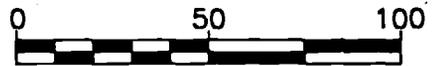
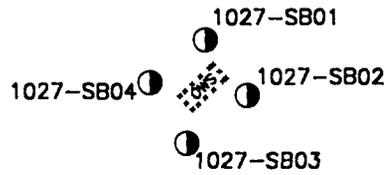
LEGEND:



OIL/WATER SEPARATOR



SOIL BORING LOCATION



SCALE IN FEET

UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT SOIL BORING LOCATION OIL/WATER SEPARATOR BUILDING 1027		
PREPARED BY/DATE: TDM 26 AUG 94	FIGURE NUMBER: 9-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: JFO 2 SEPT 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: EES 9 SEPT 94		FILE NAME: bldg1027.dwg

TABLE 9-1

**AIRCRAFT WASH RACK (BUILDING 1027)
SOIL DESCRIPTION
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas**

Location: Aircraft Wash Rack (Building 1027)
Bottom Depth of Oil/Water Separator: 11 ft

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
1027-SB01	12	0-4	silty fine sand	--	0-2
		4-6	sandy silt to clay		
		6-8	silty fine sand		10-12
		8-10	sandy silt to clay		
		10-11.8	silty fine sand		
	11.8-12	silty fine gravel			
1027-SB02	14	0-2	slightly sandy silt	--	2-4
		2-9	very silty to very clayey fine sand		12-14
		9-10	silty to clayey sandy fine gravel		
		10-14	slightly silty fine to coarse sand		
1027-SB03	14	0-3	sandy silt with fine gravel	--	10-12
		3-5	sandy silt to clay		12-14
		5-10	very silty to very clayey fine sand		
		10-12	slightly silty fine sand		
	12-14	sandy silt to clay			
1027-SB04	12	0-4	very silty fine sand	--	6-8
		4-8	sandy silt with gravel		10-12
		8-12	silty fine to coarse sand		

Note:
(ft) : feet
-- : Ground water not observed in boring
See Figure 9-1 for boring location.

PREPARED/DATE: TDM/2 Sep 94
CHECKED/DATE: JFO/2 Sep 94

FOR PLOT

9.4 CHEMICAL ANALYTICAL RESULTS

One surface and seven subsurface soil samples were collected at this site. A duplicate sample was collected from soil boring 1027-02SB. Positive analytical results are presented in Table 9-2. Sample locations, with VOCs and metals concentrations detected at each soil boring, are detailed on Figures 9-2 and 9-3, respectively.

Methylene chloride was detected in all surface and subsurface soil samples collected at Building 1027; however, two of the methylene chloride results are qualified. Refer to Section 3.0 for discussion of data quality evaluation. No other VOCs were detected.

Arsenic, cadmium, copper, lead, magnesium, and zinc were detected above background concentrations for surface sample 1027-01SBA, and arsenic was detected above background concentrations for subsurface sample 1027-04SBF.

9.5 RISK EVALUATION

Surface Soil - The analytical results for the surface soil sample were first compared to the surface soil background concentration range for the base. Arsenic, cadmium, copper, lead, magnesium, and zinc exceeded their respective maximum surface soil background concentrations (Table 9-3A). All other metals were below or within their background ranges. In addition, the concentrations of these six metals were compared to USGS data for metals detected in surface soils under ambient conditions in the western United States (USGS, 1984). The six metals detected above background fell within the expected range for ambient conditions.

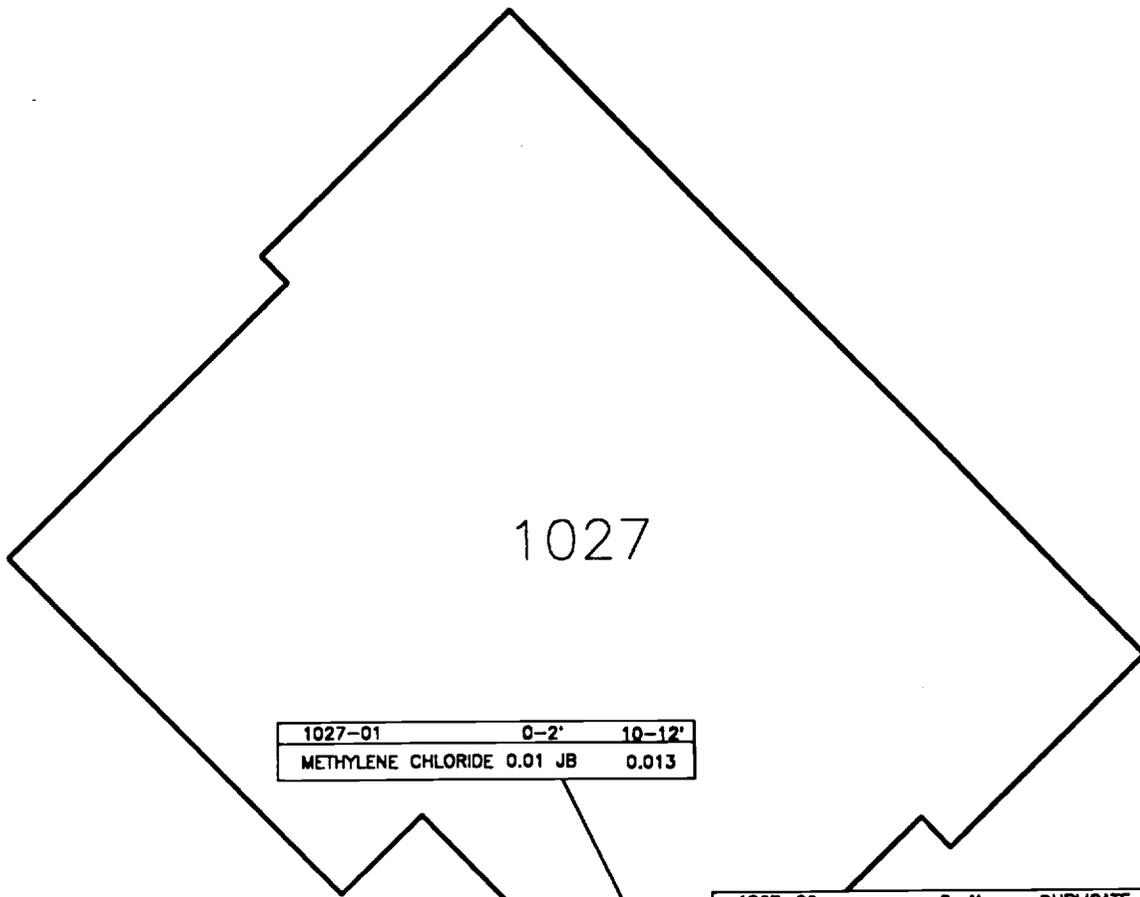
TABLE 9-2

POSITIVE RESULTS - SOIL SAMPLES
 BUILDING 1027
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

PARAMETER	Sample Date:	Sample	Duplicate	102701SBA	102701SBF	102702SBB	1027DPSB1	102702SBBG	102703SBF	102703SBBG	102704SBD	102704SBF
	Depth:	0-2 ft	04/22/94	10-12 ft	04/22/94	2-4 ft	04/22/94	12-14 ft	10-12 ft	04/22/94	6-8 ft	04/22/94
Metals (Method, SW6010/SW3050) (mg/kg)												
ALUMINUM		6800		2000		6000	6100	1800	3700	8200	7400	4800
ARSENIC		10	<3.4			11	11	12	6.0	10	10	14
BARIUM		60	17	48		41	41	36	20	36	43	32
BERYLLIUM		<1.6	0.24			<1.7	<1.6	<1.6	<1.6	<1.7	<1.7	<1.8
CADMIUM		6.1	1.3			0.83	1.1	0.99	0.39	1.0	1.2	1.5
CALCIUM		160000	22000			190000	160000	180000	160000	200000	160000	170000
CHROMIUM, TOTAL		17	4.4			7.4	8.1	4.7	5.2	8.9	9.2	6.1
COBALT		4.2	4.6			5.1	5.1	4.2	1.6	3.1	2.9	3.6
COPPER		26	4.9			27	19	18	8.6	15	14	30
IRON		8000	8700			76 J	10000 J	6200	3200	7800	7500	8100
LEAD		58	5.3			8.9	10	7.0	4.9	7.7	6.6	7.3
MAGNESIUM		2400	430			2600	2200	1600	1700	2300	2900	1800
MANGANESE		240	140			310	250	600	120	160	150	260
NICKEL		9.3	5.3			9.1	7.6	7.7	2.6	6.7	6.4	7.4
POTASSIUM		1100	320			910	680	280	530	1100	1200	660
SODIUM		89	27			100	90	100	80	88	100	82
VANADIUM		8.9	12			15	18	11	<7.8	15	8.4	20
ZINC		890 JH	12 JH			24 JH	16 JH	22 JH	7.2 JH	15 JH	31 JH	29 JH
Volatile Organics (Method, SW8240/SW5630) (mg/kg)												
METHYLENE CHLORIDE		0.01 JB	0.013			0.014	0.0099 JB	0.013	0.012	0.013	0.013	0.014

J: Estimated quantitation based upon QC data
 JH: Estimated quantitation - possibly biased high based upon QC data
 JB: Estimated quantitation - possibly biased high or false positive based upon blank data

PREPARED/DATE: DR./2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

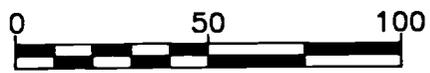


1027-01	0-2'	10-12'
METHYLENE CHLORIDE	0.01 JB	0.013

1027-02	2-4'	DUPLICATE	12-14'
METHYLENE CHLORIDE	0.014	0.0099 JB	0.013

1027-04	6-8'	10-12'
METHYLENE CHLORIDE	0.013	0.014

1027-03	10-12'	12-14'
METHYLENE CHLORIDE	0.012	0.013



SCALE IN FEET

LEGEND:

OWS OIL/WATER SEPARATOR

SOIL BORING LOCATION

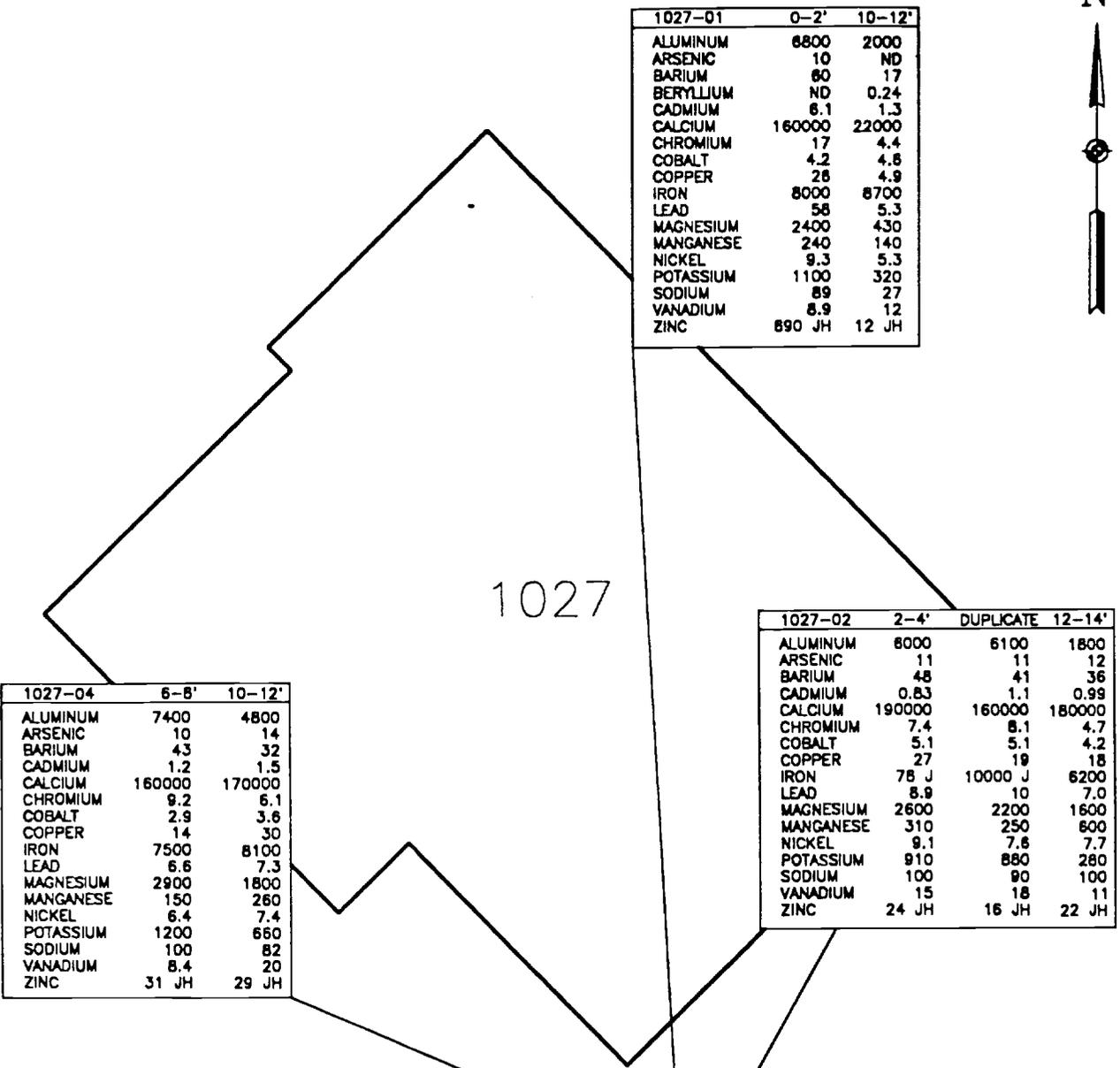
JB ESTIMATED QUANTITATION: POSSIBLE BIASED HIGH OR FALSE POSITIVE BASED UPON BLANK DATA

UNITED STATES AIR FORCE
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
FORT WORTH, TEXAS

OIL/WATER SEPARATOR ASSESSMENT

POSITIVE ANALYTICAL RESULTS
VOLATILE ORGANICS (mg/kg)
BUILDING 1027

PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 9-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1027.dwg

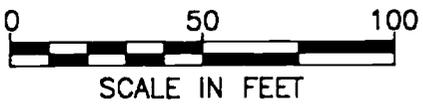
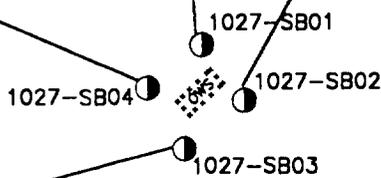


1027-01	0-2'	10-12'
ALUMINUM	6800	2000
ARSENIC	10	ND
BARIIUM	60	17
BERYLLIUM	ND	0.24
CADIUM	6.1	1.3
CALCIUM	160000	22000
CHROMIUM	17	4.4
COBALT	4.2	4.6
COPPER	26	4.9
IRON	8000	8700
LEAD	58	5.3
MAGNESIUM	2400	430
MANGANESE	240	140
NICKEL	9.3	5.3
POTASSIUM	1100	320
SODIUM	89	27
VANADIUM	8.9	12
ZINC	890 JH	12 JH

1027-04	6-8'	10-12'
ALUMINUM	7400	4800
ARSENIC	10	14
BARIIUM	4.3	32
CADIUM	1.2	1.5
CALCIUM	180000	170000
CHROMIUM	9.2	6.1
COBALT	2.9	3.6
COPPER	14	30
IRON	7500	8100
LEAD	6.6	7.3
MAGNESIUM	2900	1800
MANGANESE	150	260
NICKEL	6.4	7.4
POTASSIUM	1200	660
SODIUM	100	82
VANADIUM	8.4	20
ZINC	31 JH	29 JH

1027-02	2-4'	DUPLICATE	12-14'
ALUMINUM	6000	6100	1800
ARSENIC	11	11	12
BARIIUM	48	41	36
CADIUM	0.83	1.1	0.99
CALCIUM	190000	160000	180000
CHROMIUM	7.4	8.1	4.7
COBALT	5.1	5.1	4.2
COPPER	27	19	18
IRON	78 J	10000 J	6200
LEAD	8.9	10	7.0
MAGNESIUM	2600	2200	1600
MANGANESE	310	250	600
NICKEL	9.1	7.6	7.7
POTASSIUM	910	880	280
SODIUM	100	90	100
VANADIUM	15	18	11
ZINC	24 JH	16 JH	22 JH

1027-03	10-12'	12-14'
ALUMINUM	3700	8200
ARSENIC	6.0	10
BARIIUM	20	36
CADIUM	0.39	1.0
CALCIUM	180000	200000
CHROMIUM	5.2	8.9
COBALT	1.6	3.1
COPPER	8.6	15
IRON	3200	7800
LEAD	4.9	7.7
MAGNESIUM	1700	2300
MANGANESE	120	160
NICKEL	2.6	6.7
POTASSIUM	530	1100
SODIUM	80	88
VANADIUM	ND	15
ZINC	7.2 JH	15 JH



LEGEND:

- OIL/WATER SEPARATOR
- SOIL BORING LOCATION
- ND NOT DETECTED
- J ESTIMATED QUANTITATION BASED UPON QC DATA
- JH ESTIMATED QUANTITATION—POSSIBLY BIASED HIGH BASED UPON QC DATA

UNITED STATES AIR FORCE
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
FORT WORTH, TEXAS

OIL/WATER SEPARATOR ASSESSMENT

POSITIVE ANALYTICAL RESULTS
METALS (mg/kg)

BUILDING 1027

PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 9-3	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 27 AUG 95		FILE NAME: bldg1027.dwg

TABLE 9-3A

SURFACE SOIL CONCENTRATIONS COMPARED TO INDUSTRIAL MSCs,
BASE BACKGROUND, AND AMBIENT CONCENTRATIONS
BUILDING 1027
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

	102701 SBA 04/22/94 0-2 ft (mg/kg)	MSCs		Surface Soil Background Range (a) (mg/kg)	Ambient Concentrations for the Western U.S. (b) (mg/kg)
		GWP-Ind (mg/kg)	SAI-Ind (mg/kg)		
Metals :					
Aluminum	6,800			6,600 - 16,000	5,000 - 100,000
Arsenic	10	5	3.27	3.7 - 5.3	<0.10 - 97
Barium	60			62 - 130	70 - 5,000
Beryllium	<1.6			0.52 - 0.87	<1 - 15
Cadmium	6.1	0.5	1,020	1.2 - 4.4	1 - 10 (c)
Calcium	160,000			6,200 - 190,000	600 - 320,000
Chromium (total)	17			6.6 - 18	3 - 2,000
Cobalt	4.2			2.2 - 6.3	<3 - 50
Copper	26	--	--	6.6 - 21	2 - 300
Iron	8,000			6,000 - 17,000	1,000 - >100,000
Lead	58	1.5	1,000	6.1 - 16	<10 - 700
Magnesium	2,400	--	--	1,200 - 1,900	300 - >100,000
Manganese	240			108 - 250	30 - 5,000
Nickel	9.3			4.7 - 12	<5 - 700
Potassium	1,100			750 - 1,400	1,900 - 63,000
Sodium	89			36 - 120	500 - 100,000
Vanadium	8.9			13 - 37	7 - 500
Zinc	690 JH	--	--	10 - 26	10 - 2,100

GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration

SAI - Ind: Industrial Soil/Air and Ingestion Standard

(a) Background data collected from three locations throughout the base

(b) USGS, 1984

(c) USGS, 1975

JH: Estimated quantitation -- possibly biased high based upon QC data

MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)

--: no data available

Boxes: Value exceeds maximum surface soil background concentration

Bold: Value exceeds GWP-Ind MSC

Italics: Value exceeds SAI-Ind MSC

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/27 Aug 94

CHECKED/DATE: JRF/2 Nov 95

Due to the exceedances of maximum surface soil background concentrations, the analytical results for arsenic, cadmium, copper, lead, magnesium, and zinc were compared to the GWP-Ind and SAI-Ind MSCs (Table 9-3A). This comparison showed that the GWP-Ind and the SAI-Ind MSCs for arsenic were exceeded in the surface soil sample, 102701SBA, which was collected to the north of the oil/water separator. The GWP-Ind MSCs for cadmium and lead were also exceeded in that surface soil sample. Copper, magnesium, and zinc do not have published MSCs. Therefore, arsenic, cadmium, and lead were the only metals detected in the surface soils at the site to exceed Standard Number 2 MSCs.

Subsurface - The analytical results for the subsurface soil samples were first compared to the subsurface soil background concentration range for the base. Table 9-3B shows that arsenic exceeded its maximum subsurface soil background concentrations. All other metals were below or within their background ranges. Due to this exceedance, the analytical result for arsenic was compared to the GWP-Ind MSC (Table 9-3B). This comparison showed that the GWP-Ind MSC for arsenic was exceeded in the subsurface soil sample, 102704SBF, taken to the west of the oil/water separator at a depth of 10 to 12 feet. Arsenic is the only metal detected in the subsurface soils at the site to exceed its Standard Number 2 MSC.

Methylene chloride was the only VOC detected above its PQL. The concentration of methylene chloride detected was below both the maximum background concentration and the GWP-Ind MSC. Therefore, subsurface soils are in compliance with Risk Reduction Standards 1 and 2 for VOCs.

Risk Evaluation Summary - The analytical results for surface and subsurface soil were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard

TABLE 9-3B

SUBSURFACE SOIL CONCENTRATIONS COMPARED TO AN INDUSTRIAL MSC AND BASE BACKGROUND CONCENTRATIONS
 BUILDING 1027
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

	102701SBF 04/22/94 10-12 ft (mg/kg)	102702SBB 04/22/94 2-4 ft (mg/kg)	102702SBG 04/22/94 12-14 ft (mg/kg)	102703SBF 04/22/94 10-12 ft (mg/kg)	102703SBG 04/22/94 12-14 ft (mg/kg)	102704SBD 04/22/94 6-8 ft (mg/kg)	102704SBF 04/22/94 10-12 ft (mg/kg)	MSC GWP-Ind (mg/kg)	Subsurface Soil Background Range (a) (mg/kg)
Metals :									
Aluminum	2,000	6,100	1,800	3,700	8,200	7,400	4,800	5	350 - 13,000
Arsenic	<3.4	11	12	6.0	10	10	14		<3.4 - 12
Barium	17	48	36	20	36	43	32		4.9 - 130
Beryllium	0.24	<1.7	<1.6	<1.6	<1.7	<1.7	<1.8		<0.16 - 0.42
Cadmium	1.3	1.1	0.99	0.39	1.0	1.2	1.5		<0.34 - 6.8
Calcium	22,000	190,000	180,000	160,000	200,000	180,000	170,000		350 JH - 210,000 JH
Chromium (total)	4.4	8.1	4.7	5.2	8.9	9.2	6.1		<0.67 - 13
Cobalt	4.6	5.1	4.2	1.6	3.1	2.9	3.6		<1.1 - 7.6
Copper	4.9	27	18	8.6	15	14	30		5.0 - 66
Iron	8,700	10,000 J	6,200	3,200	7,800	7,500	8,100		543 - 24,000
Lead	5.3	10	7.0	4.9	7.7	6.6	7.3		<3.1 - 88
Magnesium	430	2,600	1,600	1,700	2,300	2,900	1,800		95 - 3,100
Manganese	140	310	600	120	160	150	260		1.8 - 920
Nickel	5.3	9.1	7.7	2.6	6.7	6.4	7.4		<2.1 - 15
Potassium	320	910	280	530	1,100	1,200	660		90 - 2,200
Sodium	27	100	100	80	88	100	82		36 - 280
Vanadium	12	18	11	<7.8	15	8.4	20		1 - 29
Zinc	12 JH	24 JH	22 JH	7.2 JH	15 JH	31 JH	29 JH		1.2 - 64
Volatile Organics :									
Methylene Chloride	0.013	0.014	0.013	0.012	0.013	0.013	0.014	0.5	0.092 - 0.920

GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration
 MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)
 J: Estimated quantitation based upon QC data

JH: Estimated quantitation - possibly biased high based upon QC data

(a) Background data collected from five locations throughout the base

Boxes: Value exceeds maximum subsurface soil background concentration

Bold: Value exceeds GWP-Ind MSC

--: No data available

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/14 Sep 94
 CHECKED/DATE: JRF/2 Nov 95

applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 1027 is now, and is expected to continue to be, entirely industrial. Based upon the results of this comparison, the following conclusions were drawn:

- VOCs were detected in subsurface soil samples. However, the detected concentrations did not exceed the MSCs for Risk Reduction Standard Number 1 or 2. Therefore, soils were in compliance with the standard for these analytes.
- The concentrations of six metals in the surface soil sample exceeded their maximum surface soil background concentrations. However, on comparing these metals to Risk Reduction Standard Number 2 MSCs, only arsenic exceeded both its MSCs, and cadmium and lead exceeded their GWP-Ind MSCs. The concentrations of one metal detected in just one of the seven subsurface soil samples exceeded its maximum subsurface soil background concentrations. Comparison to the appropriate Risk Reduction Standard Number 2 MSC indicated that arsenic exceeded its MSC.
- No other constituents were detected in soil samples.

An analysis of the findings from this study indicates that there was an exceedance of MSCs by arsenic, cadmium, and lead in surface soils and by arsenic in subsurface soils. These exceedances occur at two different site boring locations.

9.6 SITE CONCLUSION

NAS Fort Worth maintenance personnel reported overflow problems with the lift station adjacent to the Building 1027 oil/water

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separator. The lift station was reported to overflow during heavy rain storms and some apparent surface soil staining was observed at the site of the lift station. Maintenance personnel also reported that sludge tended to build up in the sludge chamber at an excessive rate, and coalescing bundles had been replaced twice. The recommendation for this oil/water separator is to have NAS Fort Worth maintenance personnel thoroughly inspect the oil/water separator and associated lift station to clean out any sludge build up and replace any damaged parts.

Soil samples collected for chemical analysis around the oil/water separator were found to contain arsenic, cadmium, and lead in surface soil at concentrations above MSCs. In addition, arsenic was detected above its SAI-Ind MSC at 10 to 12 feet. The presence of metals contamination may be associated with oil/water separator overflows. The presence of arsenic at the 10- to 12-foot sample interval could suggest that the contamination may be the result of a leak in the oil/water separator, but could also be due to past overflows migrating through the sandy soils.

10.0 ENGINE TEST CELL (BUILDING 1015, SWMU NO. 47)

10.1 SITE DESCRIPTION

The Engine Test Cell Building (Building 1015) is located in the southeastern portion of the flight line area (Figure 1-2). The oil/water separator unit, adjacent to Building 1015, is a below ground concrete vault operated by gravity flow (Figure 10-1). The separator unit has a 1,000-gallon capacity and a 500-gallon oil storage chamber. The unit was installed in the late 1960s to service Building 1015. Floor drains from Building 1015 flow into the oil/water separator which is designed to handle hydraulic fluid, lubricating (engine) oil, and petroleum by-products. Based on facility drawings, effluent from the separator unit discharges into the sanitary sewer.

10.2 SITE-SPECIFIC INVESTIGATION ACTIVITIES

The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Subsequently, three soil borings were advanced around the perimeter of the oil/water separator (Figure 10-1). A fourth soil boring was deleted because of the proximity of the large fire extinguishing device located south of the oil/water separator. The soil borings were advanced to depths ranging from 4.2 feet (1015-SB02) to 8 feet (1015-SB03) below the ground surface.

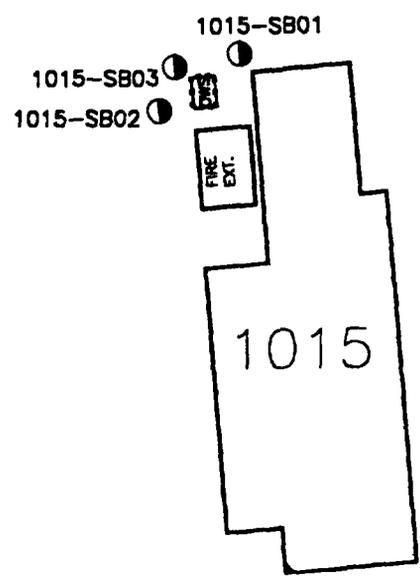
10.3 SITE-SPECIFIC GEOLOGY

The soils encountered included silty fine to coarse sands to silty, sandy gravel (Table 10-1). Ground water was not encountered within the soil borings at this location. Evidence of a release from the



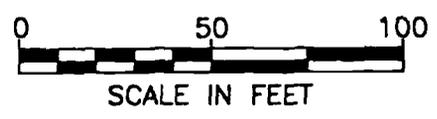
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ROARING SPRINGS ROAD



LEGEND:

- OIL/WATER SEPARATOR
- SOIL BORING LOCATION



UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT SOIL BORING LOCATION OIL/WATER SEPARATOR BUILDING 1015		
PREPARED BY/DATE: TDM 26 AUG 94	FIGURE NUMBER: 10-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: JFO 2 SEPT 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: EFB 9 SEPT 94		FILE NAME: bldg1015.dwg

TABLE 10-1
ENGINE TEST CELL (BUILDING 1015)
SOIL DESCRIPTION
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

Location: Engine Test Cell Building (Building 1015)
 Bottom Depth of Oil/Water Separator: 10 ft

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
1015-SB01	6.2	0-2	silty fine sand to coarse gravel	--	0-2
		2-6.2	silty fine to coarse sand with gravel		4-6
1015-SB02	4.2	0-4.2	silty to sandy fine gravel	--	0-2
					2-4
1015-SB03	8	0-6	silty fine to coarse sand with gravel	--	4-6
		6-8	slightly silty coarse sand with gravel		6-8

Note:

(ft) : feet
 -- : Ground water not observed in boring
 See Figure 10-1 for boring location.

PREPARED/DATE: TDM/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

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oil/water separator was not detected during the soil sampling activities.

10.4 CHEMICAL ANALYTICAL RESULTS

Two surface and four subsurface soil samples were collected for chemical analysis. A duplicate sample was collected from soil boring 1015-02SBB. Positive analytical results are presented in Table 10-2. Sample locations, with VOCs and metal concentrations detected at each soil boring, are detailed on Figures 10-2 and 10-3, respectively.

Acetone was detected in one surface soil sample (1015-02SBA) at an estimated concentration of 0.01 mg/kg. Methylene chloride was detected in all soil samples collected at Building 1015; however, all methylene chloride results are qualified. Refer to Section 3.0 for discussion of data quality evaluation.

Surface soil from boring 101501SBA indicated five metals (arsenic, calcium, magnesium, manganese, and sodium) above background concentrations. Surface soil from boring 101502SBA indicated six metals (aluminum, barium, magnesium, nickel, potassium, and zinc) were detected above background concentrations. The metals detected in the subsurface soil samples which exceeded the background concentrations included aluminum, calcium, chromium, magnesium, potassium, and sodium.

10.5 RISK EVALUATION

Surface Soil - The analytical results for the surface soil samples were first compared to the surface soil background concentration range for the base. Ten metals exceeded their respective maximum surface soil background concentrations (Table 10-3A). The remaining metals were below or within their background ranges. In

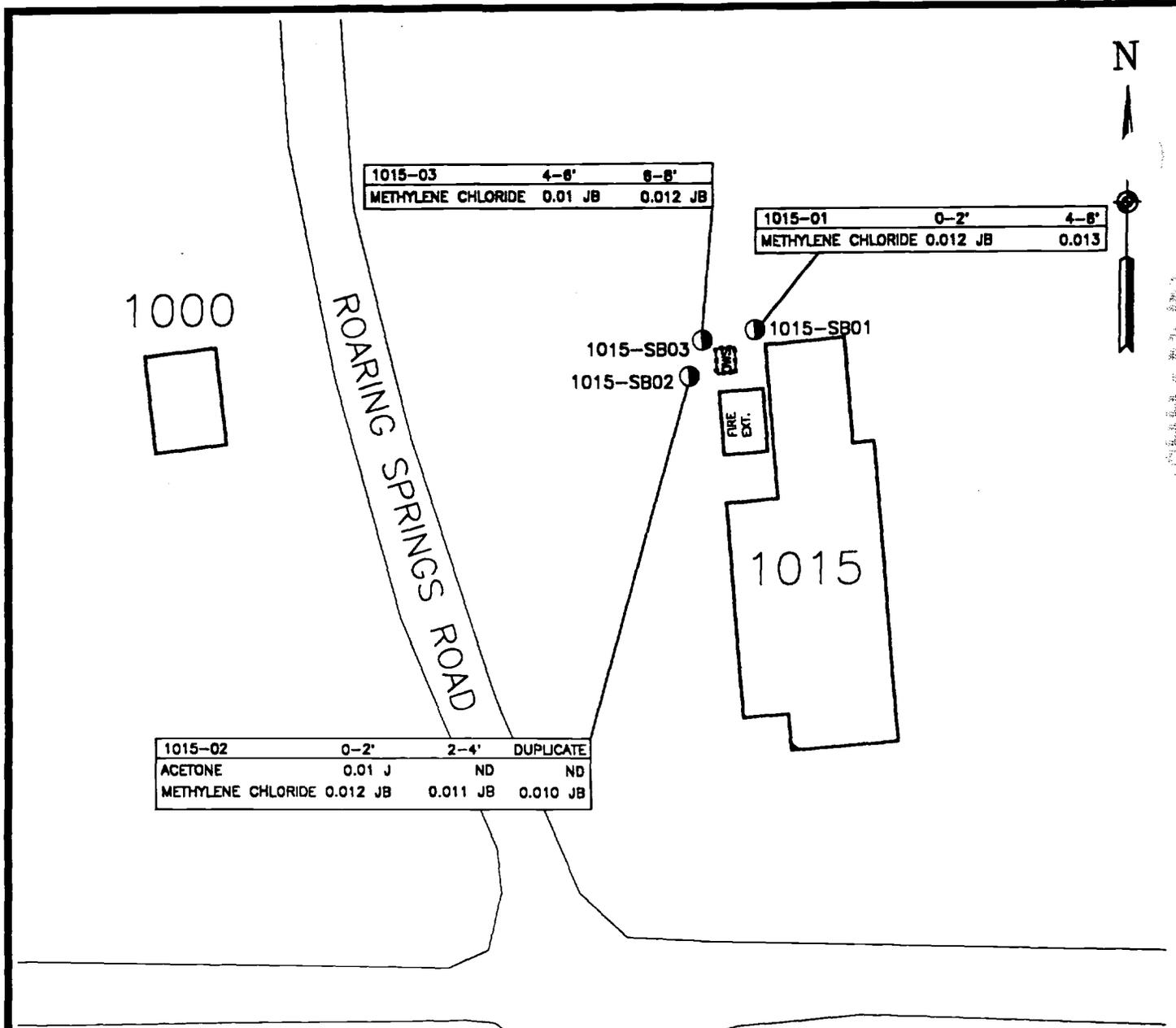
TABLE 10-2

POSITIVE RESULTS - SOIL SAMPLES
 BUILDING 1015
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

PARAMETER	101501SBA	101501SBC	101502SBA	101502SBB	101503SBC	101503SBD
Sample Date:	04/22/94	04/22/94	04/22/94	04/22/94	04/22/94	04/22/94
Depth:	0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	6-8 ft
	Sample	Duplicate				
Metals (SW6010/SW3050) (mg/kg)						
ALUMINUM	5100	7600	19000	14000	11000	3100
ARSENIC	10	11	4.9	10	8.5	7.4
BARIUM	44	48	140	120 J	67 J	23
BERYLLIUM	<1.5	<1.8	0.69	<1.7	<1.6 JL	<1.6
CADMIUM	1.1	1.2	2.3	1.8	1.5	0.80
CALCIUM	280000	310000	70000	170000 J	240000 J	320000
CHROMIUM, TOTAL	18	8.9	18	15	12	4.6
COBALT	3.4	3.2	5.8	5.3	3.9	2.4
COPPER	17	25	12	17	16	22
IRON	7100	8100	17000	14000 J	1100 J	4400
LEAD	6.3	6.2	14	11	8.0	<3.0
MAGNESIUM	3000	3600	2600	300 J	3200 J	3200
MANGANESE	260	200	240	240	210	170
NICKEL	6.0	7.0	13	10	9.3	4.7
POTASSIUM	700	1100	1900	1800	1500	540
SODIUM	210	190	110	150	200	280
VANADIUM	8.9	15	30	2.4 J	14 J	<8.0
ZINC	12 JH	26 JH	28 JH	26 JH	23 JH	9.1 JH
Volatile Organics (SW8240/SW5030) (mg/kg)						
ACETONE	<0.011	<0.011	0.01 J	<0.011	<0.011	<0.011
METHYLENE CHLORIDE	0.012 JB	0.013	0.012 JB	0.011 JB	0.010 JB	0.012 JB

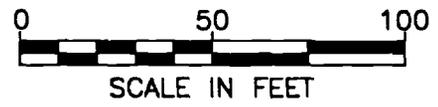
J: Estimated quantification based upon QC data
 JH: Estimated quantification - possibly biased high based upon QC data
 JL: Estimated quantification - possibly biased low based upon QC data
 JB: Estimated quantification - possibly biased high or false positive based upon blank data

PREPARED/DATE: CDH/27 Aug 94
 CHECKED/DATE: LWC/29 Aug 94



LEGEND:

- OWS OIL/WATER SEPARATOR
- SOIL BORING LOCATION
- ND NOT DETECTED
- J ESTIMATED QUANTITATION BASED UPON QC DATA
- JB ESTIMATED QUANTITATION: POSSIBLE BIASED HIGH OR FALSE POSITIVE BASED UPON BLANK DATA

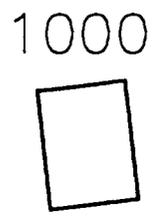


UNITED STATES AIR FORCE		
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT		
POSITIVE ANALYTICAL RESULTS VOLATILE ORGANICS (mg/kg)		
BUILDING 1015		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 10-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 Aug 95		FILE NAME: bldg1015.dwg

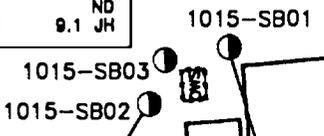
10-7



1015-03	4-8'	6-8'
ALUMINUM	3600	3100
ARSENIC	8.7	7.4
BARIUM	26	23
BERYLLIUM	ND	ND
CADMIUM	0.85	0.80
CALCIUM	340000	320000
CHROMIUM	5.4	4.8
COBALT	2.5	2.4
COPPER	22	22
IRON	5900	4400
LEAD	5.1	ND
MAGNESIUM	3300	3200
MANGANESE	190	170
NICKEL	4.7	4.7
POTASSIUM	6100	540
SODIUM	340	280
VANADIUM	10	ND
ZINC	12 JH	9.1 JH



ROARING SPRINGS ROAD

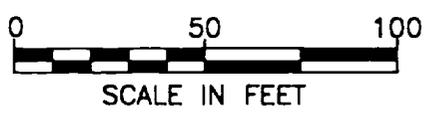


1015-01	0-2'	4-6'
ALUMINUM	5100	7600
ARSENIC	10	11
BARIUM	44	48
CADMIUM	1.1	1.2
CALCIUM	280000	310000
CHROMIUM	18	8.9
COBALT	3.4	3.2
COPPER	17	25
IRON	7100	8100
LEAD	6.3	6.2
MAGNESIUM	3000	3600
MANGANESE	260	200
NICKEL	6.0	7.0
POTASSIUM	700	1100
SODIUM	210	190
VANADIUM	8.9	15
ZINC	12 JH	26 JH

1015-02	0-2'	2-4'	DUPLICATE
ALUMINUM	19000	14000	11000
ARSENIC	4.9	10	8.5
BARIUM	140	120 J	67 J
BERYLLIUM	0.89	ND	ND
CADMIUM	2.3	1.8	1.5
CALCIUM	70000	170000 J	240000 J
CHROMIUM	18	15	12
COBALT	5.8	5.3	3.8
COPPER	12	17	16
IRON	17000	14000 J	1100 J
LEAD	14	11	8.0
MAGNESIUM	2600	300 J	3200 J
MANGANESE	240	240	210
NICKEL	13	10	9.3
POTASSIUM	1900	1800	1500
SODIUM	110	150	200
VANADIUM	30	2.4 J	14 J
ZINC	28 JH	26 JH	23 JH

LEGEND:

-  OIL/WATER SEPARATOR
-  SOIL BORING LOCATION
- ND NOT DETECTED
- J ESTIMATED QUANTITATION BASED UPON QC DATA
- JH ESTIMATED QUANTITATION-POSSIBLY BIASED HIGH BASED UPON QC DATA



<p><u>UNITED STATES AIR FORCE</u> NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS</p>		
<p>OIL/WATER SEPARATOR ASSESSMENT POSITIVE ANALYTICAL RESULTS METALS (mg/kg) BUILDING 1015</p>		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 10-3	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TOM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1015.dwg

TABLE 10-3A

**SURFACE SOIL CONCENTRATIONS COMPARED TO INDUSTRIAL MSCs AND AMBIENT CONCENTRATIONS
BUILDING 1015
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas**

	101501SBA	101502SBA	* MSCs		Surface Soil Background Range (a) (mg/kg)	Ambient Concentrations for the Western U.S. (b) (mg/kg)
	04/22/94 0-2 ft (mg/kg)	04/22/94 0-2 ft (mg/kg)	GWP-Ind (mg/kg)	SAI-Ind (mg/kg)		
Metals :						
Aluminum	5,100	19,000	--	--	6,600 - 16,000	5,000 - 100,000
Arsenic	10	4.9	5	3.27	3.7 - 5.3	<0.10 - 97
Barium	44	140	200	137,000	62 - 130	70 - 5,000
Beryllium	<1.5	0.69			0.52 - 0.87	<1 - 15
Cadmium	1.1	2.3			1.2 - 4.4	1 - 10 (c)
Calcium	280,000	70,000	--	--	6,200 - 190,000	600 - 320,000
Chromium (total)	18	18			6.6 - 18	3 - 2,000
Cobalt	3.4	5.6			2.2 - 6.3	<3 - 50
Copper	17	12			6.6 - 21	2 - 300
Iron	7,100	17,000			6,000 - 17,000	1,000 - >100,000
Lead	6.3	14			6.1 - 16	<10 - 700
Magnesium	3,000	2,600	--	--	1,200 - 1,900	300 - >100,000
Manganese	260	240			106 - 250	30 - 5,000
Nickel	6.0	13	10	20,400	4.7 - 12	<5 - 700
Potassium	700	1,900	--	--	750 - 1,400	1,900 - 63,000
Sodium	210	110	--	--	36 - 120	500 - 100,000
Vanadium	6.9	30			13 - 37	7 - 500
Zinc	12 JH	28 JH	--	--	10 - 26	10 - 2,100
Volatile Organics :						
Acetone	<0.011	0.01 J	1,020	4,160	<0.012	

GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration

SAI-Ind: Industrial Soil/Air and Ingestion Standard

(a) Background data collected from three locations throughout the base

(b) USGS, 1984

(c) USGS, 1975

JH: Estimated quantitation - possibly biased high based upon QC data

MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)

--: no data available

Boxes: Value exceeds maximum surface soil background concentration

Bold: Value exceeds GWP-Ind MSC

Italics: Value exceeds SAI-Ind MSC

J: Estimated quantitation based upon QC data

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/27 Aug 94

CHECKED/DATE: JRF/2 Nov 95

addition, these ten metal concentrations were compared to USGS data for metals detected in surface soils under ambient conditions in the western United States (USGS, 1984). All fell within the expected range for ambient conditions.

Due to the exceedances of maximum surface soil background concentrations, the analytical results for the ten metals were compared to the GWP-Ind and SAI-Ind MSCs (Table 10-3A). This comparison showed that the GWP-Ind and the SAI-Ind MSCs for arsenic were exceeded in surface soil sample 101501SBA taken to the northeast of the oil/water separator. The GWP-Ind MSC for nickel was exceeded in surface soil sample 101502SBA. Barium is the only other metal that has MSCs; the remaining seven metals do not have MSCs for comparison. Therefore, arsenic and nickel were the only metals detected in the surface soils at the site to exceed Standard Number 2 MSCs.

Acetone was the only VOC detected above its PQL. The concentration of acetone detected was below both its maximum background concentration and GWP-Ind and SAI-Ind MSCs. Therefore, surface soils are in compliance with Risk Reduction Standards 1 and 2 for VOCs.

Subsurface - The analytical results for the subsurface soil samples were first compared to the subsurface soil background concentration range for the base. Aluminum, calcium, chromium, magnesium, potassium, and sodium exceeded their maximum subsurface soil background concentrations (Table 10-3B). All other metals were below or within their background ranges. Due to these exceedances the analytical results for these metals were compared to the GWP-Ind MSC (Table 10-3B). This comparison indicated that the GWP-Ind MSC for chromium was exceeded in subsurface soil sample 101502SBB taken to the northwest of the oil/water separator (2 to 4 feet). None of the other metals have MSCs for comparison. Therefore, chromium was the only metal detected in the subsurface soils at the site to exceed its Standard Number 2 MSC.

TABLE 10-3B
 SUBSURFACE SOIL CONCENTRATIONS COMPARED TO AN INDUSTRIAL MSC AND BACKGROUND CONCENTRATIONS
 BUILDING 1015
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

	101501SBC 04/22/94 4-6 ft (mg/kg)	101502SBB 04/22/94 2-4 ft (mg/kg)	101503SBC 04/22/94 4-6 ft (mg/kg)	101505BD 04/22/94 6-8 ft (mg/kg)	MSC GWP-Ind (mg/kg)	Subsurface Soil Background Range (a) (mg/kg)
Metals :						
Aluminum	7,600	14,000	3,600	3,100	--	350 - 13,000
Arsenic	11	10	8.7	7.4	--	<3.4 - 12
Barium	48	120 J	26	23	--	4.9 - 130
Cadmium	1.2	1.8	0.85	0.80	--	<0.34 - 6.8
Calcium	310,000	240,000 J	340,000	320,000	--	350 JH - 210,000 JH
Chromium (total)	8.9	15	5.4	4.6	10	<0.67 - 13
Cobalt	3.2	5.3	2.5	2.4	--	<1.1 - 7.6
Copper	25	17	22	22	--	5.0 - 66
Iron	8,100	14,000	5,900	4,400	--	543 - 24,000
Lead	6.2	11	5.1	<3.0	--	<3.1 - 88
Magnesium	3,600	3,200 J	3,300	3,200	--	65 - 3,100
Manganese	200	240	190	170	--	1.8 - 920
Nickel	7.0	10	4.7	4.7	--	<2.1 - 15
Potassium	1,100	1,800	6,100	540	--	90 - 2,200
Sodium	190	200	340	280	--	<15 - 260
Vanadium	15	14 J	10	<8.0	--	1 - 29
Zinc	26 JH	26 JH	12 JH	9.1 JH	--	1.2 - 54
Volatile Organics :						
Acetone	<0.011	<0.011	<0.01	<0.011	1,020	<0.012 - 0.023
Methylene Chloride	0.013	0.011 JB	0.01 JB	0.012 JB	0.5	0.0092 - 0.020

(a) Background data collected from five locations throughout the base
 GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration
 MSC: Medium-Specific Concentration
 J: Estimated quantitation based upon QC data
 JB: Estimated quantitation - possibly biased based upon blank contamination
 JH: Estimated quantitation - possibly biased high based upon QC data
 Boxes: Value exceeds maximum subsurface soil background concentration
 Bold: Value exceeds GWP-Ind MSC
 --: No data available
 Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/14 Sep 94
 CHECKED/DATE: JRF/2 Nov 95

Methylene chloride and acetone were the only VOCs detected above their PQLs. The concentrations of both methylene chloride and acetone detected were below their maximum background concentrations and GWP-Ind MSCs. Therefore, subsurface soils were in compliance with Risk Reduction Standards 1 and 2 for VOCs.

Risk Evaluation Summary - The analytical results for surface and subsurface soil were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 1015 is now, and is expected to continue to be, entirely industrial. Based upon the results of this comparison, the following conclusions were drawn:

- VOCs were detected in surface and subsurface soil samples. However, the detected concentrations did not exceed the Risk Reduction Standard Number 1 or 2. Therefore, soils were in compliance with the standard for these analytes.
- The concentrations of ten metals in the surface soil sample exceeded their maximum surface soil background concentrations. However, comparison of these metals to Risk Reduction Standard Number 2 MSCs indicated that only arsenic exceeded both its MSCs, and nickel exceeded its GWP-Ind MSC. The concentrations of six metals detected in all four of the subsurface soil samples exceeded their maximum subsurface soil background concentrations. However, comparison of these metals to the appropriate Risk Reduction Standard Number 2 MSC indicated that only chromium exceeded its MSC.
- No other constituents were detected in soil samples.

An analysis of the findings from this study indicated that there was an exceedance of GWP-Ind and SAI-Ind MSCs by arsenic in surface soils. Nickel also exceeded the GWP-Ind MSC in a surface soil sample. Chromium exceeded the GWP-Ind MSC in a subsurface sample.

10.6 SUMMARY

NAS Fort Worth has not reported any problems associated with the Building 1015 oil/water separator and visual observations did not indicate any apparent problems associated with the integrity of the separator unit. The oil/water separator appears to be operational, and as long as the operation and material usage of Building 1015 remain similar to when the separator was installed, there should not be a problem.

Soil samples collected from soil borings around the perimeter of the oil/water separator did detect surface contamination above GWP-Ind and SAI-Ind MSCs for arsenic, and nickel was detected above its GWP-Ind MSC. Chromium exceeded the GWP-Ind MSC in one subsurface sample. The metals contamination in soils may be from oil/water separator overflows or from surface run off. The soil data support visual observations that indicate the structure of the separator is intact and there are no recurring releases to the environment.

11.0 BOMB ASSEMBLY BUILDING (BUILDING 4210)

11.1 SITE DESCRIPTION

The Bomb Assembly Building (Building 4210) is located within the flight line area adjacent to the north-south taxiway (Figure 1-2). The oil/water separator, adjacent to Building 4210, operates by gravity flow and is a below ground, reinforced concrete vault near the ground surface with a capacity of 3,500 gallons. The separator unit was installed to service wastewater from Building 4210.

11.2 SITE-SPECIFIC INVESTIGATIVE ACTIVITIES

The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Subsequently, four soil borings (4210-SB01 through 4210-SB04) were advanced near the perimeter of the oil/water separator (Figure 11-1). The depths of the borings ranged from 14 feet (borings 4210-SB01, 4210-SB03, and 4210-SB04) to 16 feet (boring 4210-SB02) below the ground surface.

11.3 SITE-SPECIFIC GEOLOGY

The soil borings encountered sandy to very sandy silts and clays, and silty to clayey sands (Table 11-1). Ground water was not encountered within the soil borings at this location. Evidence of a release from the oil/water separator was not detected during the soil sampling activities.

BUILDING 4210



PAVED ROAD

4210-SB01

4210-SB02

BUILDING



4208

4210-SB04

4210-SB03

TAXIWAY C 190

LEGEND:



OIL/WATER SEPARATOR



SOIL BORING LOCATION

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
FORT WORTH, TEXAS

OIL/WATER SEPARATOR ASSESSMENT

SOIL BORING LOCATION
OIL/WATER SEPARATOR

BUILDING 4210

PREPARED BY/DATE:
TDM 26 AUG 94

CHECKED BY/DATE:
JFO 2 SEPT 94

APPROVED BY/DATE:
EPA 9 SEPT 94

FIGURE
NUMBER:

11-1

FILE DATE: 20.JANUARY.94

PLOT DATE: 17.AUG.95

FILE NAME: bldg4208.dwg

TABLE 11-1

**BOMB ASSEMBLY BUILDING (BUILDING 4210)
SOIL DESCRIPTION
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas**

Location: Bomb Assembly Building (Building 4210)
Bottom Depth of Oil/Water Separator: 12 ft

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
4210-SB01	14	0-14	sandy to very sandy silt to clay	--	10-12 12-14
4210-SB02	16	0-4 4-8 8-10.5 10.5-12 12-16	silty to clayey fine sand with gravel sandy silt to clay silty fine sand very silty to very clayey fine sand very sandy silt to clay	--	4-6 14-16
4210-SB03	14	0-2 2-6 6-7 7-9 9-10 10-14	silty fine to medium sand very silty to clayey fine to coarse sand sandy silt to clay silty fine to coarse sand silty sandy fine gravel sandy silt to clay	--	4-6 12-14
4210-SB04	14	0-2 2-8 8-10 10-12 12-14	sandy silt to clay with gravel silty to clayey fine sand sandy silt to clay very silty to very clayey fine to coarse sand sandy silt to clay	--	10-12 12-14

Note:

(ft) : feet
-- : Ground water not observed in boring
See Figure 11-1 for boring locations.

PREPARED/DATE: TDM/2 Sep 94
CHECKED/DATE: JFO/2 Sep 94

11-3

11.4 CHEMICAL ANALYTICAL RESULTS

Eight subsurface soil samples were collected for off-site chemical analysis. No surface soil samples were collected from this site. A duplicate sample was collected from soil boring 4210-04SB. Positive analytical results are presented in Table 11-2. Sample locations, with VOCs and metals concentrations detected at each soil boring, are detailed on Figures 11-2 and 11-3, respectively.

Acetone was detected at low concentrations in subsurface samples 4210-01SBG (0.021 mg/kg) and 4210-03SBC (0.034 mg/kg). Methylene chloride was detected in all soil samples collected at Building 4210; however, all methylene chloride results are qualified.

The detected concentrations of arsenic, beryllium, chromium, cobalt, nickel, and vanadium concentrations were above the background concentrations.

11.5 RISK EVALUATION

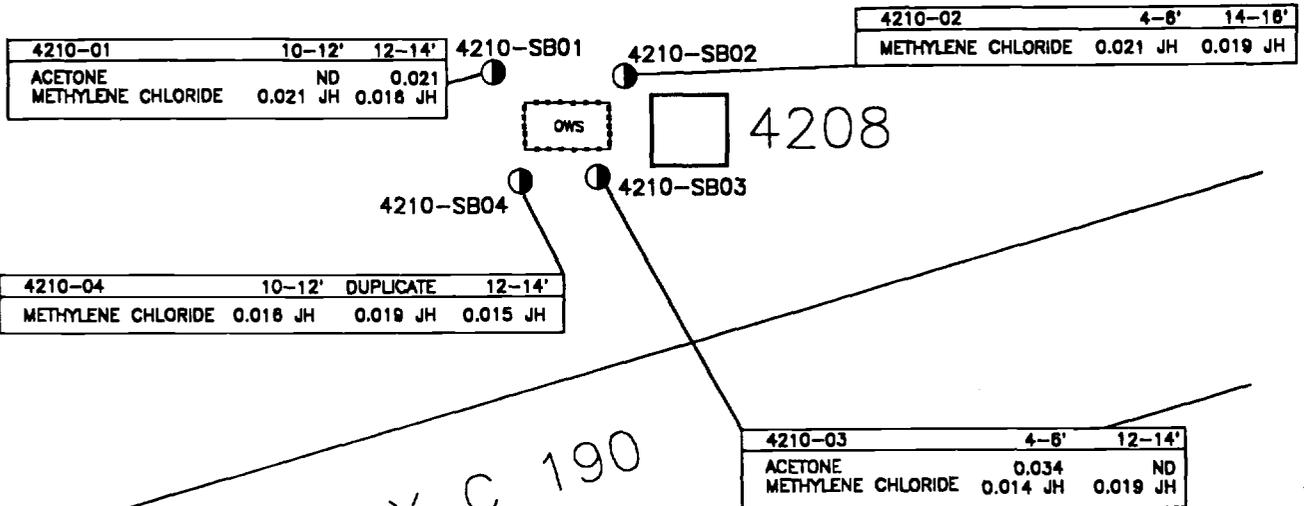
Subsurface - The analytical results for the subsurface soil samples were first compared to the subsurface soil background concentration range for the base. Six metals exceeded their maximum subsurface soil background concentration (Table 11-3A). All other metals were below or within their background ranges. Due to these exceedances, the analytical results for these six metals were compared to the GWP-Ind MSC (Table 11-3A). This comparison indicated that the GWP-Ind MSCs for arsenic, beryllium, chromium, and nickel were exceeded in six of the subsurface soil samples taken from all four borings around the oil/water separator at depths ranging from 4 to 6 and 12 to 14 feet. None of the other metals have MSCs for comparison. Therefore, arsenic, beryllium, chromium, and nickel were the only metals detected in the subsurface soils at the site to exceed their Standard Number 2 MSCs.

BUILDING 4210

N



PAVED ROAD



TAXIWAY C 190

LEGEND:

- OWS OIL/WATER SEPARATOR
- SOIL BORING LOCATION
- ND NOT DETECTED
- JH ESTIMATED QUANTITATION-POSSIBLY BIASED HIGH BASED UPON QC DATA

SCALE: NOT TO SCALE

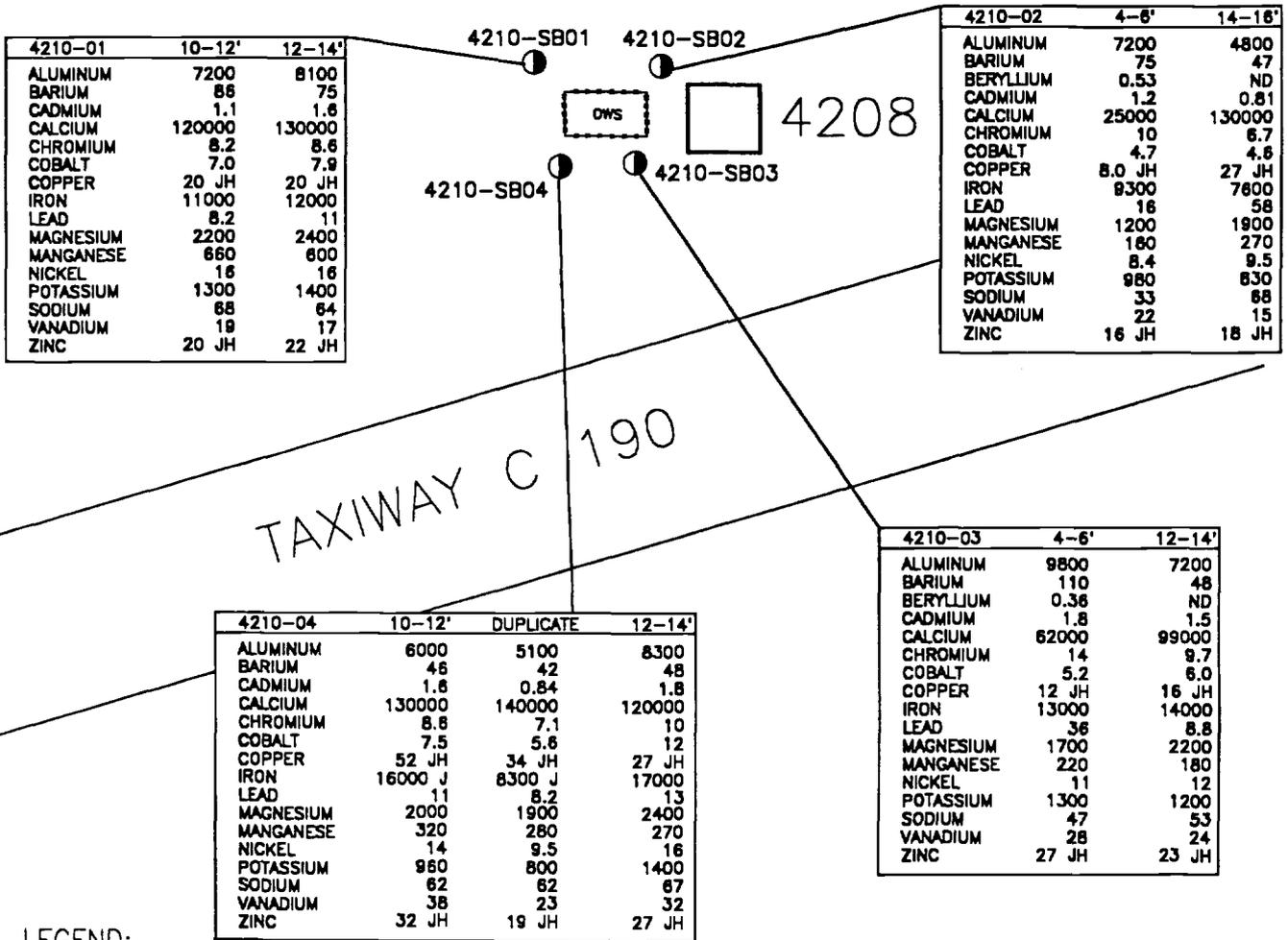
UNITED STATES AIR FORCE		
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT		
POSITIVE ANALYTICAL RESULTS VOLATILE ORGANICS (mg/kg)		
BUILDING 4210		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 11-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg4208.dwg

BUILDING 4210

N



PAVED ROAD



LEGEND:

- OWS OIL/WATER SEPARATOR
- SOIL BORING LOCATION
- ND NOT DETECTED
- JH ESTIMATED QUANTITATION—POSSIBLY BIASED HIGH BASED UPON QC DATA

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE
 NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
 FORT WORTH, TEXAS

OIL/WATER SEPARATOR ASSESSMENT

POSITIVE ANALYTICAL RESULTS
 METALS (mg/kg)

BUILDING 4210

PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 11-3	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg4208.dwg

TABLE 11-3A

SUBSURFACE SOIL CONCENTRATIONS COMPARED TO AN INDUSTRIAL MSC AND BACKGROUND CONCENTRATIONS

NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

	421001SBF 04/21/94 10-12 ft (mg/kg)	421001SBG 04/21/94 12-14 ft (mg/kg)	421002SBC 04/21/94 4-6 ft (mg/kg)	421002SBH 04/21/94 14-16 ft (mg/kg)	421003SBC 04/21/94 4-6 ft (mg/kg)	421003SBG 04/21/94 12-14 ft (mg/kg)	421004SBF 04/21/94 10-12 ft (mg/kg)	421004SBG 04/21/94 12-14 ft (mg/kg)	MSC GWP-Ind (mg/kg)	Subsurface Soil Background Range (a) (mg/kg)
Metals :										
Aluminum	7,200	8,100	7,200	4,800	9,900	7,200	6,000	8,300	5	350 - 13,000
Arsenic	13	14	<3.7	11	6	8.2	18	19		<3.4 - 12
Barium	86	75	75	47	110	48	46	48		4.9 - 130
Beryllium	<1.6	<1.7	0.53	<1.6	0.36	<1.7	<1.7	<1.8	0.4	<0.16 - 0.42
Cadmium	1.1	1.6	1.2	0.81	1.8	1.5	1.6	1.8		<0.34 - 6.8
Calcium	120,000	130,000	25,000	130,000	82,000	99,000	140,000	120,000		350 JH - 210,000 JH
Chromium (total)	8.2	8.6	10	6.7	14	9.7	8.6	10	10	<0.67 - 13
Cobalt	7.0	7.9	4.7	4.6	5.2	6.0	7.5	12	--	<1.1 - 7.6
Copper	20 JH	20 JH	8.0 JH	27 JH	12 JH	16 JH	52 JH	27 JH	--	5.0 - 66
Iron	11,000	12,000	9,300	7,800	13,000	14,000	16,000 J	17,000	1.5	543 - 24,000
Lead	8.2	11	16	58	36	8.8	11	13		<3.1 - 88
Magnesium	2,200	2,400	1,200	1,900	1,700	2,200	2,000	2,400		65 - 3,100
Manganese	660	600	160	270	220	180	320	270		1.8 - 920
Nickel	16	16	8.4	9.5	11	12	14	16	10	<2.1 - 15
Potassium	1,300	1,400	980	830	1,300	1,200	960	1,400		90 - 2,200
Sodium	68	64	33	68	47	53	62	67	--	15 - 260
Vanadium	19	17	22	15	28	24	38	32		1 - 29
Zinc	20 JH	22 JH	16 JH	18 JH	27 JH	23 JH	32 JH	27 JH		1.2 - 54
Volatile Organics :										
Acetone	<0.012	0.021	<0.012	<0.012	0.034	<0.012	<0.012	<0.012	1,020	<0.012 - 0.023
Methylene Chloride	0.021 JH	0.016 JH	0.021 JH	0.019 JH	0.014 JH	0.019 JH	0.019 JH	0.015 JH	0.5	0.062 - 0.020

GWP-Ind - Industrial Soil - to - Groundwater Crossmedia Protection Concentration
 JH: Estimated quantitation - possibly biased high based upon QC data
 MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)
 (a) Background data collected from five locations throughout the base
 Boxes: Value exceeds maximum subsurface soil background concentration
 Bold: Value exceeds GWP-Ind MSC
 --: No data available

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/14 Sep 94
 CHECKED/DATE: JRF/2 Nov 95

Methylene chloride and acetone were the only VOCs detected above their PQLs. The concentrations of methylene chloride detected in two of the subsurface samples exceeded the maximum concentration that was detected in background samples. The concentration of acetone detected in one subsurface soil sample exceeded the maximum concentration in the background samples. The concentrations of both methylene chloride and acetone detected were below their GWP-Ind MSCs. Therefore, subsurface soils were in compliance with Risk Reduction Standard 2 for VOCs.

Risk Evaluation Summary - The analytical results for subsurface soils were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 4210 is now, and is expected to continue to be, entirely industrial. Based upon the results of this comparison, the following conclusions were drawn:

- VOCs were detected in subsurface soil samples. Methylene chloride and acetone concentrations exceeded the maximum soil background concentrations. A comparison of VOCs to Risk Reduction Standard Number 2 MSCs indicated that subsurface soils were in compliance with Standard Number 2 for these analytes.
- The concentrations of six metals detected in six of the eight subsurface soil samples exceeded their maximum subsurface soil background concentrations. However, comparison of these metals to the appropriate Risk Reduction Standard Number 2 MSC indicates that only arsenic, beryllium, chromium, and nickel exceeded their MSCs.
- No other constituents were detected in soil samples.

An analysis of the findings from this study indicated that there was an exceedance of GWP-Ind MSCs by arsenic, beryllium, chromium, and nickel in subsurface soils. These exceedances occur at all four boring locations.

11.6 SITE CONCLUSION

Building 4210 is currently inactive. Visual observations indicated no apparent deficiencies in the structural integrity of the separator unit. NAS Fort Worth maintenance records did not indicate problems with this oil/water separator. Subsurface soil samples collected between the 4- and 12-foot depth were found to contain metals (arsenic, beryllium, nickel, and chromium) at concentrations above GWP-Ind MSCs. The presence of these metals at depths as great as 12 feet could indicate that the oil/water separator has a leak resulting in the release of contaminants into the subsurface soils. However, due to the sandy soils and gravels, the contaminants could have migrated to a depth as great as 12 feet during past overflow conditions when effluent could have been released into adjacent soils.

12.0 GENERAL MAINTENANCE BUILDING (BUILDING 1414, SWMU NO. 41)

12.1 SITE DESCRIPTION

The General Maintenance Building (Building 1414) is located within the eastern portion of the flight line area (Figure 1-2). The oil/water separator, adjacent to Building 1414, is a below ground concrete vault, located immediately beneath the concrete runway apron, with 1,000-gallon capacity. The separator operates by gravity flow. Drawings of Building 1414 indicate that the separator unit was installed in 1970 to service Building 1414 operations.

12.2 SITE-SPECIFIC INVESTIGATIVE ACTIVITIES

The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Subsequently, three soil borings (1414-SB01 through 1414-SB03) were advanced near the perimeter of the oil/water separator (Figure 12-1). Each boring was advanced to approximately 9 feet below the ground surface.

12.3 SITE-SPECIFIC GEOLOGY

The soils encountered were a mixture of sand, silt, and clay (Table 12-1). Ground water was not encountered within the borings. Evidence of a release from the oil/water separator was not detected during the soil sampling activities.



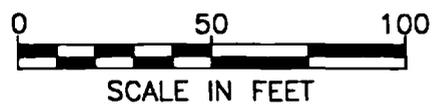
1414

1414-SB01
1414-SB03
1414-SB02

LEGEND:

- OWS OIL/WATER SEPARATOR
- SOIL BORING LOCATION

NOTE: SOIL BORING LOCATIONS
REQUIRED CONCRETE CORING



UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT SOIL BORING LOCATION OIL/WATER SEPARATOR BUILDING 1414		
PREPARED BY/DATE: TDM 26 AUG 94	FIGURE NUMBER: 12-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: JFO 2 SEPT 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: [Signature] 9 SEPT 94		FILE NAME: bldg1414.dwg

TABLE 12-1

**GENERATOR MAINTENANCE BUILDING (BUILDING 1414)
SOIL DESCRIPTION
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas**

Location: Generator Maintenance Building (Building 1414)
Bottom Depth of Oil/Water Separator: 6 ft

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
1414-SB01	9	0-1	concrete	--	1-3
		1-3	sandy silt to clay		7-9
		3-9	silty to clayey fine to coarse sand		
1414-SB02	9	0-1	concrete	--	3-5
		1-7	silty to clayey fine to coarse sand		7-9
		7-9	slightly sandy silt		
1414-SB03	9	0-1	concrete	--	1-3
		1-7	silty to clayey fine to coarse sand		7-9
		7-9	silty to clayey fine to coarse sand with gravel		

Note:

(ft) : feet

--: Ground water not observed in boring

See Figure 12-1 for boring location.

PREPARED/DATE: TDM/2 Sep 94
CHECKED/DATE: JFO/2 Sep 94

001414-141400

12.4 CHEMICAL ANALYTICAL RESULTS

Six subsurface samples were collected for off-site chemical analysis. No surface samples were obtained. Positive analytical results are presented in Table 12-2. Sample locations, with VOCs and metals concentrations detected at each soil boring, are detailed on Figures 12-2 and 12-3, respectively.

Acetone was detected in soil boring DP17-02SBB (3 to 5 feet) and in soil boring DP17-03SBA (1 to 3 feet) at concentrations of 0.066 mg/kg and 0.038 mg/kg, respectively. Methylene chloride was detected in all soil samples collected at concentrations ranging from 0.018 mg/kg to 0.022 mg/kg.

Of the metals found, barium, beryllium, calcium, cobalt, nickel, and sodium were detected above background concentrations.

12.5 RISK EVALUATION

Subsurface - The analytical results for the subsurface soil samples were first compared to the subsurface soil background concentration range for the base. It can be seen on Table 12-3A that six metals (i.e., barium, beryllium, calcium, cobalt, nickel, and sodium) exceed their maximum subsurface soil background concentrations. All other metals were below or within their background ranges. Due to these background exceedances, the analytical results for these six metals were compared to the GWP-Ind MSC (Table 12-3A). This comparison showed that the GWP-Ind MSCs for beryllium and nickel were exceeded in three of the subsurface soil samples, DP1701SBA, DP1702SBB, and DP1703SBA, at depths ranging from 1 to 3 and 3 to 5 feet. Barium was the only other metal that had an MSC for comparison. Therefore, beryllium and nickel were the only metals detected in the subsurface soils at the site to exceed their Standard Number 2 MSCs.

TABLE 12-2

POSITIVE RESULTS - SOIL SAMPLES
 BUILDING 1414
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

PARAMETER	DPI1701SBA 04/24/94 1-3 ft	DPI1701SBD 04/24/94 7-9 ft	DPI1702SBB 04/24/94 3-5 ft	DPI1702SBD 04/24/94 7-9 ft	DPI1703SBA 04/24/94 1-3 ft	DPI1703SBD 04/24/94 7-9 ft
<u>Metals (SW6010/SW3050) (mg/kg)</u>						
ALUMINUM	7700	9900	11000	5600	6800	12000
ARSENIC	8.7	<3.3	<3.5	11	4.1	9.7
BARIUM	86	150	67	34	88	38
BERYLLIUM	0.73	0.39	0.75	<1.6	0.7	<1.7
CADMIUM	2.2	1.3	1.2	1.2	1.4	1.6
CALCIUM	12000 JH	46000 JH	4600 JH	22000 JH	5200 JH	20000 JH
CHROMIUM, TOTAL	8.6	9.4	10	6.5	8.1	9.5
COBALT	16	4.8	6.1	2.8	7.7	6.1
COPPER	7.9	8.0	5.2	17	9.9	18
IRON	16000 JH	9400 JH	11000 JH	6800 JH	8100 JH	12000 JH
LEAD	51	11	13	6.6	11	8.0
MAGNESIUM	1200	2000	1300	270	1100	3100
MANGANESE	430	190	170	23	110	500
NICKEL	16	11	9.6	7.4	10	11
POTASSIUM	820	1100	740	910	700	1400
SODIUM	270	490	480	320	200	460
VANADIUM	25	16	16	13	17	22
ZINC	13 JH	16 JH	12 JH	12 JH	13 JH	19 JH
<u>Volatile Organics (SW8240/SW5030) (mg/kg)</u>						
ACETONE	<0.012	<0.012	0.066	<0.011	0.038	<0.011
METHYLENE CHLORIDE	0.019	0.021	0.018	0.02	0.022	0.018

JH: Estimated quantitation - possibly biased high based upon QC data

PREPARED/DATE: DR/J2 Sep 94
 CHECKED/DATE: JFO/J2 Sep 94



1414

DP17-01	1-3'	7-9'
METHYLENE CHLORIDE	0.019	0.021

DP17-03	1-3'	7-9'
ACETONE	0.038	ND
METHYLENE CHLORIDE	0.022	0.018

DP17-02	3-5'	7-9'
ACETONE	0.068	ND
METHYLENE CHLORIDE	0.018	0.02

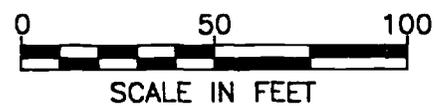
1414-SB01

1414-SB03

1414-SB02

LEGEND:

-  OIL/WATER SEPARATOR
-  SOIL BORING LOCATION
- ND NOT DETECTED



UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT		
POSITIVE ANALYTICAL RESULTS VOLATILE ORGANICS (mg/kg)		
BUILDING 1414		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 12-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1414.dwg



DP17-01	1-3'	7-9'
ALUMINUM	7700	9900
ARSENIC	8.7	ND
BARIUM	88	150
BERYLLIUM	0.73	0.39
CADMIUM	2.2	1.3
CALCIUM	12000 JH	46000 JH
CHROMIUM	8.6	9.4
COBALT	16	4.8
COPPER	7.9	8.0
IRON	16000 JH	9400 JH
LEAD	51	11
MAGNESIUM	1200	2000
MANGANESE	430	190
NICKEL	16	11
POTASSIUM	820	1100
SODIUM	270	490
VANADIUM	25	16
ZINC	13 JH	16 JH

1414

DP17-03	1-3'	7-9'
ALUMINUM	6800	12000
ARSENIC	4.1	9.7
BARIUM	88	38
BERYLLIUM	0.7	ND
CADMIUM	1.4	1.6
CALCIUM	5200 JH	200000 JH
CHROMIUM	8.1	9.5
COBALT	7.7	6.1
COPPER	9.9	18
IRON	8100 JH	12000 JH
LEAD	11	8.0
MAGNESIUM	1100	3100
MANGANESE	110	500
NICKEL	10	11
POTASSIUM	700	1400
SODIUM	200	460
VANADIUM	17	22
ZINC	13 JH	19 JH

DP17-02	3-5'	7-9'
ALUMINUM	11000	5600
ARSENIC	ND	11
BARIUM	67	34
BERYLLIUM	0.75	ND
CADMIUM	1.2	1.2
CALCIUM	4600 JH	220000 JH
CHROMIUM	10	6.5
COBALT	6.1	2.8
COPPER	5.2	17
IRON	11000 JH	8800 JH
LEAD	13	6.6
MAGNESIUM	1300	270
MANGANESE	170	23
NICKEL	9.6	7.4
POTASSIUM	740	910
SODIUM	480	320
VANADIUM	16	13
ZINC	12 JH	12 JH

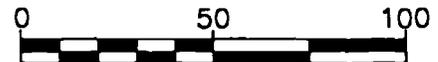
LEGEND:

OIL/WATER SEPARATOR

SOIL BORING LOCATION

ND NOT DETECTED

JH ESTIMATED QUANTITATION-POSSIBLY BIASED HIGH
BASED UPON QC DATA



SCALE IN FEET

UNITED STATES AIR FORCE
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
FORT WORTH, TEXAS

OIL/WATER SEPARATOR ASSESSMENT

POSITIVE ANALYTICAL RESULTS
METALS (mg/kg)

BUILDING 1414

PREPARED BY/DATE:
DRJ 24 AUG 94

CHECKED BY/DATE:
TDM 26 AUG 94

APPROVED BY/DATE:
[Signature] 17 AUG 95

FIGURE
NUMBER:

12-3

FILE DATE: 20.JANUARY.94

PLOT DATE: 17.AUG.95

FILE NAME: bldg1414.dwg

TABLE 12-3A

SUBSURFACE SOIL CONCENTRATIONS COMPARED TO AN INDUSTRIAL MSC AND BACKGROUND CONCENTRATIONS

BUILDING 1414
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

	DP1701SBA 04/24/94 1-3 ft (mg/kg)	DP1702SBB 04/24/94 3-5 ft (mg/kg)	DP1702SBD 04/24/94 7-9 ft (mg/kg)	DP1703SBA 04/24/94 1-3 ft (mg/kg)	DP1703SBD 04/24/94 7-9 ft (mg/kg)	MSC GWP-Ind (mg/kg)	Subsurface Soil Background Range (a) (mg/kg)
Metals :							
Aluminum	7,700	11,000	5,600	6,800	12,000		350 - 13,000
Arsenic	8.7	<3.5	11	4.1	9.7		<3.4 - 12
Barium	86	67	34	88	38	200	4.0 - 130
Beryllium	0.73	0.75	<1.0	0.7	<1.7	0.4	<0.16 - 0.42
Cadmium	2.2	1.2	1.2	1.4	1.6		<0.34 - 6.8
Calcium	12,000 JH	4,600 JH	220,000 JH	5,200 JH	200,000 JH		350 JH - 210,000 JH
Chromium (total)	8.6	10	6.5	8.1	9.5		<0.97 - 13
Cobalt	16	6.1	2.8	7.7	6.1		<1.1 - 7.6
Copper	7.9	5.2	17	9.9	18		5.0 - 66
Iron	51	11,000 JH	6,800 JH	8,100 JH	12,000 JH		543 - 24,000
Lead	1,200	13	6.6	11	8.0		<3.1 - 88
Magnesium	430	1,300	270	1,100	3,100		65 - 3,100
Manganese	16	170	23	110	500	10	1.8 - 920
Nickel	820	9.6	7.4	10	11		<2.1 - 15
Potassium	270	740	910	700	1,400		90 - 2,200
Sodium	25	480	320	200	490		15 - 200
Vanadium	13 JH	16	13	17	22		1 - 29
Zinc		12 JH	12 JH	13 JH	19 JH		1.2 - 54
Volatile Organics :							
Acetone	<0.012	0.068	<0.011	0.038	<0.011	1.020	<0.012 - 0.023
Methylene Chloride	0.019	0.018	0.02	0.022	0.018	0.5	0.062 - 0.020

PREPARED/DATE: CDH/14 Sep 94
CHECKED/DATE: JRF/2 Nov 95

GWP-Ind - Industrial Soil-to-Groundwater Crossmedia Protection Concentration
JH: Estimated quantitation - possibly biased high based upon QC data
MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)
(a) Background data collected from five locations throughout the base
Boxes: Value exceeds maximum subsurface soil background concentration
Bold: Value exceeds GWP-Ind MSC
- -: No data available
Note: Background data are derived from limited data and do not represent a comprehensive background study.

Methylene chloride and acetone were the only VOCs detected above their PQLs. It should be noted that the maximum concentrations of methylene chloride and acetone detected in three of the subsurface samples exceeded the maximum concentrations that were detected in background samples. The concentrations of both methylene chloride and acetone were below their GWP-Ind MSCs. Therefore, subsurface soils were in compliance with Risk Reduction Standard 2 for VOCs.

Risk Evaluation Summary - The analytical results for subsurface soils were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 1414 is now, and is expected to continue to be, entirely industrial. Based upon the results of this comparison, the following conclusions were drawn:

- VOCs were detected in subsurface soil samples. Acetone and methylene chloride concentrations exceeded the maximum soil background concentrations. A comparison of VOCs to Risk Reduction Standard Number 2 MSCs showed that subsurface soils were in compliance with Standard Number 2 for these analytes.
- The concentrations of six metals detected in all six of the subsurface soil samples exceeded their maximum subsurface soil background concentrations. However, on comparing these metals to the appropriate Risk Reduction Standard Number 2 MSC, only beryllium and nickel exceeded their MSCs.
- No other constituents were detected in soil samples.

444 4000

An analysis of the findings from this study indicates that there was an exceedance of GWP-Ind MSCs by beryllium and nickel in subsurface soils. These exceedances occur at all three site boring locations.

12.6 SITE CONCLUSION

Based on visual observations, the separator unit appeared to be intact and free of obvious cracks or other damage. The NAS Fort Worth maintenance personnel and records did not identify this oil/water separator as exhibiting any operational problems or requiring equipment repairs or replacement. Subsurface soil sample analyses from soil collected around the perimeter of the separator were found to contain beryllium and nickel above GWP-Ind MSCs at depths extending to 5 feet. Metals contamination extending to the 5-foot depth could indicate that the oil/water separator may have leaked; however, the metals contamination may be the result of oil/water separator overflows with metal-contaminated effluent migrating through the sandy, gravelly soil to a depth of 5 feet.

13.0 AUTO HOBBY SHOP (BUILDING 1145)

13.1 SITE DESCRIPTION

The Auto Hobby Shop (Building 1145) is located south of the POL Tank Farm on Hobby Shop Road (Figure 1-2). The oil/water separator for Building 1145 is under the concrete pavement adjacent to the building. The oil/water separator unit operates by gravity flow and was installed at Building 1145 to handle engine lubricating oil, brake fluid, grease, and petroleum by-products. The separator unit has a 500-gallon capacity and is connected to a 1,050-gallon, double-walled, underground oil tank. Facility drawings indicate that the separator unit was installed prior to 1982.

13.2 SITE-SPECIFIC INVESTIGATION ACTIVITIES

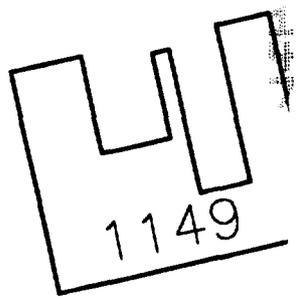
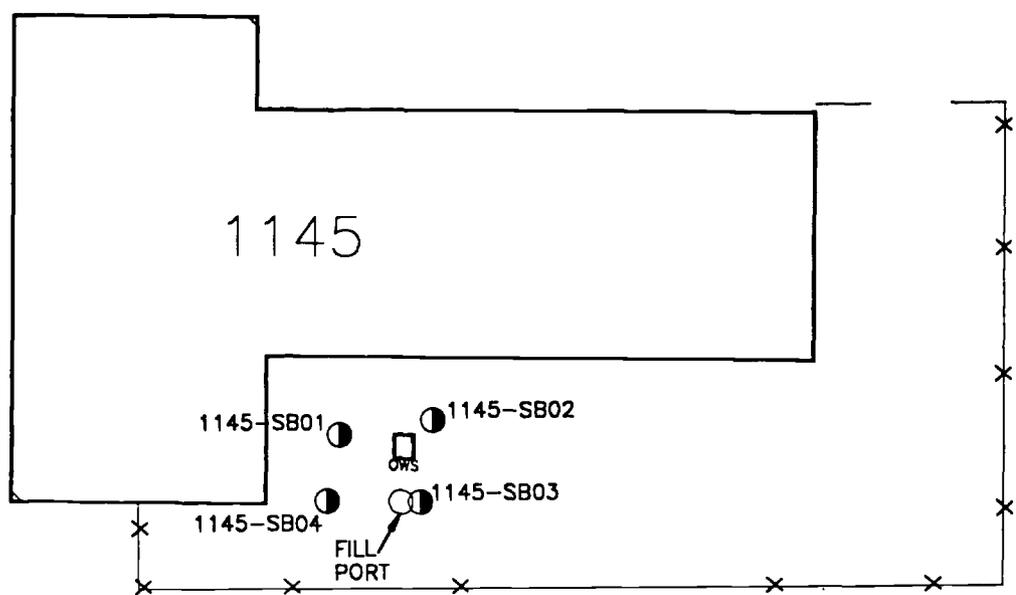
The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Subsequently, four soil borings (1145-SB01 through 1145-SB04) were installed near the perimeter of the oil/water separator (Figure 13-1). Soil boring 1145-SB01 was advanced to a depth of 11 feet below the ground surface, while soil borings 1145-SB02 through 1145-SB04 were advanced to depths of 10 feet.

13.3 SITE-SPECIFIC GEOLOGY

The soil borings encountered silty to clayey fine to coarse sands and gravel, and sandy silt and clay (Table 13-1). Ground water was not detected in the soil borings. Petroleum odors were detected in the soil samples from soil borings 1145-SB01 through 1145-SB03 at the 8- to 10-foot depth intervals.



HOBBYSHOP ROAD



LEGEND:

 OIL/WATER SEPARATOR

 SOIL BORING LOCATION

NOTE: SOIL BORING LOCATIONS SB02, AND SB03 REQUIRED CONCRETE CORING

SCALE: NOT TO SCALE

<u>UNITED STATES AIR FORCE</u> NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT SOIL BORING LOCATION OIL/WATER SEPARATOR BUILDING 1145		
PREPARED BY/DATE: TDM 26 AUG 94	FIGURE NUMBER: 13-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: JKE 17 AUG 95		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: SKE 17 AUG 95		FILE NAME: bldg1145.dwg

TABLE 13-1
AUTO HOBBY SHOP (BUILDING 1145)
SOIL DESCRIPTION
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

Location: Auto Hobby Shop (Building 1145)
 Bottom Depth of Oil/Water Separator: 8 ft

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
1145-SB01	11	0-4	silty fine sand	--	7-9
		4-9	slightly sandy silt to clay		9-11
		9-11	very silty fine sand		
1145-SB02	10	0-0.5	concrete	--	6-8
		0.5-2	silty to clayey fine to coarse sand with gravel		8-10
		2-6	sandy silt to clay		
		6-10	silty to clayey fine to medium sand		
1145-SB03	10	0-0.5	concrete	--	1-2
		0.5-1	silty fine to coarse sand		8-10
		1-2	silty fine to coarse sand with gravel		
		2-10	silty to clayey fine sand		
1145-SB04	10	0-4	fill, silty fine to medium sand	--	0-2
		4-8	slightly sandy silt to clay		8-10
		8-10	silty fine to medium sand		

Note:
 (ft) : feet
 -- : Ground water not observed in boring
 See Figure 13-1 for boring locations.

PREPARED/DATE: TDM/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

1145-SB01

13.4 CHEMICAL ANALYTICAL RESULTS

Two surface and six subsurface soil samples were collected for chemical analysis. A duplicate sample was collected from soil boring 1145-04SB. Positive analytical results are presented in Table 13-2. Sample locations with VOC and metal concentrations detected at each soil boring are detailed on Figures 13-2 and 13-3, respectively.

Total xylenes were detected in subsurface soil sample 1145-01SBE. In addition to total xylenes, ethylbenzene, acetone, and methylene chloride were detected at concentrations near the detection limit in subsurface sample 1145-02SBE. Acetone was also detected in one subsurface sample (1145-02SBD) and in one surface sample (1145-03SBA at low concentrations). Methylene chloride was detected in all soil samples collected at Building 1145.

Arsenic, calcium, magnesium, manganese, and sodium were detected above background concentrations from surface soil sample 1145-03SBA. Arsenic and lead were also detected above background concentrations from surface soil sample 1145-04SB. Two metals (aluminum and chromium) exceeded background concentrations for subsurface samples.

13.5 RISK EVALUATION

Surface Soil - The analytical results for the surface soil sample were first compared to the surface soil background concentration range for the base. Six metals (arsenic, calcium, magnesium, manganese, sodium, and lead) exceeded their respective maximum surface soil background concentrations (Table 13-3A). All other metals are below or within their background ranges. In addition, these six metal concentrations were compared to USGS data for metals detected in surface soils under ambient conditions in the

TABLE 13-2

POSITIVE RESULTS - SOIL SAMPLES
 BUILDING 1145
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

PARAMETER	Sample Date:	Depth:	114501SBD	114501SBE	114502SBD	114502SBE	114503SBA	114503SBE	Sample	Duplicate	114504SBE
	04/24/94	7-9 ft	04/24/94	04/24/94	04/24/94	04/24/94	04/24/94	04/24/94	04/24/94	04/24/94	04/24/94
			6-8 ft	8-10 ft	1-2 ft	8-10 ft	0-2 ft	0-2 ft	0-2 ft	0-2 ft	8-10 ft
Metals (SW8010/SW3050) (mg/kg)											
ALUMINUM	12000	12000	13000	16000	4500	13000	2600 J	5800 J	16000		
ARSENIC	<3.7	<3.7	9.4	<3.8	17	<3.9	<3.8	5.4	<3.2		
BARIUM	120	99	120	110	75	89	23 J	51 J	100		
BERYLLIUM	<0.18	<0.18	<1.7	<0.18	<1.7	<1.9	0.27	<0.16	<0.16		
CADMIUM	2.1	2.0	2.7	3.2	2.3	2.4	0.99 J	2.3 J	2.7		
CALCIUM	150000 JH	140000 JH	180000 JH	160000 JH	310000 JH	180000 JH	110000 JH	110000 J	160000 JH		
CHROMIUM, TOTAL	10	9.7	11	14	6.8	12	0.72 J	7.1 J	12		
COBALT	3.0	3.3	5.1	4.5	4.6	3.8	3.2	3.3	4.7		
COPPER	10 JH	7.9 JH	13 JH	11 JH	14 JH	11 JH	4.0 J	8.4 J	9.3 JH		
IRON	7900	7700	10000	13000	8100	9000	3600 J	9700 J	12000		
LEAD	10	11	11	11	6.3	11	7.3 J	21 J	11		
MAGNESIUM	1900	1900	2200	2300	2600	2200	560 J	1600 J	2200		
MANGANESE	77	16	200	94	290	190	25 J	140 J	120		
NICKEL	7.7	7.4	8.5	9.1	8.8	9.9	2.7	7.0	8.3		
POTASSIUM	1300	1300	1300	1700	700	1600	300 J	920 J	170		
SODIUM	55	63	61	78	180	98	19	72	74		
VANADIUM	18	16	27	23	18	27	2.7 J	13 J	24		
ZINC	21 JH	18 JH	21 JH	25 JH	15 JH	21 JH	3.1 J	22 J	23 JH		
Volatile Organics (SW8240/SW5030) (mg/kg)											
ACETONE	<0.012	<0.012	0.03	0.048	0.073	<0.012	<0.011	<0.011	<0.012		
ETHYLBENZENE	<0.006	<0.006	<0.006	0.01	<0.0056	<0.006	<0.0054	<0.0054	<0.006		
TOTAL-XYLENE	<0.006	0.049	<0.006	0.045	<0.0056	<0.006	<0.0054	<0.0054	<0.006		
METHYLENE CHLORIDE	0.016	0.014	0.017	0.017	0.017	0.015	0.014	0.014	0.015		

J: Estimated quantitation based upon QC data
 JH: Estimated quantitation - possibly biased high based upon QC data

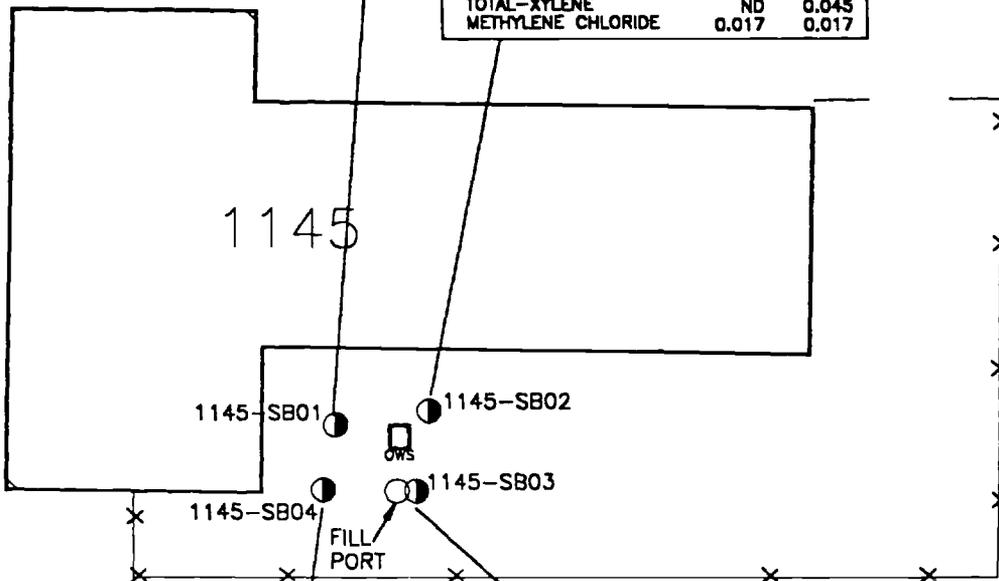
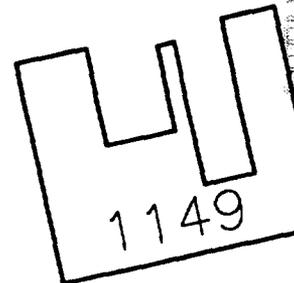
PREPARED/DATE: DRJ/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94



HOBBYSHOP ROAD

1145-01	7-9'	9-11'
TOTAL-XYLENE	ND	0.048
METHYLENE CHLORIDE	0.016	0.014

1145-02	6-8'	8-10'
ACETONE	0.03	0.048
ETHYLEBENZENE	ND	0.01
TOTAL-XYLENE	ND	0.045
METHYLENE CHLORIDE	0.017	0.017



1145-04	0-2'	DUPLICATE	8-10'
METHYLENE CHLORIDE	0.014	0.014	0.015

1145-03	1-2'	8-10'
ACETONE	0.073	ND
METHYLENE CHLORIDE	0.017	0.015

LEGEND:

OIL/WATER SEPARATOR

SOIL BORING LOCATION

ND NOT DETECTED

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE
 NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
 FORT WORTH, TEXAS

OIL/WATER SEPARATOR ASSESSMENT

POSITIVE ANALYTICAL RESULTS
 VOLATILE ORGANICS (mg/kg)

BUILDING 1145

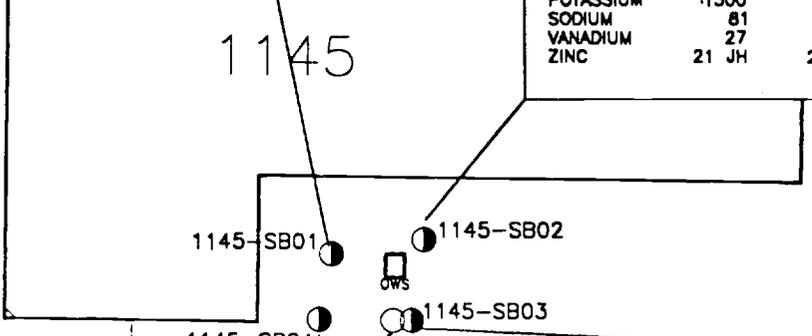
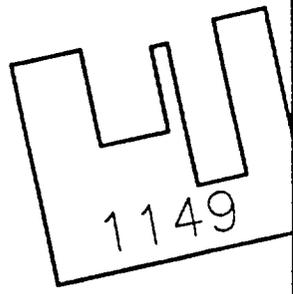
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 13-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1145.dwg



HOBBYSHOP ROAD

1145-01	7-9'	9-11'
ALUMINUM	12000	12000
BARIIUM	120	99
CADMIUM	2.1	2.0
CALCIUM	150000 JH	140000 JH
CHROMIUM	10	9.7
COBALT	3.0	3.3
COPPER	10 JH	7.9 JH
IRON	7900	7700
LEAD	10	11
MAGNESIUM	1800	1900
MANGANESE	77	16
NICKEL	7.7	7.4
POTASSIUM	1300	1300
SODIUM	55	63
VANADIUM	18	16
ZINC	21 JH	18 JH

1145-02	6-8'	8-10'
ALUMINUM	13000	16000
ARSENIC	9.4	NO
BARIIUM	120	110
CADMIUM	2.7	3.2
CALCIUM	180000 JH	160000 JH
CHROMIUM	11	14
COBALT	5.1	4.6
COPPER	13 JH	11 JH
IRON	10000	13000
LEAD	11	11
MAGNESIUM	2200	2300
MANGANESE	200	94
NICKEL	8.5	9.1
POTASSIUM	1300	1700
SODIUM	81	78
VANADIUM	27	23
ZINC	21 JH	25 JH



1145-04	0-2'	DUPLICATE	8-10'
ALUMINUM	2800 J	5800 J	16000
ARSENIC	NO	5.4	NO
BARIIUM	23 J	51 J	100
BERYLLIUM	0.27	NO	NO
CADMIUM	0.99 J	2.3 J	2.7
CALCIUM	11000 J	110000 J	160000 JH
CHROMIUM	0.72 J	7.1 J	12
COBALT	3.2	3.3	4.7
COPPER	4.0 J	8.4 J	9.3 JH
IRON	3800 J	9700 J	12000
LEAD	7.3 J	21 J	11
MAGNESIUM	580 J	1600 J	2200
MANGANESE	25 J	140 J	120
NICKEL	2.7	7.0	8.3
POTASSIUM	300 J	920 J	170
SODIUM	19	72	74
VANADIUM	2.7 J	13 J	24
ZINC	3.1 J	22 J	23 JH

1145-03	1-2'	8-10'
ALUMINUM	4500	13000
ARSENIC	17	ND
BARIIUM	75	89
CADMIUM	2.3	2.4
CALCIUM	310000 JH	180000 JH
CHROMIUM	6.8	12
COBALT	4.6	3.8
COPPER	14 JH	11 JH
IRON	8100	9000
LEAD	6.3	11
MAGNESIUM	2600	2200
MANGANESE	290	190
NICKEL	8.8	9.9
POTASSIUM	700	1600
SODIUM	180	98
VANADIUM	18	27
ZINC	15 JH	21 JH

SCALE: NOT TO SCALE

LEGEND:

- OWS OIL/WATER SEPARATOR
- SOIL BORING LOCATION
- ND NOT DETECTED
- J ESTIMATED QUANTITATION BASED UPON QC DATA
- JH ESTIMATED QUANTITATION-POSSIBLY BIASED HIGH BASED UPON QC DATA

UNITED STATES AIR FORCE
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
FORT WORTH, TEXAS

OIL/WATER SEPARATOR ASSESSMENT

POSITIVE ANALYTICAL RESULTS
METALS (mg/kg)

BUILDING 1145

PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 13-3	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1145.dwg

TABLE 13-3A

**SURFACE SOIL CONCENTRATIONS COMPARED TO INDUSTRIAL MSCs AND AMBIENT CONCENTRATIONS
BUILDING 1145
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas**

	114503 SBA	114504 SBA	MSCs		Surface Soil Background Range (a)	Ambient Concentrations for the Western U.S. (b)
	04/24/94 1-2 ft (mg/kg)	04/24/94 0-2 ft (mg/kg)	GWP-Ind (mg/kg)	SAI-Ind (mg/kg)		
Metals :						
Aluminum	4,500	5,800 J			6,600 - 16,000	5,000 - 100,000
Arsenic	17	5.4	5	3.27	3.7 - 5.3	<0.10 - 97
Barium	75	51 J			62 - 130	70 - 5,000
Beryllium	<1.7	0.27			0.52 - 0.87	<1 - 15
Cadmium	2.3	2.3 J			1.2 - 4.4	1 - 10 (c)
Calcium	310,000 JH	110,000 J	--	--	6,200 - 190,000	600 - 320,000
Chromium (total)	6.8	7.1 J			6.6 - 18	3 - 2,000
Cobalt	4.6	3.3			2.2 - 6.3	<3 - 50
Copper	14 JH	8.4 J			6.6 - 21	2 - 300
Iron	8,100	9,700 J			6,000 - 17,000	1,000 - >100,000
Lead	6.3	21 J	1.5	1,000	6.1 - 16	<10 - 700
Magnesium	2,600	1,600 J	--	--	1,200 - 1,900	300 - >100,000
Manganese	290	140 J	--	--	108 - 250	30 - 5,000
Nickel	8.8	7.0			4.7 - 12	<5 - 700
Potassium	700	920 J			750 - 1,400	1,900 - 63,000
Sodium	180	72	--	--	36 - 120	500 - 100,000
Vanadium	18	13 J			13 - 37	7 - 500
Zinc	15 JH	22 J			10 - 26	10 - 2,100
Volatile Organics :						
Acetone	0.073	<0.011	1,020	4,160	<0.012	
Methylene Chloride	0.017	0.014	0.5	13.8	0.014 - 0.019	

GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration

SAI - Ind: Industrial Soil/Air and Ingestion Standard

(a) Background data collected from three locations throughout the base

(b) USGS, 1984

(c) USGS, 1975

JH: Estimated quantitation - possibly biased high based upon QC data

MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)

--: no data available

Boxes: Value exceeds maximum surface soil background concentration

Bold: Value exceeds GWP-Ind MSC

Italics: Value exceeds SAI-Ind MSC

J: Estimated quantitation based on QC data

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/27 Aug 94

CHECKED/DATE: JRF/2 Nov 95

western United States (USGS, 1984). All seven metals fell within the expected range for ambient conditions.

Due to the exceedances of maximum surface soil background concentrations, the analytical results for the seven metals were compared to the GWP-Ind and SAI-Ind MSCs (Table 13-3A). This comparison showed that the GWP-Ind and the SAI-Ind MSCs for arsenic were exceeded in surface soil samples collected south and southwest of the oil/water separator. The GWP-Ind MSC for lead was also exceeded in surface soil sample 114504SBA. The remaining metals do not have MSCs for comparison. Therefore, arsenic and lead were the only metals detected in the surface soils at the site to exceed Standard Number 2 MSCs.

Acetone and methylene chloride were the only VOCs detected above their PQLs. Acetone was detected in one surface soil sample at a concentration exceeding the maximum background concentration. Detected concentrations of both acetone and methylene chloride were below both their GWP-Ind and SAI-Ind MSCs. Therefore, surface soils were in compliance with Risk Reduction Standard 2 for VOCs.

Subsurface - The analytical results for the subsurface soil samples were first compared to the subsurface soil background concentration range for the base. The metals aluminum and chromium exceeded their maximum subsurface soil background concentration (Table 13-3B). All other metals were below or within their background ranges. Due to these exceedances, the analytical results for these metals were compared to the GWP-Ind MSC, as shown in Table 13-3B. This comparison showed that the GWP-Ind MSC for chromium was exceeded in the subsurface soil sample, 114502SBE, taken to the northeast of the oil/water separator at a depth of 8 to 10 feet. Aluminum does not have an MSC for comparison. Therefore, chromium was the only metal detected in the subsurface soils at the site to exceed its Standard Number 2 MSC.

TABLE 13-3B

SUBSURFACE SOIL CONCENTRATIONS COMPARED TO AN INDUSTRIAL MSC AND BACKGROUND CONCENTRATIONS
BUILDING 1145
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas

	114501SBD 04/24/94 7-9 ft (mg/kg)	114501SBE 04/24/94 9-11 ft (mg/kg)	114502SBD 04/24/94 6-8 ft (mg/kg)	114502SBE 04/24/94 8-10 ft (mg/kg)	114503SBE 04/24/94 8-10 ft (mg/kg)	114504SBE 04/24/94 8-10 ft (mg/kg)	MSC GWP-Ind (mg/kg)	Subsurface Soil Background Range (a) (mg/kg)
Metals :								
Aluminum	12,000	12,000	13,000	16,000	13,000	16,000	--	350 - 13,000
Arsenic	<3.7	<3.7	9.4	<3.8	<3.9	<3.2		<3.4 - 12
Barium	120	99	120	110	89	100		4.9 - 130
Cadmium	2.1	2.0	2.7	3.2	2.4	2.7		<0.34 - 6.8
Calcium	150,000 JH	140,000 JH	180,000 JH	160,000 JH	180,000 JH	160,000 JH	10	350 JH - 210,000 JH
Chromium (total)	10	9.7	11	14	12	12		<0.67 - 13
Cobalt	3.0	3.3	5.1	4.6	3.8	4.7		<1.1 - 7.6
Copper	10 JH	7.9 JH	13 JH	11 JH	11 JH	9.3 JH		5.0 - 66
Iron	7,900	7,700	10,000	13,000	9,000	12,000		543 - 24,000
Lead	10	11	11	11	11	11		<3.1 - 88
Magnesium	1,900	1,900	2,200	2,300	2,200	2,200		65 - 3,100
Manganese	77	16	200	94	190	120		1.8 - 920
Nickel	7.7	7.4	8.5	9.1	9.9	8.3		<2.1 - 15
Potassium	1,300	1,300	1,300	1,700	1,600	170		90 - 2,200
Sodium	55	63	61	78	98	74		15 - 260
Vanadium	18	16	27	23	27	24		1 - 29
Zinc	21 JH	18 JH	21 JH	25 JH	21 JH	23 JH		1.2 - 54
Volatile Organics :								
Acetone	<0.012	<0.012	0.03	0.048	<0.012	<0.012	1,020	<0.012 - 0.023
Ethylbenzene	<0.006	<0.006	<0.006	0.01	<0.006	<0.006	70	<0.006
Total Xylene	<0.006	0.049	<0.006	0.045	<0.006	<0.006	1,000	<0.006
Methylene Chloride	0.016	0.014	0.017	0.017	0.015	0.015	0.5	0.092 - 0.020

GWP - Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration

MSC: Medium-Specific Concentration (where background is not exceeded, MSC is not presented)

J: Estimated quantitation based upon QC data

JB: Estimated quantitation - possibly biased based upon blank contamination

JH: Estimated quantitation - possibly biased high based upon QC data

(a) Background data collected from five locations throughout the base

Boxes: Value exceeds maximum subsurface soil background concentration

--: No data available

Notes: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/14 Sep 94
 CHECKED/DATE: JRF/2 Nov 95

Acetone, ethylbenzene, total xylene, and methylene chloride were the only VOCs detected above their PQLs. Acetone and methylene chloride were detected in two samples at concentrations exceeding the maximum background concentrations. Ethylbenzene was detected in one sample at a concentration exceeding the maximum background concentration. The concentrations of all four VOCs detected were below their GWP-Ind MSC. Therefore, subsurface soils were in compliance with Risk Reduction Standard 2 for VOCs.

Risk Evaluation Summary - The analytical results for surface and subsurface soil were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 1145 is now, and is expected to continue to be, entirely industrial. Based upon the results of this comparison, the following conclusions were drawn:

- VOCs were detected in surface and subsurface soil samples. However, the detected concentrations did not exceed the MSCs for Risk Reduction Standard Number 2. Therefore, soils were in compliance with the standard for these analytes.

- The concentrations of six metals in the surface soil samples exceeded their maximum surface soil background concentrations. However, comparison of these metals to Risk Reduction Standard Number 2 MSCs indicated that only arsenic exceeded both its MSCs, and lead exceeded its GWP-Ind MSC. The concentrations of two metals detected (in two of the six subsurface soil samples) exceeded their maximum subsurface soil background concentrations. However, comparison of these metals to the appropriate

Risk Reduction Standard Number 2 MSC indicated that only chromium exceeded its MSC.

- No other constituents were detected in soil samples.

An analysis of the findings from this study indicated that there was an exceedance of MSCs by arsenic and lead in surface soils and by chromium in subsurface soils. These exceedances occurred at three different site boring locations.

13.6 SITE CONCLUSION

During the course of this project, Building 1145 was inactive; therefore, the flow of water through the separator was minimal. Visual observations and review of records indicates no damage, structural deficiencies, or requirements for repair. Petroleum odors were detected during the drilling of the soil borings; however, volatile petroleum constituents are not detected in the soil samples. Analyses of soil samples collected near the perimeter of the oil/water separator detected metal contamination of surface soils, with arsenic above its GWP-Ind and SAI-Ind MSCs and lead above its GWP-Ind MSC. Also, chromium was detected above its GWP-Ind MSC in a soil sample collected from 8 to 10 feet. The detection of chromium at the 8- to 10-foot depth could indicate that the oil/water separator had a subsurface leak and contaminants migrated into the surrounding soil. However, overflows could also result in metal-contaminated effluent migrating into the surrounding soil to a depth of 8 to 10 feet because the soil surrounding the separator unit consists of sand and gravel, which allows for the migration of liquids.

14.0 HAZARDOUS WASTE STORAGE AREA (BUILDING 1190, SWMU NO. 52)

14.1 SITE DESCRIPTION

The Hazardous Waste Storage Area (Building 1190) is located along Haile Road north of the POL Tank Farm and adjacent to area SD-10, the Flight Line Drainage Ditch (Figure 1-2). The oil/water separator for the Hazardous Waste Storage Area is a two-stage unit consisting of an equalization tank and an oil separation tank.

14.2 SITE-SPECIFIC INVESTIGATION ACTIVITIES

The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Subsequently, soil borings were installed adjacent to the oil/water separator. Because of access limitations, the soil borings (1190-SB01 through 1190-SB03) were located to the north (downgradient) of the oil/water separators (Figure 14-1). The soil borings were advanced using hand augering techniques to the ground-water surface at depths ranging from 2 feet below the ground surface (1190-SB02) to 4 feet below the ground surface (1190-SB01).

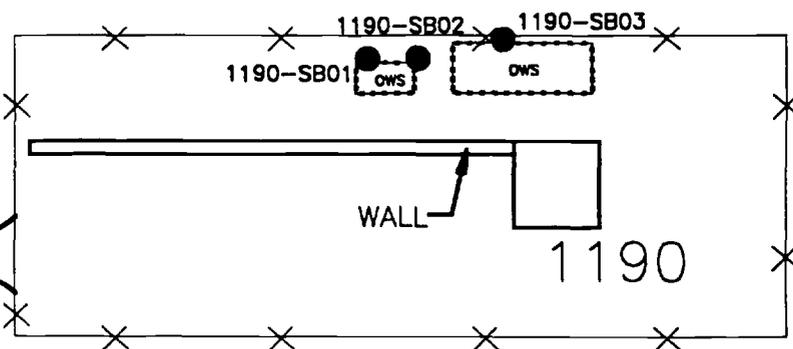
14.3 SITE-SPECIFIC GEOLOGY

The soils encountered were silty to clayey fine to coarse sand (Table 14-1). Water was encountered at a depth of approximately 2 feet below the ground surface. Petroleum odors were detected in 1190-SB01 and 1190-SB02 at the apparent ground-water surface.

N



HAILE DRIVE



LEGEND:

-  OIL/WATER SEPARATOR
-  HAND AUGER BORING LOCATION

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT SOIL BORING LOCATION OIL/WATER SEPARATORS BUILDING 1190		
PREPARED BY/DATE: TDM 26 AUG 94	FIGURE NUMBER: 14-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: SKE 17 AUG 95		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: SKE 17 AUG 95		FILE NAME: bldg1190.dwg

TABLE 14-1

**HAZARDOUS WASTE STORAGE AREA (BUILDING 1190)
SOIL DESCRIPTION
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas**

Location: Hazardous Waste Storage Area (Building 1190)
Bottom Depth of Oil/Water Separators: 6 and 7 ft

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
1190-SB01	4	0-4	silty to clayey fine sand	2.5	0-2
1190-SB02	2	0-2	clayey fine to coarse sand	2	0-2
1190-SB03	2.25	0-2.25	silty to clayey fine to coarse sand	2	0-2

Note:
(ft) : feet
-- : Ground water not observed in boring
See Figure 14-1 for boring locations.

PREPARED/DATE: TDM/2 Sep 94
CHECKED/DATE: JFO/2 Sep 94

2544-1000

14.4 CHEMICAL ANALYTICAL RESULTS

Three surface soil and no subsurface soil samples were collected for chemical analysis. A duplicate sample was collected from soil boring 1190-01SB. The positive analytical results are presented in Table 14-2. Sample locations, with VOC and metal concentrations detected at each soil boring are detailed on Figures 14-2 and 14-3, respectively.

Methylene chloride was detected in all soil samples collected at Building 1190; however, most of the results are qualified. Refer to Section 3.0 for discussion on data quality. No other VOCs were detected.

Arsenic, cadmium, lead, manganese, and zinc were detected above background concentrations in two surface soil samples.

14.5 RISK EVALUATION

Surface Soil - The analytical results for the surface soil sample were first compared to the surface soil background concentration range for the base. As shown on Table 14-3A, five metals (i.e., arsenic, cadmium, lead, manganese, and zinc) exceeded their respective maximum surface soil background concentrations. The other detected metals were below or within their background ranges. In addition, these five metal concentrations were compared to USGS data for metals detected in surface soils under ambient conditions in the western United States (USGS, 1984). All five metals fell within the expected range for ambient conditions.

Due to the exceedances of maximum surface soil background concentrations the analytical results for the five metals were compared to the GWP-Ind and SAI-Ind MSCs, also in Table 14-3A. This comparison showed that the GWP-Ind and the SAI-Ind MSCs for

TABLE 14-2

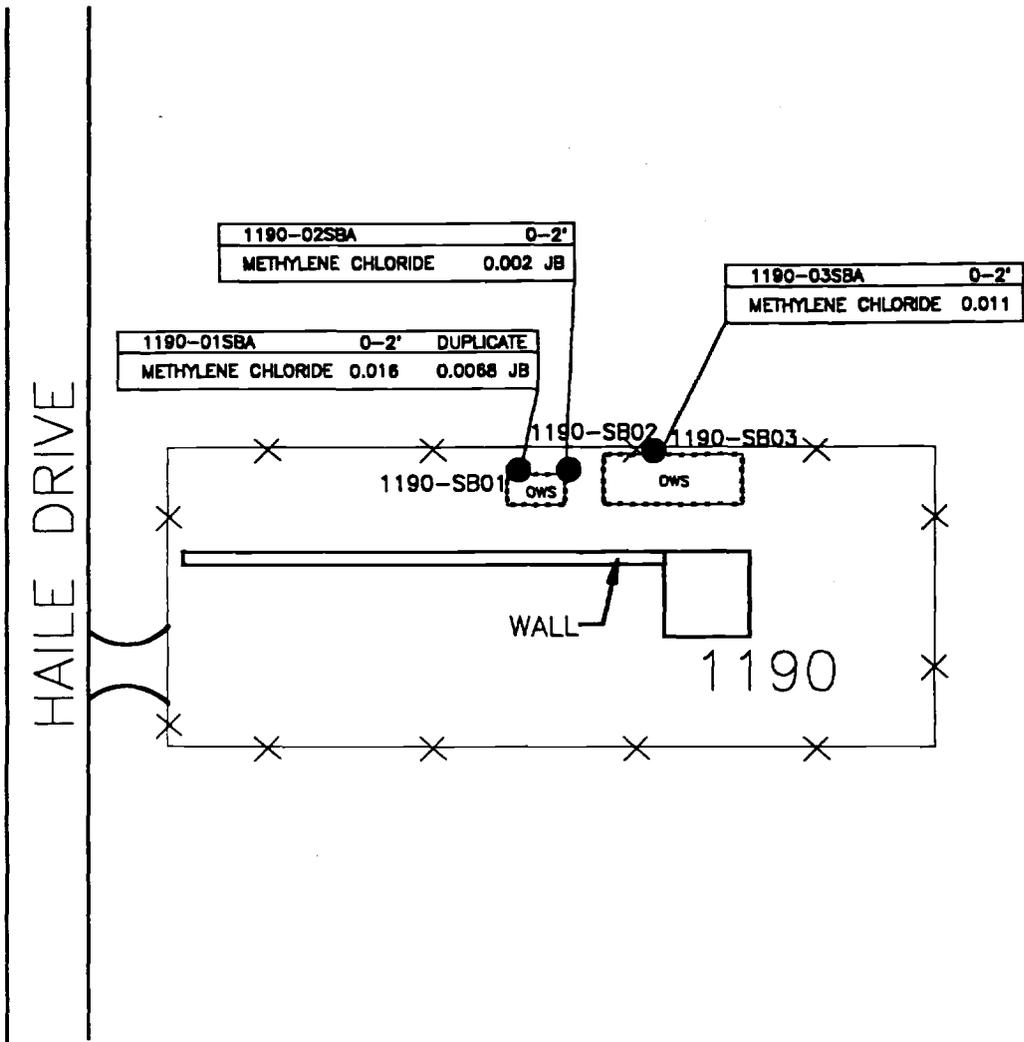
POSITIVE RESULTS - SOIL SAMPLES
 BUILDING 1190
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

PARAMETER	Sample 119001SBA 04/26/94 0-2 ft	Duplicate 1190DPSB1 04/26/94 0-2 ft	119002SBA 04/26/94 0-2 ft	119003SBA 04/26/94 0-2 ft
<u>Metals (SW6010/SW3050) (mg/kg)</u>				
ALUMINIUM	3200 J	5600 J	6600	10000
ARSENIC	<3.7	4.4	4.3	7.6
BARIUM	36 J	61 J	57	76
BERYLLIUM	<0.18	<0.16	<0.16	0.33
CADMIUM	1.8 J	5.4 J	2.1	3.6
CALCIUM	150000	110000	87000	46000
CHROMIUM, TOTAL	6.3 J	17 J	9.8	11
COBALT	2.0	3.1	2.5	5.2
COPPER	7.5 J	19 J	5.1	5.9
IRON	5300	7600	6800	12000
LEAD	8.8 J	88 J	10	12
MAGNESIUM	1200	1400	1100	160
MANGANESE	180	200	92	260
NICKEL	5.9	7.6	5.8	10
POTASSIUM	460 J	870 J	680	1200
SODIUM	67	54	39	45
VANADIUM	12	16	20	19
ZINC	10 J	46 J	18	17
<u>Volatile Organics (SW8240/SW5030) (mg/kg)</u>				
METHYLENE CHLORIDE	0.016	0.0068 JB	0.002 JB	0.011

J: Estimated quantitation based upon QC data

JB: Estimated quantitation - possibly biased high or false positive based upon blank data

PREPARED/DATE: DRJ/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94



LEGEND:

SCALE: NOT TO SCALE

- OWS OIL/WATER SEPARATOR
- HAND AUGER BORING LOCATION
- JB ESTIMATED QUANTITATION: POSSIBLE BIASED HIGH OR FALSE POSITIVE BASED UPON BLANK DATA

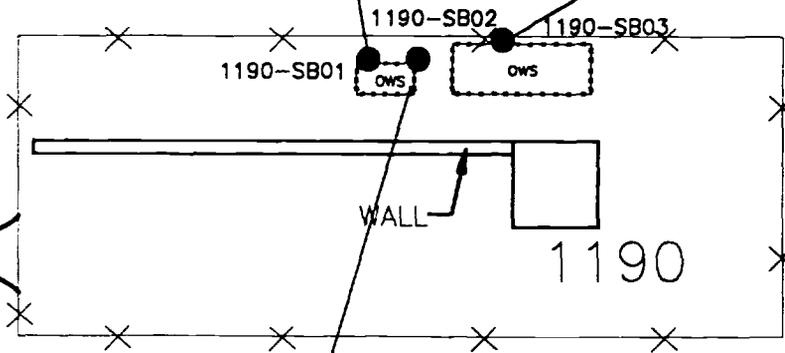
UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT POSITIVE ANALYTICAL RESULTS VOLATILE ORGANICS (mg/kg) BUILDING 1190		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 14-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1190.dwg



1190-01SBA	0-2'	DUPLICATE
ALUMINUM	3200 J	5600 J
ARSENIC	ND	4.4
BARIUM	36 J	81 J
CADMIUM	1.8 J	5.4 J
CALCIUM	150000	110000
CHROMIUM	8.3 J	17 J
COBALT	2.0	3.1
COPPER	7.5 J	19 J
IRON	5300	7600
LEAD	8.8 J	8.8 J
MAGNESIUM	1200	1400
MANGANESE	180	200
NICKEL	5.8	7.8
POTASSIUM	480 J	870 J
SODIUM	87	54
VANADIUM	12	16
ZINC	10 J	46 J

1190-03SBA	0-2'
ALUMINUM	10000
ARSENIC	7.8
BARIUM	78
BARYLIUM	0.33
CADMIUM	3.8
CALCIUM	48000
CHROMIUM	11
COBALT	5.2
COPPER	5.9
IRON	12000
LEAD	12
MAGNESIUM	160
MANGANESE	260
NICKEL	10
POTASSIUM	1200
SODIUM	45
VANADIUM	19
ZINC	17

HAILE DRIVE



1190-02SBA	0-2'
ALUMINUM	6600
ARSENIC	4.3
BARIUM	57
CADMIUM	2.1
CALCIUM	87000
CHROMIUM	9.8
COBALT	2.5
COPPER	5.1
IRON	8800
LEAD	10
MAGNESIUM	1100
MANGANESE	92
NICKEL	5.8
POTASSIUM	880
SODIUM	39
VANADIUM	20
ZINC	18

LEGEND:

- OWS OIL/WATER SEPARATOR
- HAND AUGER BORING LOCATION
- ND NOT DETECTED
- J ESTIMATED QUANTITATION BASED UPON QC DATA

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE		
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT		
POSITIVE ANALYTICAL RESULTS METALS (mg/kg)		
BUILDING 1190		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 14-3	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 27 AUG 95		FILE NAME: bldg1190.dwg

TABLE 14-3A

SURFACE SOIL CONCENTRATIONS COMPARED TO INDUSTRIAL MSCs AND AMBIENT CONCENTRATIONS

BUILDING 1190
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

	119001SBA 04/26/94 0-2 ft (mg/kg)	119002SBA 04/26/94 0-2 ft (mg/kg)	119003SBA 04/26/94 0-2 ft (mg/kg)	MSCs GWP-Ind (mg/kg)	SAI-Ind (mg/kg)	Surface Soil Background Range (e) (mg/kg)	Ambient Concentrations for the Western U.S. (b) (mg/kg)
Metals :							
Aluminum	5,600 J	6,600	10,000			6,600 - 16,000	5,000 - 100,000
Arsenic	4.4	4.3	7.6	5	3.27	3.7 - 5.3	<0.10 - 97
Berium	61 J	57	76			62 - 130	70 - 5,000
Beryllium	<0.18	<0.16	0.33			0.52 - 0.87	<1 - 15
Cadmium	5.4 J	2.1	3.6	0.5	1,020	1.2 - 4.4	1 - 10 (c)
Calcium	150,000	87,000	46,000			6,200 - 190,000	600 - 320,000
Chromium (total)	17 J	9.8	11			6.6 - 18	3 - 2,000
Cobalt	3.1	2.5	5.2			2.2 - 6.3	<3 - 50
Copper	19 J	5.1	5.9			6.6 - 21	2 - 300
Iron	7,600	6,800	12,000	1.5	1,000	6,000 - 17,000	1,000 - >100,000
Lead	88 J	10	12			6.1 - 16	<10 - 700
Magnesium	1,400	1,100	160			1,200 - 1,900	300 - >100,000
Manganese	200	92	260			108 - 250	30 - 5,000
Nickel	7.6	5.8	10			4.7 - 12	<5 - 700
Potassium	870 J	680	1,200			750 - 1,400	1,900 - 63,000
Sodium	67	39	45			36 - 120	500 - 100,000
Vanadium	16	20	19			13 - 37	7 - 500
Zinc	46 J	18	17			10 - 26	10 - 2,100
Volatile Organics :							
Methylene Chloride	0.016	0.002 JB	0.011	0.5	13.8	0.014 - 0.019	

GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration

SAI - Ind: Industrial Soil/Air and Ingestion Standard

(a) Background data collected from three locations throughout the base

(b) USGS, 1984

(c) USGS, 1975

JH: Estimated quantification - possibly biased high based upon QC data

MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)

--: no data available

Boxes: Value exceeds maximum surface soil background concentration

Bold: Value exceeds GWP-Ind MSC

Italics: Value exceeds SAI-Ind MSC

J: Estimated quantification based upon QC data

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/27 Aug 94

CHECKED/DATE: JRF/2 Nov 95

arsenic were exceeded in surface soil sample, 119003SBA, which was collected north of the larger oil/water separator. The GWP-Ind MSCs for lead and cadmium were also exceeded in surface soil sample 119001SBA. The remaining metals do not have MSCs for comparison. Therefore, arsenic, cadmium, and lead were the only metals detected in the surface soils at the site that exceeded Standard Number 2 MSCs.

Methylene chloride was the only VOC detected above its PQL. The concentration detected was below its maximum background concentration and GWP-Ind and SAI-Ind MSCs. Therefore, surface soils were in compliance with Risk Reduction Standards 1 and 2 for VOCs.

Risk Evaluation Summary - The analytical results for surface soil were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 1190 is now, and is expected to continue to be, entirely industrial. Based upon the results of this comparison, the following conclusions were drawn:

- VOCs were detected in surface soil samples. However, the detected concentrations did not exceed the Risk Reduction Standard Number 1 or 2. Therefore, soils were in compliance with the standard for VOCs.
- The concentrations of five metals in the surface soil samples exceeded their maximum surface soil background concentrations. However, comparison of these metals to Risk Reduction Standard Number 2 MSCs indicated that only arsenic exceeded both its MSCs, and cadmium and lead exceeded their GWP-Ind MSC.

11/21/99

- No other constituents were detected in soil samples.

An analysis of the findings from this study indicated that there was an exceedance of MSCs by arsenic, cadmium, and lead in surface soils. These exceedances occurred at two different site boring locations.

14.6 SITE CONCLUSION

NAS Fort Worth maintenance personnel report that the Building 1190 oil/water separator system has experienced overflows due to operational problems associated with the pumping mechanism of the oil/water separator system. Results of the LAW visual observation did not identify obvious structural deficiencies. The recommendations for this oil/water separator are to reevaluate the new pumping system and make any repairs or replacements as necessary. Petroleum odors were detected while hand augering the soil borings; however, volatile petroleum constituents were not detected in the soil samples. Surface soils were found to contain arsenic above its GWP-Ind and SAI-Ind MSCs. Also, cadmium and lead were detected in surface soil at concentrations exceeding their GWP-Ind MSC. The presence of surface soil contamination at the 0- to 2-foot depth may indicate past overflow conditions that resulted in contamination; however, the presence of surface contamination could also be a result of site activities or surface run off from the adjacent storage area.

104-104

15.0 VEHICLE MAINTENANCE SHOP (BUILDING 1191, SWMU NO. 37)

15.1 SITE DESCRIPTION

The Vehicle Maintenance Shop (Building 1191) is located along Haile Road north of the Flight Line Drainage Ditch (SD-10) (Figure 1-2). The oil/water separator for the Vehicle Maintenance Shop is located immediately adjacent to the western wall of Building 1191 (Figure 15-1). The separator unit operates by gravity flow and consists of two 500-gallon tanks. The separator unit was installed in the early 1980s to receive waste, including engine oil, brake fluid, and other petroleum-related wastes from Building 1191.

15.2 SITE-SPECIFIC INVESTIGATION ACTIVITIES

The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Three soil borings (1191-SB01 through 1191-SB03) were advanced along the perimeter of the oil/water separator (Figure 15-1). The borings were advanced to a depth of 5 feet below the ground surface.

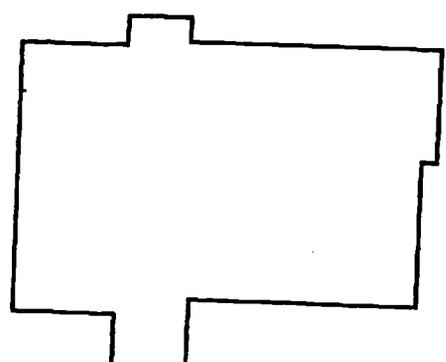
15.3 SITE-SPECIFIC GEOLOGY

Four feet of fill was encountered in soil boring 1191-SB01 (Table 15-1). The fill consisted of silty fine sand with gravel and wood debris. Other soils encountered in the soil borings were slightly silty fine to coarse sands. Ground water was detected in each boring at an approximate depth of 5 feet below the ground surface. Petroleum odors were detected in the soil sample from the 4- to 5-foot depth from soil boring 1191-SB02.

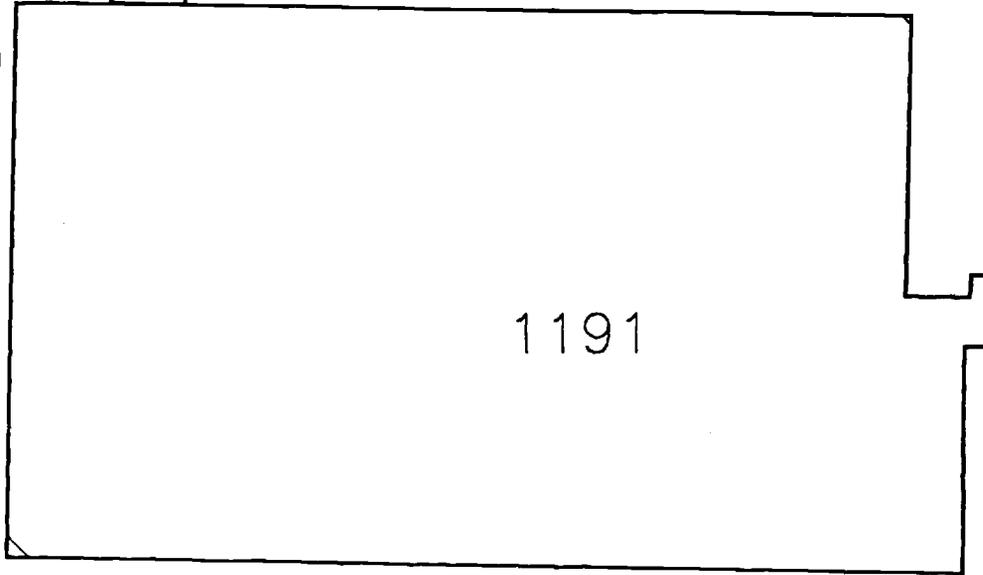


15-2

HAILE DRIVE



- 1191-SB01 ●
- 1191-SB03 ● OWS
- 1191-SB02 ●



(PAVED ROAD)

LEGEND:

- OWS OIL/WATER SEPARATOR
- SOIL BORING LOCATION

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT SOIL BORING LOCATION OIL/WATER SEPARATOR BUILDING 1191		
PREPARED BY/DATE: TDM 26 AUG 94	FIGURE NUMBER: 15-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TKE 17 AUG 95		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: [Signature] 17 AUG 95		FILE NAME: bldg1191.dwg

TABLE 15-1

VEHICLE MAINTENANCE SHOP (BUILDING 1191)
 SOIL DESCRIPTION
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

Location: Vehicle Maintenance Shop (Building 1191)
 Bottom Depth of Oil/Water Separator: 4.5 ft

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
1191-SB01	5	0-1	asphalt and gravel subgrade	4	1-3
		1-4	fill, silty fine sand with gravel and wood debris		3-5
		4-5	slightly silty fine sand		
1191-SB02	5	0-1	asphalt and gravel subgrade	4	2-4
		1-5	slightly silty fine sand with fine gravel		
1191-SB03	5	0-1	asphalt and gravel subgrade	5	2-4
		1-5	slightly silty medium to coarse sand		

Note:
 (ft) : feet
 --: Ground water not observed in boring
 See Figure 15-1 for boring locations.

PREPARED/DATE: TDM/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

0414 11/93

15.4 CHEMICAL ANALYTICAL RESULTS

Four subsurface soil samples were collected and analyzed for VOCs and metals. A duplicate sample was collected from soil boring 1191-02SB (no surface soil samples were obtained). Positive analytical results are presented in Table 15-2. Sample locations, with VOC and metals concentrations detected at each soil boring, are detailed on Figures 15-2 and 15-3, respectively.

Methylene chloride was detected in all soil samples collected at Building 1191. No other VOCs were detected.

For metals, arsenic and calcium exceeded background concentrations.

15.5 RISK EVALUATION

Subsurface - The analytical results for the subsurface soil samples were first compared to the subsurface soil background concentration range for the base. Arsenic and calcium exceeded their maximum subsurface soil background concentrations (Table 15-3A). All other metals were below or within their background ranges. Due to these exceedances the analytical results for these two metals were therefore compared to the GWP-Ind MSC, in Table 15-3A. This comparison shows that the GWP-Ind MSCs for arsenic were exceeded in three of the subsurface soil samples (119101SBB, 119102SBB, and 119103SBB) at depths ranging from 1 to 3 to 2 to 4 feet. Calcium does not have an MSC for comparison. Therefore, arsenic was the only metal detected in the subsurface soils at the site to exceed its Standard Number 2 MSC.

Methylene chloride was the only VOC detected above its PQL. The concentration of methylene chloride detected was below its maximum background concentration and GWP-Ind MSC. Therefore, subsurface soils were in compliance with Risk Reduction Standards 1 and 2 for VOCs.

TABLE 15-2

POSITIVE RESULTS - SOIL SAMPLES
 BUILDING 1191
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

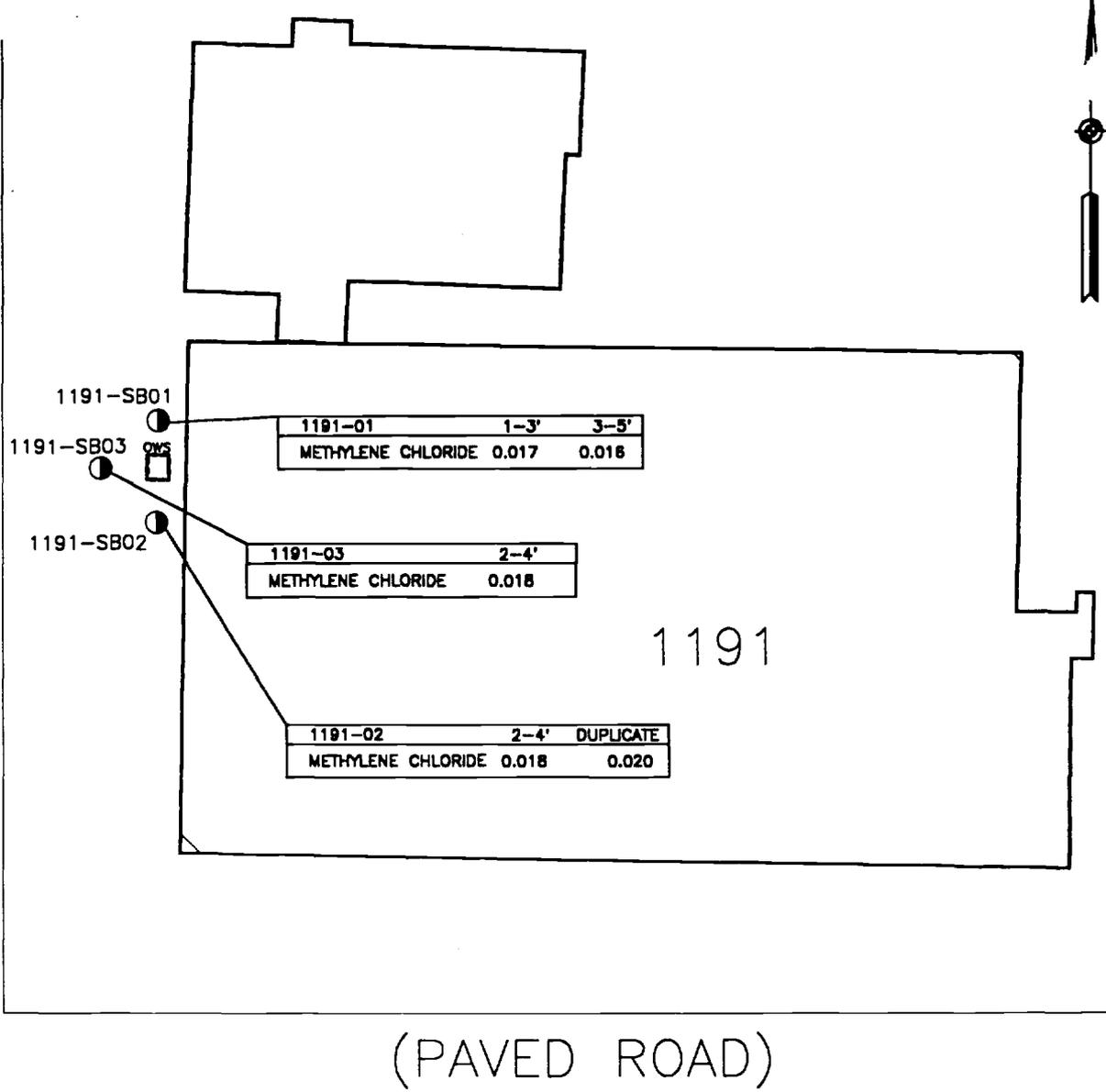
PARAMETER	119101SBB 04/25/94 1-3 ft	119101SBC 04/25/94 3-5 ft	119102SBB 04/25/94 2-4 ft	1191DPSB1 04/25/94 2-4 ft	119103SBB 04/25/94 2-4 ft
<u>Metals (SW6010/SW3050) (mg/kg)</u>					
ALUMINUM	550	3600	630	530	690
ARSENIC	13	6.6	13	13	14
BARIUM	4.9	38	5.3	6.8	6.9
CADMIUM	0.38	2.7	0.66	0.45	1.0
CALCIUM	360000 JH	39000 JH	350000 JH	410000 JH	370000 JH
CHROMIUM, TOTAL	2.1	5.7	2.7	2.3	2.7
COBALT	2.3	4.1	1.7	2.1	0.23
COPPER	9.2	8.1	14	14	16
IRON	1900 JH	11000 JH	1900 J	180 J	3400 JH
LEAD	<2.8	7.9	<2.7	<2.8	<2.8
MAGNESIUM	1900	680	2300	2400	2000
MANGANESE	120	330	130	130	180
NICKEL	<1.9	6.2	<1.8	<1.9	2.6
POTASSIUM	110	540	120	100	130
SODIUM	110	45	100	100	120
VANADIUM	<7.7	14	<7.3	<7.5	<7.7
ZINC	5.1	20	5.1	7.6	39
<u>Volatile Organics (SW8240/SW5030) (mg/kg)</u>					
METHYLENE CHLORIDE	0.017	0.016	0.018	0.02	0.018

J: Estimated quantitation based upon QC data
 JH: Estimated quantitation - possibly biased high based upon QC data

PREPARED/DATE: DRJ/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94



HAILE DRIVE



LEGEND:

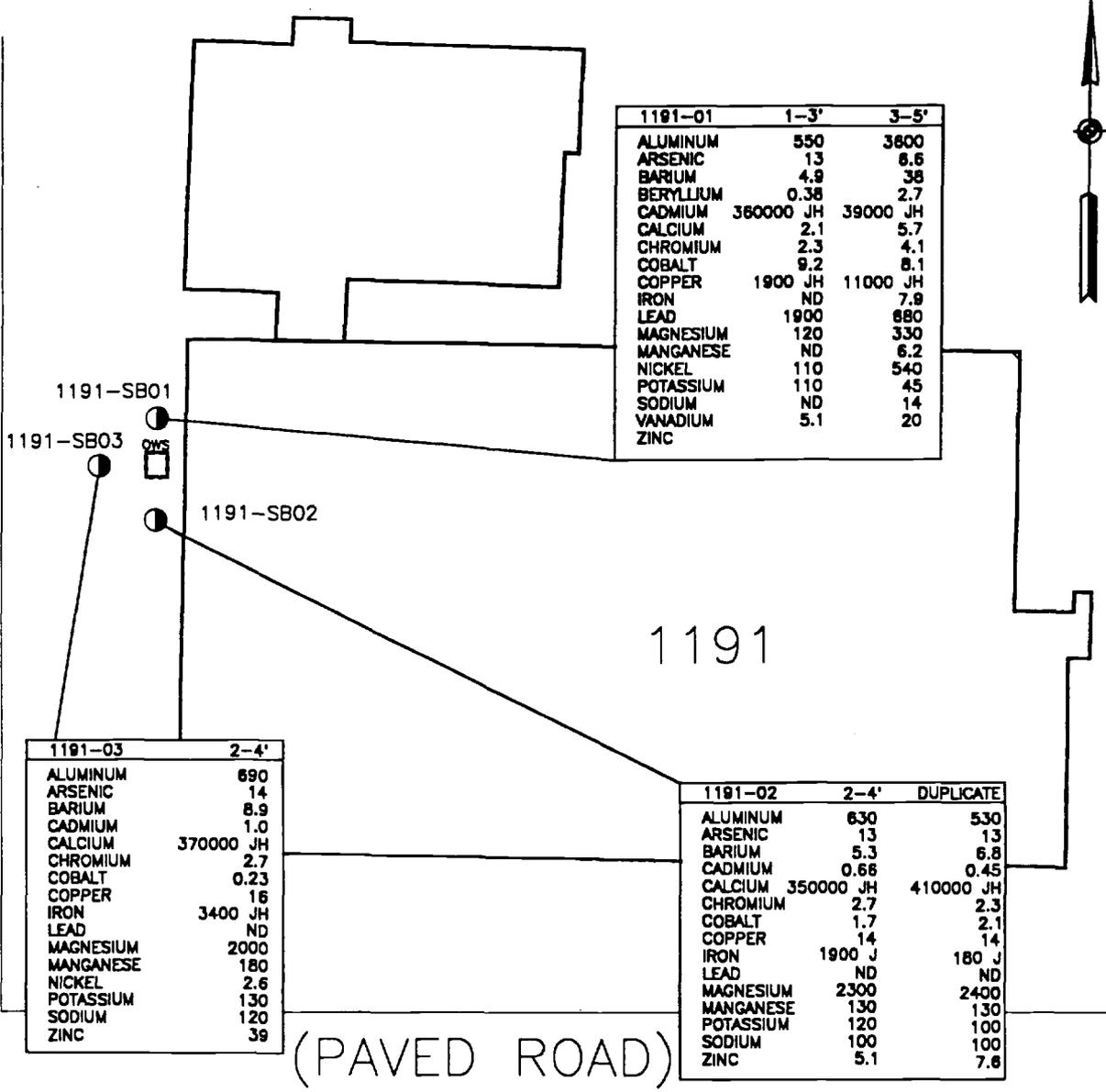
- OWS OIL/WATER SEPARATOR
- SOIL BORING LOCATION

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT POSITIVE ANALYTICAL RESULTS VOLATILE ORGANICS (mg/kg) BUILDING 1191		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 15-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1191.dwg



HAILE DRIVE



1191-01	1-3'	3-5'
ALUMINUM	550	3800
ARSENIC	13	6.6
BARIUM	4.9	38
BERYLLIUM	0.38	2.7
CADMIUM	360000 JH	39000 JH
CALCIUM	2.1	5.7
CHROMIUM	2.3	4.1
COBALT	9.2	8.1
COPPER	1900 JH	11000 JH
IRON	ND	7.9
LEAD	1900	880
MAGNESIUM	120	330
MANGANESE	ND	6.2
NICKEL	110	540
POTASSIUM	110	45
SODIUM	ND	14
VANADIUM	5.1	20
ZINC		

1191-03	2-4'
ALUMINUM	690
ARSENIC	14
BARIUM	8.9
CADMIUM	1.0
CALCIUM	370000 JH
CHROMIUM	2.7
COBALT	0.23
COPPER	16
IRON	3400 JH
LEAD	ND
MAGNESIUM	2000
MANGANESE	180
NICKEL	2.6
POTASSIUM	130
SODIUM	120
ZINC	39

1191-02	2-4'	DUPLICATE
ALUMINUM	630	530
ARSENIC	13	13
BARIUM	5.3	6.8
CADMIUM	0.68	0.45
CALCIUM	350000 JH	410000 JH
CHROMIUM	2.7	2.3
COBALT	1.7	2.1
COPPER	14	14
IRON	1900 J	180 J
LEAD	ND	ND
MAGNESIUM	2300	2400
MANGANESE	130	130
POTASSIUM	120	100
SODIUM	100	100
ZINC	5.1	7.8

(PAVED ROAD)

SCALE: NOT TO SCALE

LEGEND:

-  OIL/WATER SEPARATOR
-  SOIL BORING LOCATION
- ND NOT DETECTED
- J ESTIMATED QUANTITATION BASED UPON QC DATA
- JH ESTIMATED QUANTITATION-POSSIBLY BIASED HIGH BASED UPON QC DATA

UNITED STATES AIR FORCE		
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT		
POSITIVE ANALYTICAL RESULTS METALS (mg/kg)		
BUILDING 1191		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 15-3	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1191.dwg

TABLE 15-3A

SUBSURFACE SOIL CONCENTRATIONS COMPARED TO AN INDUSTRIAL MSC AND BACKGROUND CONCENTRATIONS
 BUILDING 1191
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

	119101SBB 04/25/94 1-3 ft (mg/kg)	119101SBC 04/25/94 3-5 ft (mg/kg)	119102SBB 04/25/94 2-4 ft (mg/kg)	119103SBB 04/25/94 2-4 ft (mg/kg)	MSC GWP-Ind (mg/kg)	Subsurface Soil Background Range (a) (mg/kg)
Metals :						
Aluminum	550	3,600	630	690	5	350 - 13,000
Arsenic	13	6.6	13	14		<3.4 - 12
Barium	4.9	38	6.8	8.9		4.9 - 130
Cadmium	0.38	2.7	0.66	1.0		<0.34 - 6.8
Calcium	360,000 JH	39,000 JH	410,000 JH	370,000 JH	--	350 JH - 210,000 JH
Chromium (total)	2.1	5.7	2.7	2.7		<0.67 - 13
Cobalt	2.3	4.1	2.1	0.23		<1.1 - 7.6
Copper	9.2	8.1	14	16		5.0 - 66
Iron	1,900 JH	11,000 JH	1,900 J	3,400 JH		543 - 24,000
Lead	<2.8	7.9	<2.8	<2.8		<3.1 - 88
Magnesium	1,900	680	2,400	2,000		65 - 3,100
Manganese	120	330	130	180		1.8 - 920
Nickel	<1.9	6.2	<1.9	2.6		<2.1 - 15
Potassium	110	540	120	130		90 - 2,200
Sodium	110	45	100	120		15 - 260
Vanadium	<7.7	14	<7.5	<7.7		1 - 29
Zinc	5.1	20	7.6	39		1.2 - 54
Volatile Organics :						
Methylene Chloride	0.017	0.016	0.02	0.018	0.5	0.018 - 0.020

GWP-Ind: Industrial Soil-to-Groundwater to Crossmedia Protection Concentration
 MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)
 J: Estimated quantitation based upon QC data

JH: Estimated quantitation - possibly biased high based upon QC data

(a) Background data collected from five locations throughout the base

Boxes: Values exceeds subsurface soil background concentration

Box: Value exceeds GWP-Ind MSC

--: No data available

Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/14 Sep 94
 CHECKED/DATE: JRF/2 Nov 95



Risk Evaluation Summary - The analytical results for subsurface soil were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 1191 is now, and is expected to continue to be, entirely industrial. Based upon the results of this comparison, the following conclusions were drawn:

- VOCs were detected in subsurface soil samples. A comparison of VOCs to background concentrations and Risk Reduction Standard Number 2 MSCs indicates that subsurface soils were in compliance with Standard Numbers 1 and 2 for VOCs.
- The concentrations of two metals detected in three of the four subsurface soil samples exceeded their maximum subsurface soil background concentrations. However, on comparison of these metals to the appropriate Risk Reduction Standard, Number 2 MSC indicated that only arsenic exceeded its MSC.
- No other constituents were detected in soil samples.

An analysis of the findings from this study indicated that there was an exceedance of the GWP-Ind MSC by arsenic in subsurface soils. These exceedances occurred at all three site boring locations.

15.6 SITE CONCLUSION

Based on visual observations, maintenance records, and discussions with base personnel, the oil/water separator has no apparent

structural or operational deficiencies and requires no replacement or repair. Petroleum odors were detected while advancing the soil borings; however, volatile petroleum constituents were not detected in the soil samples. Subsurface soil samples exhibited arsenic above its GWP-Ind MSC to a depth of 4 feet which could indicate that the oil/water separator is leaking; however, the contamination may be migrating into the soil from either oil/water separator overflows or from site spills or run off.

16.0 FUEL TRUCK REPAIR BUILDING (BUILDING 1194, SWMU NO. 35)

16.1 SITE DESCRIPTION

The Fuel Truck Repair Building (Building 1194) is located at the intersection of Knights Lake Road and Jennings Drive (Figure 1-2). The oil/water separator is located immediately adjacent to the south side of the building. Two monitoring wells labelled MW-36 and MW-37 are located in the vicinity of the oil/water separator (Figure 16-1). The oil/water separator has a 1,200-gallon capacity and is operated by gravity flow. The separator unit was installed to receive waste liquids, including diesel fuel, JP-4, and other petroleum-related compounds from Building 1194. The oil/water separator is connected to an underground waste oil tank. Effluent from the oil/water separator is discharged into the sanitary sewer.

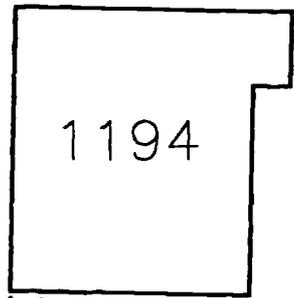
16.2 SITE-SPECIFIC INVESTIGATION ACTIVITIES

The oil/water separator was visually inspected, personnel were interviewed, and records pertaining to the unit were reviewed during a September 1993 site visit. Three soil borings (1194-SB01 through 1194-SB03) were installed. The depth to ground water, measured in the adjacent flush-mounted monitoring wells, ranged from 4.3 feet below the top of casing in monitoring well MW-36 to 8.7 feet below the top of casing in monitoring well MW-37. Soil boring 1194-SB01 and 1194-SB02 are located beyond the existing monitoring wells (Figure 16-1).

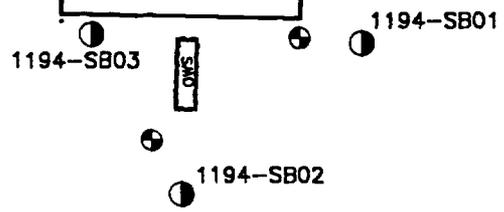
Based on the depth of ground water measured in the monitoring wells, the depth of the soil borings ranged from 5 feet below the ground surface in 1194-SB02 to 9 feet below the ground surface in 1194-SB01.



JENNINGS DRIVE



1194



KNIGHTS LAKE ROAD

LEGEND:

-  OIL/WATER SEPARATOR
-  SOIL BORING LOCATION
-  EXISTING MONITORING WELL

NOTE: SOIL BORING LOCATIONS
REQUIRED CONCRETE CORING

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT SOIL BORING LOCATION OIL/WATER SEPARATOR BUILDING 1194		
PREPARED BY/DATE: TDM 26 AUG 94	FIGURE NUMBER: 16-1	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: JRE 17 AUG 95		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: JRE 17 AUG 95		FILE NAME: bldg1194.dwg

16.3 SITE-SPECIFIC GEOLOGY

The soils encountered included sandy clays and silty to clayey fine to coarse sands (Table 16-1). Evidence of a release was not detected during the advancement of the soil borings.

16.4 CHEMICAL ANALYTICAL RESULTS

One surface and five subsurface soil samples were collected and analyzed for VOCs and metals. Positive analytical results are presented in Table 16-2. Sample locations, with VOC and metals concentrations detected at each soil boring, are detailed on Figures 16-2 and 16-3, respectively.

Acetone and benzene were detected in one surface soil sample (1194-02SBA) at concentrations of 0.013 mg/kg and 0.0016 mg/kg, respectively. Similarly, acetone (0.027 mg/kg) and benzene (0.0013 mg/kg) were detected in subsurface soil sample, 1194-01SBB. Methylene chloride was detected in all soil samples collected from Building 1194.

Cobalt and copper were detected above background concentrations in surface soil sample 1194-02SBA. Beryllium was the only metal which exceeded background concentrations for subsurface samples (1194-01SBB).

16.5 RISK EVALUATION

Surface Soil - The analytical results for the surface soil sample were first compared to the surface soil background concentration range for the base. Cobalt and copper exceeded their respective maximum surface soil background concentrations (Table 16-3A). All

TABLE 16-1

FUEL TRUCK REPAIR BUILDING (BUILDING 1194)
 SOIL DESCRIPTION
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

Location: Fuel Truck Repair Building (Building 1194)
 Bottom Depth of Oil/Water Separator: NA

Boring	Termination Depth (ft)	Soil Type(s)		Depth to Ground Water (ft)	Intervals Sampled (ft)
		Depth (ft)	Description		
1194-SB01	9	0-0.8	concrete	--	3-5
		0.8-9	silty to clayey fine to coarse sand		7-9
1194-SB02	5	0-0.8	concrete	--	1-3
		0.8-3	sandy clay		3-5
		3-5	very silty to very clayey fine sand		
1194-SB03	7	0-0.8	concrete	--	3-5
		0.8-3	sandy clay		5-7
		3-6.5	silty to clayey fine to coarse sand		
		6.5-7	slightly silty coarse sand		

Note:

(ft) : feet

--: Ground water not observed in boring

See Figure 16-1 for boring locations.

PREPARED/DATE: TDM/2 Sep 94
 CHECKED/DATE: JFO/2 Sep 94

TABLE 16--2

POSITIVE RESULTS -- SOIL SAMPLES
 BUILDING 1194
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

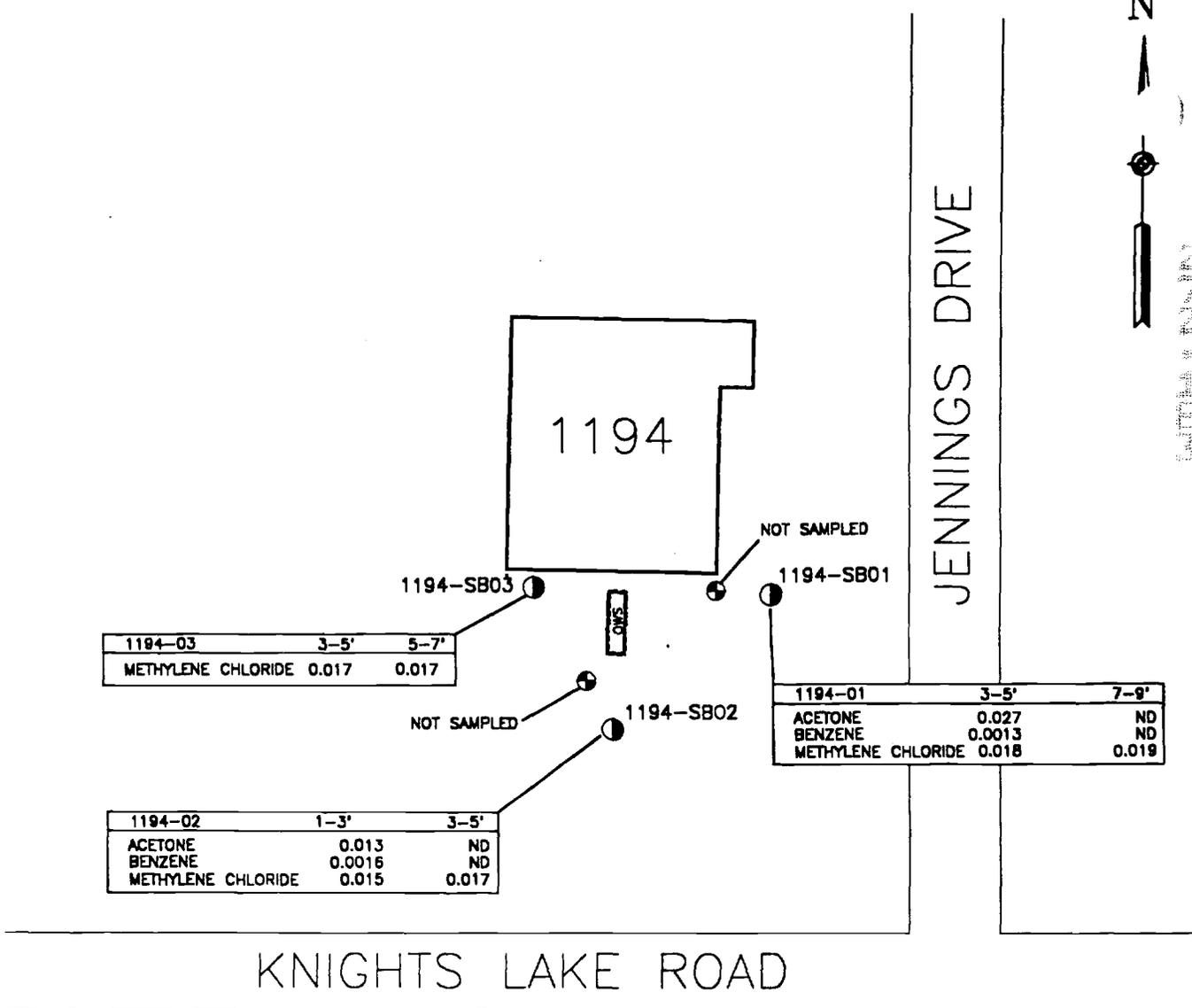
PARAMETER	119401SBB 04/25/94 3-5 ft (mg/kg)	119401SBD 04/25/94 7-9 ft (mg/kg)	119402SBA 04/25/94 1-3 ft (mg/kg)	119402SBB 04/25/94 3-5 ft (mg/kg)	119403SBB 04/25/94 3-5 ft (mg/kg)	119403SBC 04/25/94 5-7 ft (mg/kg)
Metals (SW6010/SW3050) (mg/kg)						
ALUMINIUM	9200	7600	7300	5000	3300	8900
ARSENIC	4.0	<3.6	5.2	5.7	4.7	5.0
BARIIUM	90	80	99	46	27	87
BERYLLIUM	0.66	<0.17	0.6	0.15	0.24	0.32
CADMIUM	2.7	2.1	2.4	3.4	2.7	2.6
CALCIUM	10000 JH	67000 JH	13000 JH	33000 JH	4500 JH	27000 JH
CHROMIUM, TOTAL	12	8.0	11	9.8	5.9	11
COBALT	4.6	4.3	11	4.6	3.7	4.9
COPPER	6.8	3.4	24	5.0	3.8	7.8
IRON	10000 JH	8200 JH	9600 JH	13000 JH	11000 JH	10000 JH
LEAD	11	8.3	12	9.2	4.6	9.4
MAGNESIUM	1100	1100	1000	1100	540	1600
MANGANESE	370	220	240	140	84	310
NICKEL	9.7	6.7	9.4	8.4	7.1	8.8
POTASSIUM	910	720	770	720	490	1100
SODIUM	44	100	44	34	23	87
VANADIUM	21	16	27	17	13	20
ZINC	13	12	18	16	13	16
Volatiles Organics (SW8240/SW5030) (mg/kg)						
ACETONE	0.027	<0.011	0.013	<0.011	<0.011	<0.011
BENZENE	0.0013	<0.0011	0.0016	<0.0011	<0.0011	<0.0011
METHYLENE CHLORIDE	0.018	0.019	0.015	0.017	0.017	0.017

JH: Estimated quantitation - possibly biased high based upon QC data

PREPARED/DATE: DR/J2 Sep 94
 CHECKED/DATE: J.FO/R2 Sep 94



SOUTH PLAIN



LEGEND:

- OWS OIL/WATER SEPARATOR
- SOIL BORING LOCATION
- ⊕ EXISTING MONITORING WELL
- ND NOT DETECTED

NOTE: SOIL BORING LOCATIONS
REQUIRED CONCRETE CORING

SCALE: NOT TO SCALE

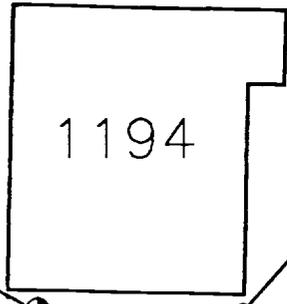
UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT POSITIVE ANALYTICAL RESULTS VOLATILE ORGANICS (mg/kg) BUILDING 1194		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 16-2	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TDM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>[Signature]</i> 17 AUG 95		FILE NAME: bldg1194.dwg



1194-03	3-5'	5-7'
ALUMINUM	3300	8900
ARSENIC	4.7	5.0
BARIIUM	27	87
BERYLLIUM	0.24	0.32
CADMIUM	2.7	2.6
CALCIUM	4500 JH	27000 JH
CHROMIUM	5.9	11
COBALT	3.7	4.9
COPPER	3.8	7.8
IRON	11000 JH	10000 JH
LEAD	4.8	9.4
MAGNESIUM	540	1600
MANGANESE	84	310
NICKEL	7.1	8.8
POTASSIUM	490	1100
SODIUM	23	87
VANADIUM	13	20
ZINC	13	16

1194-02	1-3'	3-5'
ALUMINUM	7300	5000
ARSENIC	5.2	5.7
BARIIUM	99	46
BERYLLIUM	0.6	0.15
CADMIUM	2.4	3.4
CALCIUM	13000 JH	33000 JH
CHROMIUM	11	9.8
COBALT	11	4.8
COPPER	24	5.0
IRON	9600 JH	13000 JH
LEAD	12	9.2
MAGNESIUM	1000	1100
MANGANESE	240	140
NICKEL	9.4	8.4
POTASSIUM	770	720
SODIUM	44	34
VANADIUM	27	17
ZINC	18	16

1194-01	3-5'	7-9'
ALUMINUM	9200	7600
ARSENIC	4.0	ND
BARIIUM	90	80
BERYLLIUM	0.66	ND
CADMIUM	2.7	2.1
CALCIUM	10000 JH	67000 JH
CHROMIUM	12	8.0
COBALT	4.6	4.3
COPPER	6.8	3.4
IRON	10000 JH	8200 JH
LEAD	11	8.3
MAGNESIUM	1100	1100
MANGANESE	370	220
NICKEL	9.7	6.7
POTASSIUM	910	720
SODIUM	44	100
VANADIUM	21	18
ZINC	13	12



JENNINGS DRIVE

KNIGHTS LAKE ROAD

LEGEND:

- OWS OIL/WATER SEPARATOR
- SOIL BORING LOCATION
- EXISTING MONITORING WELL
- ND NOT DETECTED
- JH ESTIMATED QUANTITATION-POSSIBLY BIASED HIGH BASED UPON QC DATA

NOTE: SOIL BORING LOCATIONS REQUIRED CONCRETE CORING

SCALE: NOT TO SCALE

UNITED STATES AIR FORCE NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE FORT WORTH, TEXAS		
OIL/WATER SEPARATOR ASSESSMENT POSITIVE ANALYTICAL RESULTS METALS (mg/kg) BUILDING 1194		
PREPARED BY/DATE: DRJ 24 AUG 94	FIGURE NUMBER: 16-3	FILE DATE: 20.JANUARY.94
CHECKED BY/DATE: TOM 26 AUG 94		PLOT DATE: 17.AUG.95
APPROVED BY/DATE: <i>CAF</i> 17 AUG 95		FILE NAME: bldg1194.dwg

TABLE 16-3A

**SURFACE SOIL CONCENTRATIONS COMPARED TO INDUSTRIAL MSCs AND AMBIENT CONCENTRATIONS
BUILDING 1194
NAS Fort Worth, Joint Reserve Base
Fort Worth, Texas**

	119402SBA 04/25/94 1-3 ft (mg/kg)	MSCs		Surface Soil Background Range (a) (mg/kg)	Ambient Concentrations for the Western U.S. (b) (mg/kg)
		GWP-Ind (mg/kg)	SAI-Ind (mg/kg)		
Metals :					
Aluminum	7,300			6,600 - 16,000	5,000 - 100,000
Arsenic	5.2			3.7 - 5.3	<0.10 - 97
Barium	99			62 - 130	70 - 5,000
Beryllium	0.6			0.52 - 0.87	<1 - 15
Cadmium	2.4			1.2 - 4.4	1 - 10 (c)
Calcium	13,000 JH			6,200 - 190,000	600 - 320,000
Chromium (total)	11			6.6 - 18	3 - 2,000
Cobalt	11	--	--	2.2 - 6.3	<3 - 50
Copper	24	--	--	6.6 - 21	2 - 300
Iron	9,600 JH			6,000 - 17,000	1,000 - >100,000
Lead	12			6.1 - 16	<10 - 700
Magnesium	1,000			1,200 - 1,900	300 - >100,000
Manganese	240			108 - 250	30 - 5,000
Nickel	9.4			4.7 - 12	<5 - 700
Potassium	770			750 - 1,400	1,900 - 63,000
Sodium	44			36 - 120	500 - 100,000
Vanadium	27			13 - 37	7 - 500
Zinc	18			10 - 26	10 - 2,100
Volatile Organics :					
Acetone	0.013	1,020	4,160	<0.012	
Benzene	0.0016	0.5	1.62	<0.0012	
Methylene Chloride	0.015	0.5	13.8	0.014 - 0.019	

GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration

SAI - Ind: Industrial Soil/Air and Ingestion Standard

(a) Background data collected from three locations throughout the base

(b) USGS, 1984

(c) USGS, 1975

JH: Estimated quantitation - possibly biased high based upon QC data

MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)

--: no data available

Boxes: Value exceeds maximum surface soil background concentration

Bold: Value exceeds GWP-Ind MSC

Italics: Value exceeds SAI-Ind MSC

Note: Background data are derived from limited data and do not represent comprehensive background study.

PREPARED/DATE: CDH/27 Aug 94

CHECKED/DATE: JRF/2 Nov 95

other metals were below or within their background ranges. In addition, these two metal concentrations were compared to USGS data for metals detected in surface soils under ambient conditions in the western United States (USGS, 1984). Both metals fell within the expected range for ambient conditions.

Due to the exceedances of maximum surface soil background concentrations the analytical results for cobalt and copper were compared to the GWP-Ind and SAI-Ind MSCs, also in Table 16-3A. Neither of these metals has a GWP-Ind or SAI-Ind MSC. Therefore, surface soils at the site were in compliance with Risk Reduction Standard Number 2.

Acetone, benzene, and methylene chloride were the only VOCs detected above their PQLs. Acetone and benzene were reported at concentrations exceeding the maximum background concentrations. Detected concentrations of acetone, benzene, and methylene chloride are below both their GWP-Ind and SAI-Ind MSCs. Therefore, surface soils were in compliance with Risk Reduction Standard 2 for VOCs.

Subsurface - The analytical results for the subsurface soil samples were first compared to the subsurface soil background concentration range for the base. It can be seen on Table 16-3B that only beryllium exceeded its maximum subsurface soil background concentration. All other metals were below or within their background ranges. Due to this exceedance the analytical result for beryllium was therefore compared to the GWP-Ind MSC, in Table 16-3B. This comparison showed that the GWP-Ind MSC for beryllium was exceeded in the subsurface soil sample, 119401SBB, taken to the east of the oil/water separator at a depth of 3 to 5 feet. Therefore, beryllium was the only metal detected in the subsurface soils at the site to exceed its Standard Number 2 MSC.

Acetone, benzene, and methylene chloride were the only VOCs detected above their PQLs. Acetone and benzene were detected in

TABLE 16-3B
 SUBSURFACE SOIL CONCENTRATIONS COMPARED TO AN INDUSTRIAL MSC AND BASE BACKGROUND CONCENTRATIONS
 BUILDING 1194
 NAS Fort Worth, Joint Reserve Base
 Fort Worth, Texas

	119401SBB 04/25/94 3-5 ft (mg/kg)	119401SBD 04/25/94 7-9 ft (mg/kg)	119402SBB 04/25/94 3-5 ft (mg/kg)	119403SBB 04/25/94 3-5 ft (mg/kg)	119403SBC 04/25/94 5-7 ft (mg/kg)	MSC GWP-Ind (mg/kg)	Subsurface Soil Background Range (a) (mg/kg)
Metals :							
Aluminum	9,200	7,600	5,000	3,300	8,900		350 - 13,000
Arsenic	4.0	<3.6	5.7	4.7	5.0		<3.4 - 12
Barium	90	80	46	27	87		4.9 - 130
Beryllium	0.66	<0.17	0.15	0.24	0.32	0.4	<0.16 - 0.42
Cadmium	2.7	2.1	3.4	2.7	2.6		<0.34 - 6.8
Calcium	10,000 JH	67,000 JH	33,000 JH	4,500 JH	27,000 JH		350 JH - 210,000 JH
Chromium (total)	12	8.0	9.8	5.9	11		<0.87 - 13
Cobalt	4.6	4.3	4.6	3.7	4.9		<1.1 - 7.6
Copper	6.8	3.4	5.0	3.8	7.8		5.0 - 66
Iron	10,000 JH	8,200 JH	13,000 JH	11,000 JH	10,000 JH		543 - 24,000
Lead	11	8.3	9.2	4.6	9.4		<3.1 - 88
Magnesium	1,100	1,100	1,100	540	1,600		65 - 3,100
Manganese	370	220	140	84	310		1.8 - 920
Nickel	9.7	6.7	8.4	7.1	8.8		<2.1 - 15
Potassium	910	720	720	490	1,100		90 - 2,200
Sodium	44	100	34	23	87		15 - 260
Vanadium	21	16	17	13	20		1 - 29
Zinc	13	12	16	13	16		1.2 - 54
Volatile Organics :							
Acetone	0.027	<0.011	<0.011	<0.011	<0.011	1,020	<0.012 - 0.023
Benzene	0.0013	<0.0011	<0.0011	<0.0011	<0.0011	0.5	0.0012
Methylene Chloride	0.018	0.019	0.017	0.017	0.017	0.5	0.098 - 0.020

GWP-Ind: Industrial Soil-to-Groundwater Crossmedia Protection Concentration
 MSC: Medium Specific Concentration (where background is not exceeded, MSC is not presented)
 (a) Background data collected from five locations throughout the base
 JH: Estimated quantitation - possibly biased high based upon QC data
 Boxes: Value exceeds subsurface soil background concentration
 ---: No data available
 Note: Background data are derived from limited data and do not represent a comprehensive background study.

PREPARED/DATE: CDH/14 Sep 94
 CHECKED/DATE: JRF/2 Nov 95

sample 119401SBB at concentrations exceeding the maximum subsurface soil background concentrations. The concentrations of these VOCs detected were below their GWP-Ind MSC. Therefore, subsurface soils are in compliance with Risk Reduction Standard 2 for VOCs.

Risk Evaluation Summary - The analytical results for surface and subsurface soil were compared with Risk Reduction Standard Numbers 1 (site background concentrations) and 2 (MSCs) of the TNRCC Risk Reduction Standards (TNRCC, 1993). The regulatory standard applicable for this investigation was selected based upon available analytical data and the understanding that current land use at Building 1194 is now, and is expected to continue to be, entirely industrial. Based upon the results of this comparison, the following conclusions were drawn:

- VOCs were detected in surface and subsurface soil samples. However, the detected concentrations did not exceed the MSCs for Risk Reduction Standard Number 2. Therefore, soils were in compliance with the standard for these analytes.
- The concentrations of two metals in the surface soil samples exceeded their maximum surface soil background concentrations. However, comparison of these metals to Risk Reduction Standard Number 2 MSCs indicated that neither metal has a MSC. The concentration of beryllium detected in one of the five subsurface soil samples exceeded its maximum subsurface soil background concentration and its Risk Reduction Standard Number 2 MSC.
- No other constituents were detected in soil samples.

An analysis of the findings from this study indicated that there was a sole exceedance of the GWP-Ind MSC for beryllium in one subsurface soil sample.

16.6 SITE CONCLUSIONS

Based on visual observations, maintenance records, and discussions with base personnel, the oil/water separator is intact and requires no replacement or repair. Beryllium was found above its GWP-Ind in one soil sample collected from the perimeter of the oil/water separator at the 3- to 5-foot depth. The beryllium contamination detected to a depth of 5 feet could indicate the separator is leaking; however, the metals contamination could be a result of past separator overflows, localized site spills, or surface run-off.

17.0 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

17.1 INFORMATION SEARCH AND COMPILATION

Information compiled and evaluated to make current and future recommendations for this report was obtained through records review, interviews with base personnel, visual observations of each oil/water separator, and analyses of soil samples collected from the perimeter of each separator unit.

17.2 RESULTS OF OIL/WATER SEPARATOR UNIT OBSERVATIONS

During the course of this study, the NAS Fort Worth was operating at a reduced capacity; therefore, none of the oil/water separators were being utilized at normal working capacity. The evaluation of the 11 oil/water separators indicated no apparent structural or operational deficiencies which would require major repairs or replacement.

17.3 RESULTS OF SOIL ANALYSES

Soil samples collected from the perimeter of each separator were analyzed for volatile organic compounds and metals. Petroleum odors were detected while advancing the soil borings at the oil/water separators (38A, Unnamed Stream; 1145, Auto Hobby Shop; 1190, Hazardous Waste Storage Building; and 1191, Vehicle Maintenance Shop). None of the soil samples analyzed were found to contain volatile organics above Texas Risk Reduction Standards. However, the soils in the immediate area of each of the 11 oil/water separators contained metal contamination above Texas Risk Reduction Standards.

The metals most often encountered above Risk Reductions Standards were arsenic, lead, chromium, nickel, beryllium, and cadmium. Arsenic was detected above Risk Reduction Standards at 8 of the 11 oil/water separators. Lead and chromium were detected at four oil/water separator units; nickel and beryllium were detected at three separator units; and cadmium was detected at two separator units above Risk Reduction Standards.

17.4 RECOMMENDATIONS

Based on the results of the assessment of the 11 oil/water separators at NAS Fort Worth, LAW has prepared the following recommendations:

- During this investigation, the base was undergoing realignment, and activities at the base appear to be greatly reduced. The majority of the oil/water separators were not receiving influent. Therefore, LAW recommends a reevaluation of the operational status of each oil/water separator while in full operation by the new tenants. The reevaluation should include a dye trace study under the full range of flow conditions.
- The Texas Risk Reduction Standards require the comparison of detected concentrations of metals in the soil to background concentrations of metals. In order to better qualify the actual range of background concentrations of metals in the soil, LAW recommends a comprehensive background study and reevaluation of the sites based on this comprehensive background data.
- Petroleum odors were detected while advancing the soil borings at four oil/water separators, and concentrations of metals exceeding the Texas Risk Reduction Standards

were detected in all 11 oil/water separators. Therefore, following reevaluation based on comparison to comprehensive background data, LAW recommends additional sampling and analyses to assess the horizontal and vertical extent of elevated concentrations of metals, if appropriate, and the potential for semi-volatile compounds at each oil/water separator.

REFERENCES

- Barnes, Virgil E., 1988, Geologic Atlas of Texas, Dallas Sheet, The University of Texas at Austin, Bureau of Economic Geology, 1988.
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- TNRCC, 1993, Final Risk Reduction Standards, Chapter 335, Industrial Solid Waste and Municipal Hazardous Waste in General, Subchapter A, Risk Reduction Standards (TWC 335.551-335.568), June 15, 1993.
- USACE, 1991, Carswell Air Force Base, Texas, Work Plan SWMU No. 64 French Underdrain System and SWMU No. 67 Building 340 Oil/Water Separator, U.S. Army Corps of Engineers, Fort Worth District, October 1991.
- USGS, 1984, T. H. Shacklette and J.G. Boerngen, United States Geological Survey Professional Paper 1270.
- USGS, 1975, J.J. Connor and H.T. Shacklette, United States Geological Survey Professional Paper 574-F.

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 27, 1994
 WEATHER Cloudy, Windy, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1064-SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine to coarse SAND (SW) FILL Fine to coarse sand 80% Low plastic fines 20% Quartzose sand Dark yellowish brown (10YR 4/4)	1						0	50%	Soil sample retained for chemical analysis		1
2	Silty fine SAND (SM) - FILL Fine sand 80% Low plastic fines 20% Pale yellow (2.5Y 7/6)	2						0	80%	Soil sample retained for chemical analysis		2
3												3
4	Slightly sandy fine GRAVEL (GP) - FILL Fine well rounded chert gravel 90% Fine sand 10%									Soil boring advanced with continuous split spoon sampler. No augers used.		4
5	Boring terminated at 4.0 ft.									Soil samples collected with California Brass Rings.		5
6										Soil boring grouted to ground surface upon completion.		6

BORING TERMINATED: 4.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH

TO
TO
TO
TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NUMBER: <u>11-3517-0111</u>	BORING NUMBER: <u>SD13-MW06</u>
JOB NAME: <u>Carwell AFB</u>	GROUND SURFACE ELEVATION: <u>555.74</u>
DATE: <u>March 24, 1994</u>	HOURS MOVING: _____
WEATHER: <u>Cloudy 70°F Windy</u>	HOURS DRILLING: _____
DRILLER: <u>B. Christopher - ATEC</u>	PAGE: <u>1</u> OF <u>2</u>

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty CLAY w/ gravel (CL) - FILL Slightly plastic fines 90% Fine gravel 10% Angular limestone gravel Dark gray (N4/)	1						7.5	50%	Petroleum odor		1
										0'-2' sample retained for analyses		
2		2						50	50%			2
3												3
4	Slightly silty CLAY (CH) High plastic fines Dark greenish gray (5GY 4/1)	3						58	50%	Gravel encountered during drilling		4
5												5
6	Silty medium SAND (SM) Medium SAND 70% Non-plastic fines 30% Black (N2.5/1)	1						7.5	40%	Strong petroleum odor		6
										Split spoon refusal at 6.9'		
										6'-6.9' sample retained for analyses		

BORING TERMINATED: <u>11.5 FT.</u>	METHOD OF ADVANCING BORING	DEPTH
BORING REFUSAL: <u>11.5 FT.</u>	POWER AUGER HAND CHOP: W/MUD: W/WATER ROTARY DRILL: W/MUD: W/WATER DIAMOND CORE	0 TO 11.5
WATER TOB DEPTH: <u>10 FT.</u>		TO
WATER 24 HR.: DEPTH: _____		TO
WATER LOSSES: <u>0.0 gallons</u>		TO
CASING: SIZE _____ LENGTH _____		

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NUMBER: 11-3517-0111
 JOB NAME: Carswell AFB
 DATE: March 24, 1994
 WEATHER: Cloudy 70°F Windy
 DRILLER: B. Christopher - ATEC

BORING NUMBER: SD13-MW06
 GROUND SURFACE ELEVATION: 555.74
 HOURS MOVING: _____
 HOURS DRILLING: _____
 PAGE: 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Weathered light gray Shaley limestone								Weathered rock - no split spoon samples collected		8	
9											9	
10											10	
11											11	
12	Auger refusal at 11.5 FT.								Boring completed as Type II Monitoring Well		12	
									Soil samples obtained using 3-inch ID split spoon w/ California brass rings		12	
13											13	

BORING TERMINATED: 11.5 FT.
 BORING REFUSAL: 11.5 FT.
 WATER TOB DEPTH: 10 FT.
 WATER 24 HR.: DEPTH: _____
 WATER LOSSES: 0.0 gallons
 CASING: SIZE _____ LENGTH _____

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 11.5
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-24-94
 WEATHER Clear 85°
 DRILLER Bill Christopher - ATEC

BORING NO. SD13-SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine to coarse SAND with gravel (SM) - Fill Fine to coarse SAND 60% Low plastic fines 30% Fine to coarse gravel 10% Gravel: angular limestone Dry to moist Light yellowish brown (2.5 Y 6/3)	1					6	40%	15:50	Soil sample retained for chemical analysis	1	
2		2					0	25%	15:55		2	
3	Silty to clayey fine SAND with wood debris (SM/SC) - Fill Dark gray (5 YR 4/1) Petroleum odor Moist to saturated	3					36	25%	16:10	Soil boring advanced with continuous split spoon sampler. No augers used. Soil samples collected using California Brass Rings	3	
4									4			
5									5			
6	Boring terminated at 6.0 ft.								Water @ 6.0' Soil boring grouted to ground surface upon completion	6		

BORING TERMINATED: 6.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH 6.0 ft.
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER _____ TO _____
 HAND CHOP: W/MUD: W/WATER _____ TO _____
 ROTARY DRILL: W/MUD: W/WATER _____ TO _____
 DIAMOND CORE _____ TO _____

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-24-94
 WEATHER Clear 80°
 DRILLER Bill Christopher - ATEC

BORING NO. SD13-SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine SAND with gravel (SM) Fine SAND 60% Low plastic fines 30% Coarse angular limestone gravel 10% Dry Dark yellow brown (10 YR 4/6)	1					0	50%	15:20		1	
2	Sandy SILT to CLAY (ML/CL) Low to medium plastic fines 80% Fine sand 20% Dry Black (10 YR 2/1)	2					6	35%	15:25	Soil sample retained for chemical analysis	2	
3											3	
4	Silty fine SAND (SM) Fine SAND 70% Low plastic fines 30% Moist Dark gray (2.5 Y 4/1) Petroleum odor	3					80	75%	15:30	Soil sample retained for chemical analysis	4	
5										Soil boring advanced with continuous split spoon sampler. No augers used.	5	
6										Soil samples collected using California Brass Rings	6	
	Top of rock Light gray limestone									Soil boring grouted to ground surface upon completion		
	Boring terminated at 7.0 ft.											

BORING TERMINATED: 7.0 ft.
 BORING REFUSAL: 7.0 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	6 TO 7
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 27, 1994
 WEATHER Cloudy, Windy, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1064-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine SAND (SM) - Fill Fine SAND 80% Non-plastic fines 20% Dry Dusky red (2.5YR 3/4)								Hand augered from 0 to 2 ft.		1	
2		1					0	60%		8:25	2	
3											3	
4											4	
5		Slightly sandy fine GRAVEL (GP) - Fill Well rounded GRAVEL 90% Fine sand 10%	2					0	35%		8:30	4
6												5
												6
												6
			3					0	50%		8:45	6
										Soil sample retained for chemical analysis		

BORING TERMINATED: 10.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 23, 1994
 WEATHER Clear, 75° F
 DRILLER John Storm - ATEC

BORING NO. 1060-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine SAND (SM) - Fill Fine SAND 70% Non-plastic fines 30% Dry Dark reddish brown (5YR 3/3)	1						NA	Split spoon could not penetrate soil. Augered to 2.0 ft.		1	
2		2						20	100%	9:30	2	
3									Soil sample retained for chemical analysis.		3	
4	FILL Concrete debris	3							Augered from 4.0 ft. to 10.0 ft. through concrete debris.		4	
5											5	
6											6	

BORING TERMINATED: 12.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING
 POWER AUGER (6¼-inch O.D.)
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH
0 TO 10
TO
TO
TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 23, 1994
 WEATHER Clear, 75° F
 DRILLER John Storm - ATEC

BORING NO. 1060-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8											8	
9											9	
10											10	
11	Silty fine SAND (SM) Fine SAND 70% Low plastic fines 25% Fine gravel 5% Gravel is well rounded limestone Yellowish brown (10YR 5/6)	4					2	100%		10:05	11	
12									Soil sample retained for chemical analysis.		12	
13	Boring terminated at 12.0 ft.								Soil samples collected using California Brass Rings.		13	
14									Soil boring grouted to ground surface upon completion.		14	

BORING TERMINATED: 12.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER (6 1/4-inch O.D.)	0 TO 10
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. <u>11-3517-0121</u> JOB NAME <u>Carswell AFB</u> DATE: <u>April 23, 1994</u> WEATHER <u>Clear, 70° F</u> DRILLER <u>John Storm - ATEC</u>	BORING NO. <u>1060-SB02</u> G.S. ELEV. <u>NA</u> HOURS MOVING <u>NA</u> HOURS DRILLING <u>NA</u> PAGE <u>1</u> OF <u>2</u>
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DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Very silty to very clayey fine SAND (SM/SC) - Fill Fine SAND 60% Low plastic fines 40% Reddish yellow (7.5YR 6/6) and brown (7.5YR 4/3) Dry	1					3	50%		8:40	1	
2		2					5	25%		8:45	2	
3	----- Silty fine SAND (SM) - Fill Fine SAND 70% Non-plastic fines 30% Brown (7.5YR 5/4) Dry										3	
4		3					NA	10%		8:50	4	
5											5	
6	Very silty to very clayey fine SAND (SM/SC) - Fill Fine SAND 60% Low plastic fines 40% Brown (7.5YR 5/4) Moist										6	
		4					130	20%		8:55	6	

BORING TERMINATED: <u>10.5 ft.</u> BORING REFUSAL: <u>10.5 ft.</u> WATER TOB DEPTH: <u>NA</u> WATER 24 HR.: DEPTH: <u>NA</u> WATER LOSSES: <u>0.0 gal.</u> CASING: SIZE <u>NA</u> LENGTH <u>NA</u>	METHOD OF ADVANCING BORING POWER AUGER HAND CHOP: W/MUD: W/WATER ROTARY DRILL: W/MUD: W/WATER DIAMOND CORE	DEPTH TO TO TO TO
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QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 23, 1994
 WEATHER Clear, 70° F
 DRILLER John Storm - ATEC

BORING NO. 1060-SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Silty fine SAND (SM) - Fill Fine SAND 70% Low plastic fines 30% Brown (7.5YR 5/4) Moist Fine roots and organic material	5					8	25%		9:00	8	
9										9		
10		Concrete debris	6					14	50%		9:07	10
11		Refusal at 10.5 ft.								Soil boring advanced with continuous split spoon sampler. No augers used.		11
12										Soil samples collected using California Brass Rings.		12
13									Soil boring grouted to ground surface upon completion.		13	
14										14		

BORING TERMINATED: 10.5 ft.
 BORING REFUSAL: 10.5 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

FORM 10-1-10

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 23, 1994
 WEATHER Clear, 75° F
 DRILLER John Storm - ATEC

BORING NO. 1060-SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine to coarse SAND with gravel (SM) - Fill Fine to coarse SAND 50% Fine to coarse gravel 30% Low plastic fines 20% Angular limestone gravel Yellowish brown (10YR 5/4)	1					140	40%	11:00	Soil sample retained for chemical analysis.	1	
2		2					30	40%	11:05		2	
3	Concrete debris										3	
4											4	
5	Silty fine to coarse SAND (SM) Fine to coarse SAND 70% Low plastic fines 30% Dark yellowish brown (10YR 4/4) Moist	3					1	100%	11:15		5	
6											6	
	Silty fine SAND (SM) Fine SAND 80% Low plastic fines 20% Yellow (10YR 7/6) Moist											

BORING TERMINATED: 13.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING
 POWER AUGER (6 1/4-inch O.D.)
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH
4 TO 5
TO
TO
TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 23, 1994
 WEATHER Clear, 75° F
 DRILLER John Storm - ATEC

BORING NO. 1060-SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Silty to very silty fine to coarse SAND (SM) Fine to coarse SAND 70% Low plastic fines 30% Moist Well rounded calcareous coarse sand Brown (7.5YR 5/4) to yellow brown (10YR 5/4)	4					1	50%	11:25	8		
9		5					0	100%	11:30	9		
10										10		
11			6					1	100%	11:35	11	
12									Soil sample retained for chemical analysis.	12		
13									Soil boring advanced with continuous split spoon sampler. Augered from 4 to 5 ft.	13		
13		Slightly silty medium to coarse SAND with gravel (SM) Medium to coarse SAND 80% Well rounded fine gravel 10% Low plastic fines 10% Moist Yellow brown (10YR 5/4) Boring terminated at 13.0 ft.							Soil samples collected using California Brass Rings.	13		
									Soil boring grouted to ground surface upon completion.			

BORING TERMINATED: 13.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER (6 1/4-inch O.D.)	4 TO 5
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 23, 1994
 WEATHER Clear, 75° F
 DRILLER John Storm - ATEC

BORING NO. 1060-SB04
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
									Rocks on surface. Augered to 1.0 ft.			
1	Silty medium to fine SAND (SM) - Fill Medium to fine SAND 70% Low plastic fines 25% Limestone gravel <5% Mottled yellowish brown (10YR 5/6) and gray brown (10YR 5/2) Dry	1					9	50%		10:25	1	
									Soil sample retained for chemical analysis.			
2											2	
3		2					5	60%		10:30	3	
4											4	
5	Concrete debris										5	
6											6	

BORING TERMINATED: 12.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER (6 1/4-inch O.D.)
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH
 0 TO 10
 TO
 TO
 TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 23, 1994
 WEATHER Clear, 75° F
 DRILLER John Storm - ATEC

BORING NO. 1060-SB04
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8											8	
9											9	
10	Sandy SILT to CLAY (ML/CL) Low plastic fines 70% Fine sand 30% Mottled dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4)	3						5	100%	10:50	10	
11									Soil sample retained for chemical analysis.		11	
12												12
13	Boring terminated at 12.0 ft.								Soil samples collected using California Brass Rings.		12	
13									Soil borings grouted to ground surface upon completion.		13	

BORING TERMINATED: 12.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER (6 1/4-inch O.D.)	0 TO 10
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: April 22, 1994
 WEATHER Clear, 80° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1027-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
-1	Silty fine SAND (SM) Fine SAND 60% Coarse sand 10% Non-plastic fines 30% Dry Brownish yellow (10YR 6/6)	1						18	30%	15:20	1	
									Sample retained for chemical analysis.			
-2		2						9	100%	15:27	2	
-3											3	
-4											4	
-5	Sandy SILT to CLAY (ML/CL) Low plastic fines 70% Fine sand 25% Fine well rounded limestone gravel 5% Dry Brown (7.5YR 5/4)	3						1	100%	15:32	5	
											6	
-6	Silty fine SAND (SM) Fine SAND 70% Low plastic fines 30% Dry Reddish yellow (7.5YR 6/6)	4						0	100%	15:37	6	

BORING TERMINATED: 12.0 ft.
 BORING REFUSAL: 12.0 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: April 22, 1994
 WEATHER Clear, 80° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1027-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)	
			1	2	3	4							
8	Sandy SILT to CLAY (ML/CL) Low plastic fines 80% Fine sand 20% Moist Yellowish brown (10YR 5/4)	5						0	100%	15:40	8		
9											9		
10		Slightly silty fine SAND (SP) Fine SAND 90% Non-plastic fines 10% Moist Brownish yellow (10YR 5/6)	6						1	90%	15:45	10	
11				Sample retained for chemical analysis.									11
12				Soil boring advanced with continuous split spoon sampler. No augers used.									12
13	Slightly silty fine GRAVEL (GP) Well rounded quartzose and limestone gravel Refusal at 12.0 ft.		Soil samples collected using California Brass Rings.									13	
			Soil borings grouted to ground surface upon completion.										

BORING TERMINATED: 12.0 ft.
 BORING REFUSAL: 12.0 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 22, 1994
 WEATHER Clear, 85° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1027-SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Slightly sandy SILT (ML) Non-plastic fines 80% Fine sand 20% Dry Light yellowish brown (10YR 6/4)	1						0	100%		11:50	1
2	----- Very silty to very clayey fine SAND (SM/SC) Fine SAND 60% Low plastic fines 40% Dry Yellowish brown (10YR 5/4)	2						8	100%	Soil sample retained for chemical analysis.	11:55	2
3												3
4		3						1	75%		12:05	4
5												5
6		4						0	75%		12:08	6

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: April 22, 1994
 WEATHER Clear, 85° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1027-SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8		5					1	NA			8	
9	Silty to clayey sandy fine GRAVEL (GM/GC) Fine GRAVEL 50% Fine to coarse sand 30% Low plastic fines 20% Well rounded limestone gravel Yellowish brown (10YR 5/6)										9	
10	Slightly silty coarse sand (SP) Coarse SAND 90% Low plastic fines 10% Angular sand grains Dry Dark yellow brown (10YR 4/6)	6					0	NA			10	
11											11	
12	Slightly silty fine SAND (SP) Fine SAND 90% Low plastic fines 10% Quartzose sand Moist Brownish yellow (10YR 6/6)	7					0	75%		12:25	12	
13											13	
	Boring terminated at 14.0 ft.											

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 22, 1994
 WEATHER Clear, 85° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1027-SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Sandy SILT with fine gravel (ML) Low plastic fines 70% Fine sand 20% Fine angular to well rounded limestone gravel 10% Yellowish brown (10YR 5/4) Dry	1					0	100%	14:30		1	
2		2					0	70%	14:35		2	
3		3					0	75%	14:38		3	
4		4					0	75%	14:40		4	
5	Sandy SILT to CLAY (ML/CL) Low plastic fines 70% Fine sand 30% Dry Yellowish Brown (10YR 5/6)										5	
6											6	
												7
												8
6	Very silty to very clayey fine SAND (SM/SC) Fine sand 60% Low plastic fines 40% Dry to moist Brownish yellow (10YR 6/8)										5	
											6	
												7
												8

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 22, 1994
 WEATHER Clear, 85° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1027-SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8		5					0	100%		14:50	8	
9											9	
10		6					0	100%		14:53	10	
11	Slightly silty fine SAND (SP) Fine SAND 90% Non-plastic fines 10% Quartzose sand Moist Yellow (10YR 7/6)								Soil sample retained for chemical analysis.		11	
12		7					0	NA	Soil sample retained for chemical analysis.		12	
13	Sandy SILT to CLAY (ML/CL) Low plastic fines 70% Fine sand 30% Moist Olive yellow (2.5Y 6/6)								Soil boring advanced with continuous split spoon sampler. No augers used.		13	
									Soil samples collected using California Brass Rings.			
									Soil borings grouted to ground surface upon completion.			
	Boring terminated at 14.0 ft.											

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER _____
 HAND CHOP: W/MUD: W/WATER _____
 ROTARY DRILL: W/MUD: W/WATER _____
 DIAMOND CORE _____

DEPTH

TO _____
 TO _____
 TO _____
 TO _____

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 22, 1994
 WEATHER Partly Cloudy, 80° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1027-SB04
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Very silty fine SAND (SM) Fine SAND 60% Non-plastic fines 40% Dry Light yellow brown (10YR 6/4) to brown (7.5YR 4/3)	1					0	100%	16:08		1	
2		2					0	100%	16:12		2	
3	Sandy SILT with gravel (ML) Low plastic fines 60% Fine sand 30% Fine well rounded limestone gravel 10% Dry Yellowish brown (7.5YR 6/6)	3					0	100%	16:15		3	
4												
5												
6		4					3	70%	16:20	Soil sample retained for chemical analysis.	6	

BORING TERMINATED: 12.0 ft.
 BORING REFUSAL: 12.0 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carewell AFB
 DATE: April 22, 1994
 WEATHER Partly Cloudy, 80° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1027-SB04
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Silty fine to coarse SAND (SM) Fine to coarse SAND 70% Low plastic fines 30% Dry Strong brown (7.5YR 5/6)	5					0	100%		16:32	8	
9											9	
10												10
11												11
12												12
10	Silty fine SAND (SM) Fine SAND 70% Low plastic fines 30% Moist Light brown (7.5YR 6/4)	6					0	NA	Soil sample retained for chemical analysis.		10	
11											11	
12												12
13												13
12												12
12	Refusal at 12.0 ft.								Soil boring advanced with continuous split spoon sampler. No augers used.		12	
13									Soil samples collected using California Brass Rings.		13	
13									Soil borings grouted to ground surface upon completion.		13	
13											13	
13											13	

BORING TERMINATED: 12.0 ft.
 BORING REFUSAL: 12.0 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 22, 1994
 WEATHER Clear, 80° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1015-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty sandy fine to coarse GRAVEL (GM) Fine to coarse GRAVEL 60% Fine to coarse sand 20% Non-plastic fines 20% Rounded limestone gravel Dry Brown (7.5YR 4/4)	1					40	90%	10:35	Soil sample retained for chemical analysis.	1	
2		2					0	100%	10:40		2	
3		3					0	60%	10:45	Soil sample retained for chemical analysis.	3	
4										Soil boring advanced with continuous split spoon sampler. No augers used.	4	
5										Soil samples collected using California Brass Rings.	5	
6										Soil boring grouted to ground surface upon completion.	6	
		Refusal at 6.2 ft.										

BORING TERMINATED: 6.2 ft.
 BORING REFUSAL: 6.2 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 22, 1994
 WEATHER Clear, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1015-SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty to sandy fine GRAVEL (GM) Fine GRAVEL 60% Fine to coarse sand 20% Non-plastic fines 20% Well rounded limestone gravel Dry Brown (7.5YR 4/3)	1						0	100%	9:25	1	
									Soil sample retained for chemical analysis.			
2	Refusal at 4.2 ft.							34	75%	9:30	2	
									Soil sample retained for chemical analysis.			
3	Refusal at 4.2 ft.										3	
4	Refusal at 4.2 ft.										4	
5	Refusal at 4.2 ft.										5	
									Soil boring advanced with continuous split spoon sampler. No augers used.			
									Soil samples collected using California Brass Rings.			
									Soil boring grouted to ground surface upon completion.			
6	Refusal at 4.2 ft.										6	

BORING TERMINATED: 4.2 ft.
 BORING REFUSAL: 4.2 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER _____
 HAND CHOP: W/MUD: W/WATER _____
 ROTARY DRILL: W/MUD: W/WATER _____
 DIAMOND CORE _____

DEPTH

TO _____
 TO _____
 TO _____
 TO _____

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 22, 1994
 WEATHER Sunny, 80° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1015-SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine to coarse SAND with gravel (SW) Fine to coarse SAND 50% Non-plastic fines 30% Fine to coarse gravel 20% Subangular to well rounded limestone gravel Dry Brown (7.5YR 5/4)	1					2	80%		9:50	1	
2		2					0	80%		9:55	2	
4		3					8	75%		10:05	4	
								Soil sample retained for chemical analysis.				
6	Slightly silty coarse SAND with gravel (SW) Coarse SAND 80% Non-plastic fines 10% Coarse gravel 10%	4					1	60%		10:15	6	
								Soil sample retained for chemical analysis.				

BORING TERMINATED: 8.0 ft.
 BORING REFUSAL: 8.0 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: April 22, 1994
 WEATHER Sunny, 80° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1015-SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Angular limestone GRAVEL Moist Yellowish brown (10YR 6/6)										8	
	Refusal at 8.0 ft.								Soil boring advanced with continuous split spoon sampler. No augers used.			
9									Soil samples collected using California Brass Rings.		9	
									Soil boring grouted to ground surface upon completion.			
10											10	
11											11	
12											12	
13											13	

BORING TERMINATED: 8.0 ft.
 BORING REFUSAL: 8.0 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

CIVIL ENGINEERING

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 21, 1994
 WEATHER Overcast, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 4210-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Sandy SILT to CLAY (ML/CL) Low plastic fines 80% Fine sand 20% Dry Yellowish brown (10YR 5/4)	1					0	100%	10:20	1		
2		2					0	35%	10:25	2		
3	Sandy SILT to CLAY (ML/CL) Low plastic fines 80% Fine sands 20% Dry Olive yellow (2.5Y 6/6)	3					0	100%	10:30	3		
4		4					1	100%	10:35	4		
5	Sandy SILT to CLAY (ML/CL) Low plastic fines 70% Fine to coarse sand 30% Coarse sand is calcareous Dry to moist Yellowish brown (10YR 5/6)									5		
6										6		

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH: NA
 WATER 24 HR.: DEPTH: NA
 WATER LOSSES: 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 21, 1994
 WEATHER Overcast, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 4210-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8		5						0	100%	10:45	8	
9											9	
10		6						1	100%	10:50	10	
									Soil sample retained for chemical analysis.			
11											11	
12		7						0	100%	10:55	12	
	Very sandy SILT to CLAY (ML/CL) Low plastic fines 60% Fine sand 40% Moist Light olive brown (2.5Y 5/6)								Soil sample retained for chemical analysis.			
									Soil borings advanced with continuous split spoon sampler. No augers used.			
									Soil samples collected using California Brass Rings.			
									Soil borings grouted to ground surface upon completion.			
14	Boring terminated at 14.0 ft.										14	

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING
 POWER AUGER
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH
 TO
 TO
 TO
 TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: April 21, 1994
 WEATHER Partly Cloudy, 74° F
 DRILLER Bill Christopher - ATEC

BORING NO. 4210-SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 3

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Very silty to very clayey fine SAND with gravel (SM/SC) Fine SAND 50% Low plastic fines 45% Fine gravel 5% Dry Dusky red (2.5YR 4/2)	1						0	75%	8:45	1	
2	Silty fine to coarse SAND with gravel (SM) Fine to coarse SAND 60% Low plastic fines 30% Fine to coarse limestone gravel 10% Dry Yellowish brown (10YR 5/6)	2						0	80%	8:50	2	
3											3	
4	Sandy SILT to CLAY (ML/CL) Low plastic fines 80% Fine sand 20% Moist Very dark gray brown (10YR 3/2) and brown (7.5YR 5/4)	3					30	100%	8:55	Soil sample retained for chemical analysis.	4	
5											5	
6		4						0	NA	9:00	6	

BORING TERMINATED: 16.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 21, 1994
 WEATHER Partly Cloudy, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 4210-SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 3

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Silty fine SAND (SM) Fine SAND 70% Low plastic fines 25% Coarse calcareous sand 5% Dry Brownish yellow (10YR 6/6)	5					0	100%		9:10	8	
9											9	
10												10
11		Very silty to very clayey fine SAND (SM/SC) Fine SAND 55% Low plastic fines 45% Moist Brownish yellow (10YR 6/6)	6					0	100%		9:15	11
12												12
13	Very sandy SILT to CLAY (ML/CL) Low plastic fines 60% Fine sand 40% Moist Yellowish brown (10YR 5/6)	7					0	100%		9:40	13	
									Fine calcareous gravel 10.0 to 10.25 ft.			

BORING TERMINATED: 16.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: April 21, 1994
 WEATHER Partly Cloudy, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 4210-SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 3 OF 3

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
		8					0	100%		9:50		
									Soil sample retained for chemical analysis.			
15											15	
16	Boring terminated at 16.0 ft.								Soil boring advanced with continuous split spoon sampler. No augers used.		16	
17									Soil samples collected using California Brass Rings.		17	
18									Soil boring grouted to ground surface upon completion.		18	
19											19	
20											20	

BORING TERMINATED: 16.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 21, 1994
 WEATHER Partly Cloudy, 80° F
 DRILLER Bill Christopher - ATEC

BORING NO. 4210-SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine to medium SAND (SM) Fine to medium SAND 70% Non-plastic fines 30% Dry Brown (7.5YR 4/3)	1					0	90%	15:10		1	
2	Very silty to very clayey fine SAND with gravel (SM/SC) Fine SAND 50% Low plastic fines 40% Coarse limestone gravel 10% Dry Very dark gray (7.5 YR 3/1)	2					0	90%	15:15		2	
4	Very silty to very clayey fine to coarse SAND (SM/SC) Fine to coarse SAND 60% Low plastic fines 40% Dry Dark brown (7.5YR 3/2)	3					2	100%	15:24 Soil sample retained for chemical analysis.		4	
6	Sandy SILT to CLAY (ML/CL) Low plastic fines 70% Fine sand 30% Moist Very dark gray (5YR 3/1)	4					0	10%	15:27		6	

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carewell AFB
 DATE: April 21, 1994
 WEATHER Partly Cloudy, 80° F
 DRILLER Bill Christopher - ATEC

BORING NO. 4210-SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Silty fine to coarse SAND (SM) Fine to coarse SAND 70% Low plastic fines 30% Well rounded calcareous coarse sand Moist Yellowish brown (10YR 5/4)	5					0	100%	15:35	8		
9	Silty sandy fine GRAVEL (GM) Fine GRAVEL 50% Fine to medium sand 30% Low plastic fines 20% Moist Lt. yellowish brown (10YR 6/4)									9		
10	Very sandy SILT to CLAY (ML/CL) Low plastic fines 60% Fine sand 40% Moist Brownish yellow (10YR 6/6)	6					0	100%	15:40	10		
11										11		
12		7					0	100%	15:50	12		
13									Soil sample retained for chemical analysis.	13		
13									Soil boring advanced with continuous split spoon sampler. No augers used.	13		
13									Soil samples collected using California Brass Rings.	13		
13									Soil boring grouted to ground surface upon completion.	13		
14	Boring terminated at 14.0 ft.									14		

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: April 21, 1994
 WEATHER Overcast, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 4210-SB04
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Sandy SILT to CLAY with gravel (ML/CL) Low plastic fines 70% Fine sand 20% Fine to coarse gravel 10% Dry Dark grayish brown (2.5Y 4/2)	1					0	90%	11:35		1	
2						0	100%	11:38		2		
3	Silty to clayey fine SAND (SM/SC) Fine SAND 70% Low plastic fines 30% Dry Light yellowish brown (10YR 6/4)	2					0	100%	11:45		3	
4						0	100%	11:45		4		
5		3					0	100%	11:45		5	
6		4					0	90%	11:53		6	

BORING TERMINATED: <u>14.0 ft.</u> BORING REFUSAL: <u>NA</u> WATER TOB DEPTH <u>NA</u> WATER 24 HR.: DEPTH <u>NA</u> WATER LOSSES <u>0.0 gal.</u> CASING: SIZE <u>NA</u> LENGTH <u>NA</u>	METHOD OF ADVANCING BORING POWER AUGER HAND CHOP: W/MUD: W/WATER ROTARY DRILL: W/MUD: W/WATER DIAMOND CORE	DEPTH TO TO TO TO
QA / QC INSTALLED BY: <u>TDM</u> CHECKED BY: <u>JLB</u> DISCREPANCIES: _____		

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 21, 1994
 WEATHER Overcast, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 4210-SB04
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Sandy SILT to CLAY (ML/CL) Low plastic fines 70% Fine sand 30% Moist Dark yellowish brown (10YR 4/6)	5					0	90%		11:55	8	
9											9	
10												10
11												11
12												12
10	Very silty to very clayey fine to coarse SAND (SM/SC) Fine to coarse SAND 55% Low plastic fines 45% Moist Mottled dark yellowish brown (10YR 4/6) and gray (10YR 6/1)	6					0	100%		12:05		10
11											11	
12												12
13												13
14												14
12	Sandy SILT to CLAY (ML/CL) Low plastic fines 70% Fine sand 30% Moist Mottled dark yellowish brown (10YR 4/6) and gray (10YR 6/1)	7					0	100%		12:08		12
13											13	
14												14
14												14
14												14
14	Boring terminated at 14.0 ft.										14	

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH: NA
 WATER 24 HR.: DEPTH: NA
 WATER LOSSES: 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER	DEPTH
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-26-94
 WEATHER Partly cloudy, Windy 80°
 DRILLER Bill Christopher - ATEC

BORING NO. BG-5
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty to clayey fine SAND (SM/SC) Fine SAND 65% Low plastic fines 35% Dry Dark reddish brown (5 YR 3/2)	1					0	50%	17:00		1	
2	Sandy CLAY (CL) Low to medium plastic fines 65% Fine sand 35% Dry Very dark gray (2.5 Y 3/1)	2					0	75%	17:05	Soil sample retained for chemical analysis	2	
3											3	
4	Silty to clayey fine SAND (SM/SC) Fine SAND 70% Low plastic fines 30% Dry Grayish brown (2.5 Y 5/2)	3					0	100%	17:15		4	
5											5	
6		4					0	50%	17:20		6	

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH 13.0 ft.
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-26-94
 WEATHER Partly cloudy, Windy 80°
 DRILLER Bill Christopher - ATEC

BORING NO. BG-5
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Sandy CLAY (CL) Low to medium plastic fines 65% Fine sand 35% Dry Gray (2.5 Y 5/1)											
		5					0	100%		17:25		
9	Very silty to very clayey SAND (SM/SC) Fine to medium SAND 55% Low plastic fines 45% Dry Yellow (2.5 Y 7/6) and reddish yellow (7.5 YR 6/4)											
		6					0	100%	17:35			
								Soil sample retained for chemical analysis				
10												
		7					2	100%	17:40			
11	Slightly silty fine SAND (SP) Fine SAND 90% Non-plastic fines 10% Saturated Pale yellow (2.5 Y 7/3)											
								Soil boring advanced with continuous split spoon sampler. No auger used.				
								Soil samples collected using California Brass Rings. Water @ 13.0'				
12												
								Soil boring grouted to ground surface upon completion				
13												
	Boring terminated at 14.0 ft.											

BORING TERMINATED: 14.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH 13.0 ft.
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH

TO
TO
TO
TO

QA / QC

INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-26-94
 WEATHER Partly cloudy, Windy 80°
 DRILLER Bill Christopher - ATEC

BORING NO. BG-4
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty to clayey fine to coarse SAND (SM/SC) Fine to coarse SAND 70% Low plastic fines 25% Fine rounded limestone gravel <5% Dry Grayish brown (10 YR 5/2) and dark yellowish brown (10 YR 3/6)	1					0	100%	16:10		1	
2		2					0	100%	16:15	Soil sample retained for chemical analysis	2	
3											3	
4											4	
5	Slightly silty fine SAND (SP) Fine SAND 90% Non-plastic fines 10% Moist Brown (10 YR 5/3) and light yellowish brown (10 YR 6/4)	3					0	50%	16:20	Soil sample retained for chemical analysis	5	
6		4					5	NA	16:25		6	

BORING TERMINATED: 8.5 ft.
 BORING REFUSAL: 8.5 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH

TO
 TO
 TO
 TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-26-94
 WEATHER Partly cloudy, Windy 80°
 DRILLER Bill Christopher - ATEC

BORING NO. BG-4
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	----- Coarse limestone gravel										8	
9	Boring terminated at 8.5 ft.								Soil boring advanced with continuous split spoon sampler. No augers used.		9	
10									Soil samples collected using California Brass Rings		10	
11									Soil boring grouted to ground surface upon completion		11	
12											12	
13											13	

BORING TERMINATED: 8.5 ft.
 BORING REFUSAL: 8.5 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER _____
 HAND CHOP: W/MUD: W/WATER _____
 ROTARY DRILL: W/MUD: W/WATER _____
 DIAMOND CORE _____

DEPTH

TO _____
 TO _____
 TO _____
 TO _____

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: 4-26-94
 WEATHER Clear, Windy 80°
 DRILLER Bill Christopher - ATEC

BORING NO. BG-2
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine SAND (SM) Fine SAND 70% Low plastic fines 25% Rounded chert gravel <5% Dry; very dark gray (5 YR 3/1)	1						0	100%	14:40	1	
										Soil sample retained for chemical analysis		
										Soil boring advanced with continuous split spoon sampler. No augers used.		
2	Silty fine to coarse SAND with gravel (SM) Fine to coarse SAND 70% Coarse limestone gravel 20% Low plastic fines 10% Dry; gray (7.5 YR 5/1)	2						0	NA	14:45	2	
										Soil samples collected using California Brass Rings		
										Soil boring grouted to ground surface upon completion		
3	Slightly sandy CLAY to SILT (ML/CL) Low plastic fines 80% Fine to coarse sand 20% Angular calcareous coarse SAND; mottled gray (7.5 YR 5/1) and brownish yellow (10 YR 6/6)	3						0	100%	14:55	3	
4	Refusal at 7.0 ft.	4						0	100%	15:00	4	
										Soil sample retained for chemical analysis		

BORING TERMINATED: 7.0 ft.
 BORING REFUSAL: 7.0 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER	DEPTH
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-26-94
 WEATHER Cloudy, Windy 80°
 DRILLER Bill Christopher - ATEC

BORING NO. BG-3
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine SAND (SM) Fine SAND 70% Non-plastic fines 30% Dry Very dark brown (7.5 YR 2.5/2)	5					0	75%	15:30	Soil sample retained for chemical analysis	1	
2												
3												
4												
5												
2	Silty fine to coarse SAND with gravel (GM) Fine to coarse SAND 50% Fine to coarse rounded limestone gravel 30% Low plastic fines 20% Dry Very dark brown (7.5 YR 2.5/2)	6					0	100%	15:35	Soil sample retained for chemical analysis	2	
3												
4												
5												
6												
4	Refusal at 4.0 ft.									Soil boring advanced with continuous split spoon samples. No augers used.	4	
5												
6												
6												
6												
6												

BORING TERMINATED: 4.0 ft.
 BORING REFUSAL: 4.0 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NUMBER: 11-3517-0111
 JOB NAME: Carwell AFB
 DATE: March 25, 1994
 WEATHER: Overcast 70°F
 DRILLER: B. Christopher - ATEC

BORING NUMBER: SD13-MW05 (BG-1)
 GROUND SURFACE ELEVATION: 571.59
 HOURS MOVING: _____
 HOURS DRILLING: _____
 PAGE: 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
	Asphalt with gravel base							-	Soil samples collected using 3-inch ID split spoon w/ California brass rings			
1	Slightly sandy silty CLAY (CL) Slightly plastic fines 90% Fine sand 10% Dark gray (7.5YR 4/1)	1						15	30% 1'-3' sample retained for chemical laboratory analyses		1	
2											2	
3	Clayey very sandy SILT (ML) Slightly plastic fines 60% Fine sand 40% Mottled light gray (5YR 7/1) and reddish brown (5YR 4/4)	2						16	50% 3'-5' sample retained for chemical laboratory analyses		3	
4											4	
5	Silty fine SAND (SM) Fine SAND 70% Non-plastic fines 30% Reddish brown (5YR 4/4)	3						9	100% 5'-7' sample retained for chemical laboratory analyses		5	
6											6	

BORING TERMINATED: 14.0 FT.
 BORING REFUSAL: 14.0 FT.
 WATER TOB DEPTH: _____
 WATER 24 HR.: DEPTH: _____
 WATER LOSSES: 0.0 gallons
 CASING: SIZE _____ LENGTH _____

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 14
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NUMBER: 11-3517-0111
 JOB NAME: Carswell AFB
 DATE: March 25, 1994
 WEATHER: Overcast 70°F
 DRILLER: B. Christopher - ATEC

BORING NUMBER: SD13-MW05 (BG-1)
 GROUND SURFACE ELEVATION: 571.59
 HOURS MOVING: _____
 HOURS DRILLING: _____
 PAGE: 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Slightly silty SAND (SP) Fine SAND 95% Non-plastic fines 5% Moist to saturated Quartzose SAND Light reddish brown (5YR 6/9)	4						3	50%			8
										7'-9' sample retained for analyses		
9		5						-	100%			9
10												10
11		6							100%			11
12	95% fine well rounded gravel / 5% SAND (GP)											12
										Gravel - white, gray, and reddish brown chert and quartz		
13	Very silty fine SAND (SM) Fine SAND 60% Non-plastic fines 40% Saturated	7						-	50%			13
Auger refusal @ 14.0 ft.												
Auger refusal at 14.0 ft.												
Boring completed as Type II monitoring well												

BORING TERMINATED: 14.0 FT.
 BORING REFUSAL: 14.0 FT.
 WATER TOB DEPTH: _____
 WATER 24 HR.: DEPTH: _____
 WATER LOSSES: 0.0 gallons
 CASING: SIZE _____ LENGTH _____

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	0 TO 14
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: 4-25-94
 WEATHER Cloudy, Windy 75°
 DRILLER Bill Christopher - ATEC

BORING NO. 1194 - SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
	Concrete											
1	Sandy CLAY (CL) Medium plastic fines 70% Fine to medium sand 30% Very dark gray (10 YR 3/1)	1					9	100%	9:55 Soil sample retained for chemical analysis		1	
2											2	
3	Very silty to very clayey fine SAND (SM/SC) Fine SAND 60% Low plastic fines 40% Mottled olive yellow (2.5 Y 6/6) and very dark gray (10 YR 3/1)	2					2	100%	10:00 Soil sample retained for chemical analysis		3	
4									Soil boring advanced with continuous split spoon sampler. No augers used.		4	
5	Boring terminated at 5.0 ft.								Soil samples collected using California Brass Rings		5	
6									Soil boring grouted to ground surface and pavement patched with concrete upon completion		6	

BORING TERMINATED: 5.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH: NA
 WATER 24 HR.: DEPTH: NA
 WATER LOSSES: 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING
 POWER AUGER
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH
 TO
 TO
 TO
 TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-25-94
 WEATHER Cloudy 75°
 DRILLER Bill Christopher - ATEC

BORING NO. 1194 - SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
	Concrete											
1	Sandy CLAY (CL) Medium plastic fines 70% Fine sand 30% Dry Very dark gray (2.5 YR 3/1)	1					0	50%		10:15	1	
2											2	
3	Silty to clayey fine to coarse SAND (SM/SC) Fine to coarse SAND 80% Low plastic fines 20% Moist Olive yellow (2.5 Y 6/6); coarse grain, sand; calcitic	2					0	100%		10:20	3	
4									Soil sample retained for chemical analysis		4	
5											5	
6	Slightly silty coarse SAND (SP) Coarse SAND 90% Low plastic fines 10% Moist Light olive yellow (2.5 Y 5/3); sand: angular, calcitic Refusal at 7.0 ft.	3					0	100%		10:30	6	
									Soil sample retained for chemical analysis; Soil boring advanced with continuous split spoon sampler. No auger used.			
									Soil samples collected using California Brass Rings; Soil boring grouted to ground surface and pavement patched with concrete upon completion			

BORING TERMINATED: 7.0 ft.
 BORING REFUSAL: 7.0 ft.
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER _____
 HAND CHOP: W/MUD: W/WATER _____
 ROTARY DRILL: W/MUD: W/WATER _____
 DIAMOND CORE _____

DEPTH

TO _____
 TO _____
 TO _____
 TO _____

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 25, 1994
 WEATHER Cloudy, Windy, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1194-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	*N*				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
	CONCRETE											
1	Silty fine to coarse SAND (SM) Fine to coarse SAND 80% Low plastic fines 20% Quartzose sand Dry Dark grayish brown (10YR 4/2)	1					4	10%		9:25	1	
2											2	
3	----- Silty to clayey fine SAND (SM/SC) Fine SAND 70% Low plastic fines 30% Dry Dark olive gray (5Y 3/2)	2					4	100%	Soil sample retained for chemical analysis.	9:30	3	
4											4	
5	----- Silty to clayey fine to coarse SAND with gravel (SM/SC) Fine to coarse SAND 70% Low plastic fines 20% Fine rounded limestone gravel 10% Moist Olive brown (2.5Y 4/3)	3					2	75%		9:35	5	
6											6	

BORING TERMINATED: 9.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 25, 1994
 WEATHER Cloudy, Windy, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1194-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Silty to clayey fine SAND (SM/SC) Fine SAND 70% Low plastic fines 30% Moist Olive brown (2.5Y 4/3)	4						1	100%	9:45	8	
									Soil sample retained for chemical analysis.			
9		Boring terminated at 9.0 ft.								Soil boring advanced with continuous split spoon sampler. No augers used. Soil samples collected using California Brass Rings.		9
										Soil boring grouted to ground surface and pavement patched with concrete upon completion.		10
11											11	
12											12	
13											13	

BORING TERMINATED: 9.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: April 25, 1994
 WEATHER Cloudy, Windy, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1191-SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	ASPHALT										1	
	Gravel and SAND subgrade											
2	Slightly silty fine SAND with fine gravel (SP) Fine SAND 90% Fine angular limestone gravel 5% Non-plastic fines 5% Quartzose sand Moist Yellow (2.5 7/6)	1					0	NA	Soil sample retained for chemical analysis.		2	
4	Water at 4.0 ft. Petroleum odor	2					NA	NA	Soil boring advanced with continuous split spoon sampler from 2 to 5 ft.		4	
5	Boring terminated at 5.0 ft.								Soil samples collected using California Brass Rings.		5	
									Soil boring grouted to ground surface upon completion.			
6											6	

BORING TERMINATED: 5.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH 4.0 ft.
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER (6 1/4-inch O.D.)
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH

0 TO 2
 TO
 TO
 TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 25, 1994
 WEATHER Cloudy, Windy, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1191-SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
-1	ASPHALT											
	SAND and GRAVEL subgrade											
-2	Slightly silty medium to coarse SAND (SP) Medium to coarse SAND 90% Low plastic fines 10% Moist to saturated Yellowish brown (10YR 5/6) Quartzose with shells	1					0	50%		11:30		
									Soil sample retained for chemical analysis.			
-3												
-4		2					NA	25%				
									Soil boring advanced with continuous split spoon sampler from 2 to 5 ft.			
-5												
-6	Boring terminated at 5.0 ft.								Soil samples collected using California Brass Rings. Water @ 5.0'.			
									Soil boring grouted to ground surface upon completion.			

DATE: 10/1/94

BORING TERMINATED: 5.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH 5.0 ft.
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING
 POWER AUGER (6 1/4-inch O.D.)
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH
0 TO 2
TO
TO
TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: 4-26-94
 WEATHER Cloudy 75°
 DRILLER _____

BORING NO. 1190 - SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty to clayey fine to coarse SAND (SM/SC) Coarse sand: well rounded calcitic Moist Dark yellowish brown (10 YR 4/4)	1						0	100%	9:50	1	
									Soil sample retained for chemical analysis			
2	Water at 2.0 ft.										2	
	Boring terminated at 2.25 ft.								Soil boring advanced with 3-inch OD hand auger			
3									Soil boring grouted to ground surface upon completion		3	
4											4	
5											5	
6											6	

BORING TERMINATED: 2.25 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH 2.0 ft.
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: April 25, 1994
 WEATHER Cloudy, Windy, 75° F
 DRILLER Bill Christopher - ATEC

BORING NO. 1191-SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
	ASPHALT											
	SAND and GRAVEL subgrade											
1	Silty fine SAND with gravel (SM) - Fill Fine quartzose SAND 60% Low plastic fines 30% Coarse limestone gravel 10% Moist Yellowish brown (10YR 5/6)	1					0	50%	12:20		1	
								Fill				
									Hydrogen sulfide odor			
2									Soil sample retained for chemical analysis.		2	
3	Silty fine SAND with wood debris (SM) - Fill Fine sand 70% Low plastic fines 20% Wood debris 10% Yellowish brown (10YR 5/6) Moist	2					0	100%	12:25		3	
								Fill				
									Hydrogen sulfide odor			
4	Slightly silty fine SAND (SP) Fine sand 90% Low plastic fines 10% Saturated Light yellowish brown (2.5Y 6/3)										4	
									Punctured sewer line			
5	Boring terminated at 5.0 ft.										5	
									Soil boring advanced with continuous split spoon sampler from 2 to 5 ft.			
									Soil samples collected using California Brass Rings.			
6											6	
									Sewer repaired by base maintenance.			

BORING TERMINATED: 5.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH 5.0 ft.
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal.
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER (6 1/4-inch O.D.)	0 TO 2
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-26-94
 WEATHER Cloudy 75°
 DRILLER _____

BORING NO. 1190 - SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty to clayey fine SAND (SM/SC) Fine SAND 70% Low plastic fines 30% Moist Very dark grayish brown (10 YR 3/2)	1					0	100%	10:30	Soil sample retained for chemical analysis	1	
2		2					5	100%	10:40		Water @ 2.5'	2
3	Petroleum odor 3-4 ft.											3
4		Boring terminated at 4.0 ft.										4
5												5
6											6	

BORING TERMINATED: 4.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH 2.5 ft.
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

DEPTH

TO
TO
TO
TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carawell AFB
 DATE: 4-26-94
 WEATHER Cloudy 75°
 DRILLER _____

BORING NO. 1190 - SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 1

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Clayey fine to coarse SAND (SC) Fine to coarse SAND 70% Medium plastic fines 30% Very dark grayish brown (10 YR 3/2) Water at 2.0 ft. Petroleum odor at 2.0 ft.	1						0	100%	10:10	1	
									Soil sample retained for chemical analysis			
2	Boring terminated at 2.0 ft.								Soil boring advanced with 3-inch OD hand auger		2	
									Soil boring grouted to ground surface upon completion		3	

BORING TERMINATED: 2.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH 2.0 ft.
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carewell AFB
 DATE: 4-24-94
 WEATHER Clear 80°
 DRILLER Bill Christopher - ATEC

BORING NO. 1145 - SB04
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Silty fine to medium SAND (SM) - Fill Fine to medium SAND 70% Low plastic fines 30% Dry Brown (7.5 YR 5/3) to dark yellowish brown (10 YR 4/4)	1					10	75%	10:05		1	
2		2					0	50% - Offset boring Encountered concrete		2		
3	Slightly sandy SILT to CLAY (ML/CL) Low plastic fines 90% Fine sand 10% Dry Very dark gray (10 YR 3/1)	3					0	100%	10:30		3	
4										4		
5											5	
6		4					1	50%	10:35		6	

BORING TERMINATED: 10.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: 4-24-94
 WEATHER Clear 80°
 DRILLER Bill Christopher - ATEC

BORING NO. 1145 - SB04
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Silty fine to medium SAND (SM) Fine to medium SAND 70% Low plastic fines 30% Dry Grayish brown (2.5 Y 5/2)	5					6	100%		10:45	8	
								Soil sample retained for chemical analysis				
9											9	
10		Boring terminated at 10.0 ft.							Soil boring advanced with continuous split spoon sampler. No augers used.			10
11									Soil samples collected using California Brass Rings			11
12								Soil boring grouted to ground surface upon completion			12	
13											13	

BORING TERMINATED: 10.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH

TO
 TO
 TO
 TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-24-94
 WEATHER Clear 85°
 DRILLER Bill Christopher - ATEC

BORING NO. 1145 - SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
	Concrete	1						11	75%	10:50		
									Soil sample retained for chemical analysis			
1	Silty fine to coarse SAND (SM) Fine to coarse SAND 70% Low plastic fines 30% Dry; very dark green (2.5 Y 3/1)									Petroleum odor	1	
2	Silty fine to coarse SAND with gravel (SM) Fine to coarse SAND 60% Fine angular limestone gravel 20% Low plastic fines 20% Dry; light yellowish brown (10 YR 8/4)										2	
3	Silty to clayey fine SAND (SM/SC) Fine SAND 70% Low plastic fines 30% Dry to moist Black (N2.5/1) to gray (2.5 Y 5/1)	2						4	100%	11:00	3	
4		3						2	100%	11:05	4	
5											5	
6		4						0	100%	11:10	6	

BORING TERMINATED: 10.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH: NA
 WATER 24 HR.: DEPTH: NA
 WATER LOSSES: 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

DEPTH

TO
TO
TO
TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-24-94
 WEATHER Clear 85°
 DRILLER Bill Christopher - ATEC

BORING NO. 1145 - SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Slight petroleum odor	5					6	100%	11:15		8	
								Soil sample retained for chemical analysis				
9											9	
10		Boring terminated at 10.0 ft.							Soil boring advanced with continuous split spoon sampler. No augers used.			10
11									Soil samples collected using California Brass Rings			11
12								Soil boring grouted to ground surface upon completion			12	
13											13	

BORING TERMINATED: 10.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-24-94
 WEATHER Clear 80°
 DRILLER Bill Christopher - ATEC

BORING NO. 1145 - SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
	Concrete	1					0	75%		11:35		
1	Silty to clayey fine to coarse SAND with gravel (SM/SC) Fine to coarse SAND 50% Low plastic fines 30% Fine rounded limestone gravel 20% Dry; Dark olive brown (2.5 Y 3/3)										1	
2	Sandy SILT to CLAY (ML/CL) Low to medium plastic fines 70% Fine sand 30% Dry Black (2.5 Y 1/1) to dark greenish gray (5 GY 4/1)	2					0	100%		11:40	2	
3											3	
4		3					0	25%		11:45	4	
5											5	
6	Silty to clayey fine to medium SAND (SM/SC) Fine to medium SAND 70% Low plastic fines 30%	4					1	100%		11:55	6	
									Soil sample retained for chemical analysis			

BORING TERMINATED: 10.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carwell AFB
 DATE: 4-24-94
 WEATHER Clear 80°
 DRILLER Bill Christopher - ATEC

BORING NO. 1145 - SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	(Continued) Dry to moist Dark greenish gray (5 GY 4/1) Slight petroleum odor										8	
			5					21			11:57	
										Soil sample retained for chemical analysis		
9	Boring terminated at 10.0 ft.										9	
10									Soil boring advanced with continuous split spoon sampler. No augers used.		10	
11									Soil samples collected using California Brass Rings		11	
12									Soil boring grouted to ground surface and pavement patched with concrete upon completion		12	
13											13	

BORING TERMINATED: 10.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-24-94
 WEATHER Sunny 74°
 DRILLER Bill Christopher - ATEC

BORING NO. 1145 - SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)	
			1	2	3	4							
1	Silty fine SAND (SM) Fine SAND 80% Low plastic fines 20% Dry 0-1' reddish yellow (7.5 YR 6/8); 1'-2' mottled brownish yellow (10 YR 6/4) and light gray (10 YR 7/1); 2'-4' thin layered brown (10 YR 4/3) and very dark brown (10 YR 3/2)	1						940	60%		9:10	1	
		SAMPLES NOT COLLECTED DUE TO POOR RECOVERY											
2		2						5	35%		9:15	2	
3	Slightly sandy SILT to CLAY (ML/CL) Low plastic fines 90% Fine to coarse sands 10% Dark greenish gray (5 G 4/1) Moist Coarse sand, well rounded calcitic	3						2	66%		9:25	3	
		3' interval / 2' recovery											
4												4	
5												5	
6												6	

BORING TERMINATED: <u>11.0 ft.</u> BORING REFUSAL: <u>NA</u> WATER TOB DEPTH <u>NA</u> WATER 24 HR.: DEPTH <u>NA</u> WATER LOSSES <u>0.0 gal</u> CASING: SIZE <u>NA</u> LENGTH <u>NA</u>	METHOD OF ADVANCING BORING POWER AUGER HAND CHOP: W/MUD: W/WATER ROTARY DRILL: W/MUD: W/WATER DIAMOND CORE	DEPTH TO TO TO TO
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QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-24-94
 WEATHER Sunny 75°
 DRILLER Bill Christopher - ATEC

BORING NO. 1145 - SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8		4					3	50%	Soil sample retained for chemical analysis		8	
9	-----										9	
10	Very silty fine SAND (SM) Fine SAND 60% Low plastic fines 40% Moist Gray (N 6/1) Petroleum odor	5					9	100%	Soil sample retained for chemical analysis		10	
11	Boring terminated at 11.0 ft.								Soil boring advanced with continuous split spoon sampler. No auger used.		11	
12									Soil samples collected using California Brass Rings		12	
13									Soil boring grouted to ground surface upon completion		13	

BORING TERMINATED: 11.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH: NA
 WATER 24 HR.: DEPTH: NA
 WATER LOSSES: 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER _____ TO _____
 HAND CHOP: W/MUD: W/WATER _____ TO _____
 ROTARY DRILL: W/MUD: W/WATER _____ TO _____
 DIAMOND CORE _____ TO _____

DEPTH

TO _____
 TO _____
 TO _____
 TO _____

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-23-94
 WEATHER Clear 80°
 DRILLER John Storm - ATEC

BORING NO. 1414 - SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
	Concrete pavement											
1	Silty to clayey fine SAND (SM/SC) Fine SAND 70% Low - medium plastic fines 30% Dark greenish gray (5 GY 4/1) Dry	1					45	75%		13:45	1	
2									Soil sample retained for chemical analysis		2	
3	----- Silty to clayey fine to coarse SAND (SM/SC) Fine to coarse SAND 70% Low plastic fines 30% Coarse sand: calcitic, organic material Reddish brown (5 YR 4/4) Dry	2					2	100%		13:50	3	
4											4	
5		3					0	80%		14:00	5	
6											6	

BORING TERMINATED: 9.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER	DEPTH
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-23-94
 WEATHER Clear 80°
 DRILLER John Storm - ATEC

BORING NO. 1414 - SB03
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Silty to clayey fine to coarse SAND with gravel (SM/SC) Fine to coarse SAND 50% Low plastic fines 30% Fine to coarse well rounded Limestone gravel 20% Dry Light brown (7.5 YR 6/4)	4						3	NA		8	
								Soil sample retained for chemical analysis				
9		Boring terminated at 9.0 ft.							Soil boring advanced with continuous split spoon sampler. No augers used.		9	
10								Soil samples collected using California Brass Rings		10		
11								Soil boring grouted to ground surface and pavement patched with concrete upon completion		11		
12									12			
13									13			

BORING TERMINATED: 9.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH: NA
 WATER 24 HR.: DEPTH: NA
 WATER LOSSES: 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-23-94
 WEATHER Clear 85°
 DRILLER John Storm - ATEC

BORING NO. 1414 - SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Concrete pavement											
2	Very silty to very clayey fine SAND (SM/SC) Fine SAND 55% Low plastic fines 45% Dark greenish gray (5 GY 4/1) Dry Organic material	1					12	100%		14:25	1	
3	Silty to clayey fine to medium SAND (SM/SC) Fine to medium SAND 70% Low plastic fines 30% Medium sand: calcareous angular Dry Brown (7.5 YR 5/4)	2					180	60%	Soil sample retained for chemical analysis	14:30	3	
5	Silty to clayey fine to coarse SAND with gravel (SM/SC) Fine to coarse SAND 60% Fine to coarse gravel 10% Low plastic fines 30% Gravel: well rounded limestone; reddish yellow (7.5 YR 6/6) Dry	3					30	60%		14:40	5	
6											6	

BORING TERMINATED: 9.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER
 HAND CHOP: W/MUD: W/WATER
 ROTARY DRILL: W/MUD: W/WATER
 DIAMOND CORE

DEPTH

TO
 TO
 TO
 TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-23-94
 WEATHER Clear 85°
 DRILLER John Storm - ATEC

BORING NO. 1414 - SB02
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Slightly sandy SILT (ML) Low plastic fines 90% Fine sand 10% Moist Strong brown (7.5 YR 4/4)	4					180	NA	Soil sample retained for chemical analysis		8	
9									Soil boring advanced with continuous split spoon sampler. No augers used.		9	
10		Boring terminated at 9.0 ft.								Soil samples collected using California Brass Rings		10
11										Soil boring grouted to ground surface and pavement patched with concrete upon completion		11
12											12	
13											13	

BORING TERMINATED: 9.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER _____
 HAND CHOP: W/MUD: W/WATER _____
 ROTARY DRILL: W/MUD: W/WATER _____
 DIAMOND CORE _____

DEPTH

TO _____
 TO _____
 TO _____
 TO _____

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-23-94
 WEATHER Clear 85°
 DRILLER John Storm - ATEC

BORING NO. 1414 - SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 1 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
1	Concrete pavement										1	
2	Sandy SILT to CLAY (ML/CL) Low plastic fines 70% Fine sand 20% Medium to coarse sand 10% Dark greenish gray (5 GY 4/1) Dry	1					125	100%	15:10	15:10	2	
3	Silty to clayey fine SAND (SM/SC) Fine SAND 60% Low plastic fines 40% Brown (7.5 YR 4/4)	2					9	100%	15:15	15:15	3	
4											4	
5	Silty to clayey coarse SAND (SM/SC) Coarse SAND 60% Fine sand 10% Low plastic fines 30% Coarse sand: calcitic, well rounded Brown (7.5 YR 4/4)	3					0	100%	15:30	15:30	5	
6											6	

BORING TERMINATED: 9.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING

POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

DEPTH

TO
TO
TO
TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

SOIL TEST BORING RECORD

JOB NO. 11-3517-0121
 JOB NAME Carswell AFB
 DATE: 4-23-94
 WEATHER Clear 85°
 DRILLER John Storm - ATEC

BORING NO. 1414 - SB01
 G.S. ELEV. NA
 HOURS MOVING NA
 HOURS DRILLING NA
 PAGE 2 OF 2

DEPTH (FEET)	STRATA DESCRIPTION	#	"N"				N	P I D	R E C	SOIL CLASSIFICATION AND REMARKS	T I M E	DEPTH (FEET)
			1	2	3	4						
8	Silty to clayey coarse SAND with gravel (SM/SC) Coarse SAND 60% Fine sand 10% Low plastic fines 20% Well rounded limestone gravel 10% Dry Strong brown (7.5 YR 5/6)	4						0	50%	15:35	8	
									Soil sample retained for chemical analysis			
9	Boring terminated at 9.0 ft.								Soil boring advanced with continuous split spoon sampler. No augers used.		9	
									Soil samples collected using California Brass Rings		10	
									Soil having grouted to ground surface and pavement patched with concrete upon completion		11	
											12	
											13	

BORING TERMINATED: 9.0 ft.
 BORING REFUSAL: NA
 WATER TOB DEPTH NA
 WATER 24 HR.: DEPTH NA
 WATER LOSSES 0.0 gal
 CASING: SIZE NA LENGTH NA

METHOD OF ADVANCING BORING	DEPTH
POWER AUGER	TO
HAND CHOP: W/MUD: W/WATER	TO
ROTARY DRILL: W/MUD: W/WATER	TO
DIAMOND CORE	TO

QA / QC INSTALLED BY: TDM CHECKED BY: JLB DISCREPANCIES: _____

ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
Building 38A
Carswell Air Force Base, Texas

PARAMETER	Sample Date:	SD1302SBA	SD1303SBB	SD1303SBC
	Depth:	04/24/94 0-2'	04/24/94 2-4'	04/24/94 4-6'
<u>D2210/METHOD,PERCENT</u>				
SOLIDS, PERCENT		93	85	89
<u>Metals (SW6010/SW3050).(mg/kg)</u>				
ALUMINIUM		3500	12000	6700
ANTIMONY		<4.5	<4.4	<4.6
ARSENIC		18	4.6	<3.5
BARIUM		41	120	69
BERYLLIUM		<1.6	0.16	<0.17
CADMIUM		1.8	3.9	2.1
CALCIUM		260000 JH	86000 JH	100000 JH
CHROMIUM, TOTAL		8.4	12	7.6
COBALT		4.1	5.5	3.6
COPPER		14 JH	8.2 JH	7.6 JH
IRON		6300	13000	7200
LEAD		14	13	7.9
MAGNESIUM		2200	2600	1800
MANGANESE		300	290	100
MOLYBDENUM		<2.9	<2.8	<3.0
NICKEL		6.4	13	6.1
POTASSIUM		640	1700	880
SELENIUM		<6.2	<6.2	<6.6
SILVER		<0.64	<0.62	<0.66
SODIUM		120	68	100
THALLIUM		<5.8	<5.6	<6.0
VANADIUM		16	22	16
ZINC		15 JH	22 JH	12 JH
<u>Volatile Organics (SW8240/SW5030).(mg/kg)</u>				
1,1,1-TRICHLOROETHANE		<0.0056	<0.0059	<0.0058
1,1,2,2-TETRACHLOROETHANE		<0.0056	<0.0059	<0.0058
1,1,2-TRICHLOROETHANE		<0.0056	<0.0059	<0.0058
1,1-DICHLOROETHANE		<0.0056	<0.0059	<0.0058
1,1-DICHLOROETHENE		<0.0056	<0.0059	<0.0058
1,2-DICHLOROETHANE		<0.0056	<0.0059	<0.0058
1,2-DICHLOROPROPANE		<0.0011	<0.0012	<0.0012
2-CHLOROETHYL VINYL ETHER		<0.011 J	<0.012 J	<0.012 J
2-HEXANONE		<0.0056	<0.0059	<0.0058
ACETONE		0.025	<0.012	<0.012
BENZENE		<0.0011	<0.0012	<0.0012
BROMODICHLOROMETHANE		<0.0011	<0.0012	<0.0012
BROMOFORM		<0.0056	<0.0059	<0.0058
BROMOMETHANE		<0.0011	<0.0012	<0.0012
CARBON DISULFIDE		<0.0056	<0.0059	<0.0058
CARBON TETRACHLORIDE		<0.0056	<0.0059	<0.0058
CHLOROBENZENE		<0.0056	<0.0059	<0.0058
CHLOROETHANE		<0.0056	<0.0059	<0.0058
CHLOROFORM		<0.0056	<0.0059	<0.0058
CHLOROMETHANE		<0.0011	<0.0012	<0.0012
DIBROMOCHLOROMETHANE		<0.0056	<0.0059	<0.0058
ETHYLBENZENE		<0.0056	<0.0059	<0.0058
TOTAL-XYLENE		<0.0056	<0.0059	<0.0058
METHYL ETHYL KETONE		<0.011	<0.012	<0.012
METHYL ISOBUTYL KETONE		<0.011	<0.012	<0.012
METHYLENE CHLORIDE		0.018	0.019	<0.0044
STYRENE		<0.0056	<0.0059	<0.0058
TETRACHLOROETHYLENE(PCE)		<0.0056	<0.0059	<0.0058
TOLUENE		<0.0056	<0.0059	<0.0058
TRICHLOROETHYLENE (TCE)		<0.0056	<0.0059	<0.0058
VINYL ACETATE		<0.011	<0.012	<0.012
VINYL CHLORIDE		<0.0022	<0.0024	<0.0023
cis-1,3-DICHLOROPROPENE		<0.0011	<0.0012	<0.0012
trans-1,2-DICHLOROETHENE		<0.0056	<0.0059	<0.0058
trans-1,3-DICHLOROPROPENE		<0.0056	<0.0059	<0.0058
<u>Surrogates, (%)</u>				
1,2-DICHLOROETHANE-D4		111	108	114
1-BROMO-4-FLUOROBENZENE		99	95	100
TOLUENE-D8		101	97	101

J - Estimated quantitation based upon QC data.
 JH - Estimated quantitation - possibly biased high based upon QC data.
 JL - Estimated quantitation - possibly biased low based upon QC data.
 JB - Estimated quantitation - possibly biased high or false positive based upon blank data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

DO NOT WRITE

**ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
Building 1064
Carswell Air Force Base, Texas**

PARAMETER	106401SBD	106401SBE	106402SBA	106402SBB
	Sample Date: 04/27/94	04/27/94	04/27/94	04/27/94
	Depth: 6-8'	8-10'	0-2'	2-4'
D2216/METHOD PERCENT SOLIDS, PERCENT	92	97	87	94
Metals (SW6010/SW3050), (mg/kg)				
ALUMINUM	1900	3700	4300	1300
ANTIMONY	<4.4	<3.9	<4.3	<4.1
ARSENIC	4.3	3.4	<3.2	16
BARIIUM	42	48	50	43
BERYLLIUM	<0.16	<0.14	<0.16	<1.5
CADMIUM	1.7	1.8	1.6	4.0
CALCIUM	110000	27000	84000	210000
CHROMIUM, TOTAL	3.1	6.7	6.0	4.4
COBALT	3.4	2.8	2.7	5.5
COPPER	12 JH	6.5 JH	6.8 JH	87 JH
IRON	6100	6000	5600	13000
LEAD	6.9	11	7.2	8.1
MAGNESIUM	880	5600	1100	1700
MANGANESE	240	130	67	470
MOLYBDENUM	<2.8	<2.5	<2.8	<2.7
NICKEL	5.2	4.7	5.3	7.8
POTASSIUM	350	500	550	200
SELENIUM	<6.2	<5.5	<6.1	<58
SILVER	<0.62	<0.56	<0.62	<0.59
SODIUM	76	22	43	91
THALLIUM	<5.6	<5.0	<5.6	<5.3
VANADIUM	7.1	12	9.9	13
ZINC	16 JH	13 JH	10 JH	44 JH
Volatile Organics (SW8240/SW5030), (mg/kg)				
1,1,1-TRICHLOROETHANE	<0.0054	<0.005	<0.0056	<0.0056
1,1,2,2-TETRACHLOROETHANE	<0.0054	<0.005	<0.0056	<0.0056
1,1,2-TRICHLOROETHANE	<0.0054	<0.005	<0.0056	<0.0056
1,1-DICHLOROETHANE	<0.0054	<0.005	<0.0056	<0.0056
1,1-DICHLOROETHENE	<0.0054	<0.005	<0.0056	<0.0056
1,2-DICHLOROETHANE	<0.0054	<0.005	<0.0056	<0.0056
1,2-DICHLOROPROPANE	<0.0011	<0.001	<0.0011	<0.0011
2-CHLOROETHYL VINYL ETHER	<0.011 J	<0.01 J	<0.011 J	<0.011 J
2-HEXANONE	<0.0054	<0.005	<0.0056	<0.0056
ACETONE	<0.011	<0.01	<0.011	<0.011
BENZENE	<0.0011	<0.001	<0.0011	<0.0011
BROMODICHLOROMETHANE	<0.0011	<0.001	<0.0011	<0.0011
BROMOFORM	<0.0054	<0.005	<0.0056	<0.0056
BROMOMETHANE	<0.0011	<0.001	<0.0011	<0.0011
CARBON DISULFIDE	<0.0054	<0.005	<0.0056	<0.0056
CARBON TETRACHLORIDE	<0.0054	<0.005	<0.0056	<0.0056
CHLOROBEZENE	<0.0054	<0.005	<0.0056	<0.0056
CHLOROETHANE	<0.0054	<0.005	<0.0056	<0.0056
CHLOROFORM	<0.0054	<0.005	<0.0056	<0.0056
CHLOROMETHANE	<0.0011	<0.001	<0.0011	<0.0011
DIBROMOCHLOROMETHANE	<0.0054	<0.005	<0.0056	<0.0056
ETHYLBENZENE	<0.0054	<0.005	<0.0056	<0.0056
TOTAL-XYLENE	<0.0054	<0.005	<0.0056	<0.0056
METHYL ETHYL KETONE	<0.011	<0.01	<0.011	<0.011
METHYL ISOBUTYL KETONE	<0.011	<0.01	<0.011	<0.011
METHYLENE CHLORIDE	0.0089 JB	0.0019 JB	0.0051 JB	0.0031 JB
STYRENE	<0.0054	<0.005	<0.0056	<0.0056
TETRACHLOROETHYLENE (PCE)	<0.0054	<0.005	<0.0056	<0.0056
TOLUENE	<0.0054	<0.005	<0.0056	<0.0056
TRICHLOROETHYLENE (TCE)	<0.0054	<0.005	<0.0056	<0.0056
VINYL ACETATE	<0.011	<0.01	<0.011	<0.011
VINYL CHLORIDE	<0.0022	<0.002	<0.0022	<0.0022
cis-1,3-DICHLOROPROPENE	<0.0011	<0.001	<0.0011	<0.0011
trans-1,2-DICHLOROETHENE	<0.0054	<0.005	<0.0056	<0.0056
trans-1,3-DICHLOROPROPENE	<0.0054	<0.005	<0.0056	<0.0056
Surrogates, (%)				
1,2-DICHLOROETHANE-D4	112	110	110	114
1-BROMO-4-FLUOROBENZENE	93	98	96	97
TOLUENE-D8	91	91	93	92

J - Estimated quantitation based upon QC data.
 JH - Estimated quantitation - possibly biased high based upon QC data.
 JL - Estimated quantitation - possibly biased low based upon QC data.
 JB - Estimated quantitation - possibly biased high or false positive based upon blank data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
BUILDING 1060
CARSWELL AFB

PARAMETER	Sample Date: Depth:	106001SBB 04/23/94 2-4	106001SBF 04/23/94 10-12	Sample 106003SBA 04/23/94 0-2'	Duplicate 1060DP-SB1 04/23/94 0-2'	106003SBF 04/23/94 11-13	106004SBB 04/23/94 1-3'	106004SBF 04/23/94 10-12'
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D2216/METHOD PERCENT SOLIDS, PERCENT 84 84 90 88 91 89 82

Metals (SW6010/SW3050) (MG/KG)								
ALUMINUM	14000	8000	1900 J	8100 J	1300	9700	11000	
ANTIMONY	<5.2 JL	<5.0	<4.1	<4.7	<4.3	<4.6	<5.2	
ARSENIC	5.9	12	9.6	8.6	9.5	3.9	11	
BARIUM	94	56	30 J	56 J	80	50	44	
BERYLLIUM	<1.8	<1.8	<1.5	<1.7	<1.6	0.33	<1.8	
CADMIUM	2.2	1.2	0.74	1.6	1.2	1.6	1.6	
CALCIUM	95000 JH	210000 JH	29000 JH	190000 JH	180000 JH	42000 JH	130000 JH	
CHROMIUM, TOTAL	15	9.2	4.1 J	9.6 J	4.9	10	11	
COBALT	5.6	4.2	2.3	4.0	7.0	4.4	4.7	
COPPER	14	18	30	21	18	8.0	13	
IRON	16000 JH	12000 JH	3100 JH	11000 JH	6600 JH	10000 JH	11000 JH	
LEAD	11	9.0	12	6.6	5.2	12	9.6	
MANGANESE	2600	3400	6400 J	2700 J	1800	1300	2600	
MOLYBDENUM	340	280	220	240	1100	220	230	
NICKEL	<3.3 JL	<3.2	<2.7	<3.0	<2.7	<3.0	<3.3	
POTASSIUM	12	9.1	6.6	8.0	12	9.3	9.3	
SELENIUM	1500	1200	440 J	930 J	240	1100	1500	
SILVER	<0.74	<7.0	<5.8	<6.6	<6.0	<6.5	<7.3	
SODIUM	150	170	96	120	100	92	120	
THALLIUM	<6.6	<6.4	<5.3	<6.0	<5.5	<5.9	<6.6	
VANADIUM	32	23	6.7	20	19	21	20	
ZINC	29 JH	18 JH	16 JH	18 JH	11 JH	16 JH	18 JH	

Volatile Organics (SW6240/SW6300) (MG/KG)								
1,1,1-TRICHLOROETHANE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
1,1,2,2-TETRACHLOROETHANE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
1,1,2-TRICHLOROETHANE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
1,1-DICHLOROETHANE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
1,1-DICHLOROETHENE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
1,2-DICHLOROETHANE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
1,2-DICHLOROPROPANE	<0.0011	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	
2-CHLOROETHYL VINYL ETHER	<0.011 J	<0.012 J	<0.011 J	<0.011 J	<0.012 J	<0.011 J	<0.012 J	
2-HEXANONE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
ACETONE	<0.011	<0.012	<0.011	<0.011	<0.012	<0.011	<0.012	
BENZENE	<0.0011	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	
BROMODICHLOROMETHANE	<0.0011	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	
BROMOFORM	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
BROMOMETHANE	<0.0011	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	
CARBON DISULFIDE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
CARBON TETRACHLORIDE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
CHLOROBENZENE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	
CHLOROETHANE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061	

ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
BUILDING 1060
CARSWELL AFB

PARAMETER	106001SBB	106001SBF	106003SBA	Duplicate	106003SBF	106004SBB	106004SBF
	04/23/94 2-4	04/23/94 10-12	04/23/94 0-2'	1060DPSB1 04/23/94 0-2'	04/23/94 11-13	04/23/94 1-3'	04/23/94 10-12'
Depth:							
CHLOROFORM	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061
CHLOROMETHANE	<0.0011	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012
DIBROMOCHLOROMETHANE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061
ETHYLBENZENE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061
TOTAL-XYLENE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061
METHYL ETHYL KETONE	<0.011 J	<0.012 J	<0.011 J	<0.011 J	<0.012 J	<0.011 J	<0.012 J
METHYL ISOBUTYL KETONE	<0.011	<0.012	<0.011	<0.011	<0.012	<0.011	<0.012
METHYLENE CHLORIDE	0.02/0.02	0.019	0.013	0.015	0.014	0.014	0.018
STYRENE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061
TETRACHLOROETHYLENE(PCE)	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061
TOLUENE	<0.0056	<0.0043	<0.0054	<0.0057	<0.0058	<0.0016	<0.0061
TRICHLOROETHYLENE (TCE)	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061
VINYL ACETATE	<0.011	<0.012	<0.011	<0.011	<0.012	<0.011	<0.012
VINYL CHLORIDE	<0.0023	<0.0024	<0.0022	<0.0023	<0.0023	<0.0021	<0.0024
cis-1,3-DICHLOROPROPENE	<0.0011	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012
trans-1,2-DICHLOROETHENE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061
trans-1,3-DICHLOROPROPENE	<0.0056	<0.006	<0.0054	<0.0057	<0.0058	<0.0054	<0.0061
Surrogates, (%)							
1,2-DICHLOROETHANE-D4	108	113	115	114	116	117	113
1-BROMO-4-FLUOROBENZENE	97	94	96	93	102	84	101
TOLUENE-D8	103	102	100	102	102	92	104

J - Estimated quantitation based upon QC data.
 JH - Estimated quantitation - possibly biased high based upon QC data.
 JL - Estimated quantitation - possibly biased low based upon QC data.
 JB - Estimated quantitation - possibly biased high or false positive based upon blank data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

03/24/94

ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
BUILDING 1027
CARSWELL AFB

PARAMETER	102701SBA 04/22/94 0-2'	102701SBF 04/22/94 10-12'	Sample 102702S8B 04/22/94 2-4'	Duplicate 1027DP SB1 04/22/94 2-4'	102702S8G 04/22/94 12-14'	102703SBF 04/22/94 10-12'	102703S8G 04/22/94 12-14'	102704S8D 04/22/94 6-8'	102704S8F 04/22/94 10-12'
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D2216/METHOD PERCENT
SOLIDS, PERCENT

Metal (Method, SW62010/SW3050), (MG/KG)	89	86	86	90	88	88	86	85	87
ALUMINUM	6900	2000	6000	6100	1800	3700	8200	7400	4800
ANTIMONY	<4.6	<4.6	<4.6	<4.6	<4.3	<4.4	<4.8	<4.7	<4.9
ARSENIC	10	<3.4	11	11	12	6.0	10	10	14
BARIUM	60	17	48	41	36	20	36	43	32
BERYLLIUM	<1.6	0.24	<1.7	<1.6	<1.6	<1.6	<1.7	<1.7	<1.8
CADMIUM	6.1	1.3	0.83	1.1	0.99	0.39	1.0	1.2	1.5
CALCIUM	160000	22000	190000	160000	180000	160000	200000	160000	170000
CHROMIUM, TOTAL	17	4.4	7.4	6.1	4.7	5.2	8.9	9.2	6.1
COBALT	4.2	4.6	5.1	5.1	4.2	1.6	1.6	2.9	3.6
COPPER	26	4.9	27	19	18	8.6	15	14	30
IRON	8000	8700	78 J	10000 J	6200	3200	7800	7500	8100
LEAD	56	5.3	8.9	10	7.0	4.9	7.7	6.6	7.3
MAGNESIUM	2400	430	2600	2200	1600	1700	2300	2900	1800
MANGANESE	240	140	310	250	600	120	160	150	260
MOLYBDENUM	<2.9	<2.9	<3.0	<2.9	<2.7	<2.8	<3.1	<3.0	<2.2
NICKEL	9.3	5.3	9.1	7.6	2.80	2.6	6.7	6.4	7.4
POTASSIUM	1100	320	910	880	280	530	1100	1200	660
SELENIUM	<6.4	<6.6	<6.6	<6.4	<6.90	<6.2	<6.8	<6.6	<7.0
SILVER	<0.65	<0.65	<0.66	<0.65	<0.61	<0.62	<0.69	<0.67	<0.7
SODIUM	89	27	100	90	100	80	88	100	82
THALLIUM	<5.8	<5.8	<6.0	<6.0	<5.5	<5.6	<6.2	<6.0	<6.3
VANADIUM	8.9	12	15	18	11	<7.8	15	8.4	20
ZINC	690 JH	12 JH	24 JH	16 JH	22	7.2 JH	15 JH	31 JH	29 JH

Volatile Organics (Method, SW8240/SW5030), (MG/KG)

1,1,1-TRICHLOROETHANE	<0.0055	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
1,1,2-TRICHLOROETHANE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
1,1,2-TRICHLOROETHANE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
1,1-DICHLOROETHANE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
1,1-DICHLOROETHANE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
1,2-DICHLOROETHANE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
1,2-DICHLOROETHANE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
2-CHLOROETHYL VINYL ETHER	<0.011	<0.011	<0.012	<0.012	<0.011	<0.0056	<0.0057	<0.0058	<0.0058
2-HEXANONE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
ACETONE	<0.011	<0.011	<0.012	<0.012	<0.011	<0.0056	<0.0057	<0.0058	<0.0058
BENZENE	<0.0011	<0.0011	<0.0012	<0.0012	<0.0011	<0.0011	<0.0011	<0.0012	<0.0012
BROMODICHLOROMETHANE	<0.0011	<0.0011	<0.0012	<0.0012	<0.0011	<0.0011	<0.0011	<0.0012	<0.0012
BROMOFORM	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
BROMOMETHANE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
CARBON DISULFIDE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
CARBON TETRACHLORIDE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
CHLOROBENZENE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
CHLOROETHANE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
CHLOROFORM	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
CHLOROMETHANE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
DIBROMOCHLOROMETHANE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
ETHYLBENZENE	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
M-P-XYLENE (SUM OF ISOMERS)	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
METHYL ETHYL KETONE (2-BUTANONE)	<0.0055	<0.0057	<0.0058	<0.0058	<0.0056	<0.0056	<0.0057	<0.0058	<0.0058
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	<0.011	<0.011	<0.012	<0.012	<0.011	<0.0056	<0.0057	<0.0058	<0.0058

ANALYTICAL DATA SUMMARY TABLES
 DO #21 SOIL SAMPLES
 BUILDING 1027
 CARSWELL AFB

PARAMETER	Sample Date:	102701SBA	102701SBF	102702SBB	102702SBB	102702SBB	102702SBB	102702SBB	102703SBF	102703SBB	102704SBD	102704SBF
	Depth:	0-2'	10-12'	2-4'	04/22/94	04/22/94	04/22/94	04/22/94	10-12'	12-14'	6-8'	04/22/94
		0.01 JB	0.013	0.014	0.013	0.013	0.013	0.013	0.012	0.013	0.013	0.014
METHYLENE CHLORIDE		<0.0055	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0057	<0.0056	<0.0058
STYRENE		<0.0055	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0057	<0.0056	<0.0058
TETRACHLOROETHYLENE (PCE)		<0.0055	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0057	<0.0056	<0.0058
TOLUENE		<0.0055	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0057	<0.0056	<0.0058
TRICHLOROETHYLENE (TOE)		<0.0055	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0057	<0.0056	<0.0058
VINYL ACETATE		<0.0011	<0.011	<0.012	<0.012	<0.011	<0.011	<0.011	<0.011	<0.011	<0.012	<0.012
VINYL CHLORIDE		<0.0022	<0.0023	<0.0023	<0.0023	<0.0022	<0.0022	<0.0022	<0.0022	<0.0023	<0.0023	<0.0023
cis-1,3-DICHLOROPROPENE		<0.0011	<0.0011	<0.0012	<0.0012	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0012	<0.0012
trans-1,2-DICHLOROETHENE		<0.0055	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0057	<0.0056	<0.0058
trans-1,3-DICHLOROPROPENE		<0.0055	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0057	<0.0056	<0.0058
Surrogates, (%)												
1,2-DICHLOROETHANE-D4		111	110	109	108	112	112	112	109	110	109	107
1-BROMO-4-FLUOROBENZENE		96	100	102	99	100	100	100	100	97	101	100
4-BROMOFLUOROBENZENE		91	92	91	93	97	97	97	92	90	90	93
TOLUENE-D8												

J - Estimated quantitation based upon QC data.
 JH - Estimated quantitation - possibly biased high based upon QC data.
 JL - Estimated quantitation - possibly biased low based upon QC data.
 JB - Estimated quantitation - possibly biased high or false positive based upon blank data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

0074 NADA

ANALYTICAL DATA SUMMARY TABLES
 DO #21 SOIL SAMPLES
 BUILDING 1015
 CARSWELL AFB

PARAMETER	Sample Date: Depth:	101501SBA 04/22/94 0-2'	101501SBC 04/22/94 4-6'	101502SBA 04/22/94 0-2'	Sample 101502SBB 04/22/94 2-4'	Duplicate 1015DP5B01 04/22/94 2-4'	101503SBC 04/22/94 4-6'	101503SBD 04/22/94 6-8'
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D2216/METHOD PERCENT SOLIDS, PERCENT 88 84 84 82 87 93 93

Metals (SW6010/SW3050) (MG/KG)

ALUMINUM	5100	7600	19000	14000	11000	3600	3100
ANTIMONY	<4.1	<4.9	<4.8	<4.7	<4.4	<4.3 JL	<4.5
ARSENIC	10	11	4.9	10	8.5	8.7	7.4
BARUM	44	48	140	120 J	67 J	26	23
BERYLLIUM	<1.5	<1.8	0.69	<1.7	<1.6	<1.6 JL	<1.6
CADMIUM	1.1	1.2	2.3	1.8	1.5	0.85	0.80
CALCIUM	280000	310000	70000	170000 J	240000 J	340000	320000
CHROMIUM, TOTAL	18	8.9	18	15	12	5.4	4.6
COBALT	3.4	3.2	5.8	5.3	3.9	2.5	2.4
COPPER	17	25	12	17	16	22	22
IRON	7100	8100	17000	14000 J	1100 J	5900	4400
LEAD	6.3	6.2	14	11	8.0	5.1	<3.0
MAGNESIUM	3000	3600	2600	300 J	3200 J	3300	3200
MANGANESE	280	200	240	240	210	190	170
MOLYBDENUM	<2.7	<3.2	<3.1	<3.0	<2.8	<2.8	<2.9
NICKEL	6.0	7.0	13	10	9.3	4.7	4.7
POTASSIUM	700	1100	1900	1800	1500	6100	540
SELENIUM	<5.8	<7.0	<6.8	<6.6	<6.2	<6.1	<6.2
SILVER	210	190	110	150	200	340	280
SODIUM	<53	<63	<62	<6.0	<56	<5.6	<58
THALLIUM	8.9	15	30	2.4 J	14 J	10	<8.0
ZINC	12 JH	26 JH	28 JH	26 JH	23 JH	12 JH	9.1 JH

Volatile Organics (SW8240/SWS030) (MG/KG)

1,1,1-TRICHLOROETHANE	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054
1,1,2,2-TETRACHLOROETHANE	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054
1,1,2-TRICHLOROETHANE	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054
1,1-DICHLOROETHANE	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054
1,1-DICHLOROETHANE	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054
1,2-DICHLOROETHANE	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054
1,2-DICHLOROPROPANE	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.01	<0.011
2-CHLOROETHYL VINYL ETHER	<0.011	<0.011	<0.011	<0.011	<0.011	<0.0052 J	<0.011
2-HEXANONE	<0.0055 J	<0.0057 J	<0.0056 J	<0.0054 J	<0.0054 J	<0.0052 J	<0.0054 J
ACETONE	<0.011	<0.011	0.01 J	<0.011	<0.011	<0.01	<0.011
BENZENE	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.001	<0.0011
BROMODICHLOROMETHANE	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.001	<0.0011
BROMOFORM	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054
BROMOMETHANE	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.001	<0.0011
CARBON DISULFIDE	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054
CARBON TETRACHLORIDE	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054
CHLOROBENZENE	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054
CHLOROETHANE	<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0052	<0.0054

ANALYTICAL DATA SUMMARY TABLES
 DO #21 SOIL SAMPLES
 BUILDING 1015
 CARSWELL AFB

PARAMETER	101501SBA		101501SBC		101502SBA		101502SBB		101503SBC		101503SBD	
	Sample Date: Depth:	0-2'	4-6'	0-2'	0-2'	2-4'	2-4'	2-4'	4-6'	4-6'	6-8'	
CHLOROFORM		<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0052	<0.0054	<0.0054	
CHLOROMETHANE		<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	
DIBROMOCHLOROMETHANE		<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0052	<0.0054	<0.0054	
ETHYLENE		<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0052	<0.0054	<0.0054	
total-XYLENE		<0.011 J	<0.011 J	<0.011 J	<0.011 J	<0.011 J	<0.011 J	<0.011 J	<0.01 J	<0.011 J	<0.011 J	
METHYL ETHYL KETONE		<0.011	<0.011	<0.01	<0.011	<0.011	<0.011	<0.011	<0.01	<0.011	<0.011	
METHYL ISOBUTYL KETONE		0.012 JB	0.013	0.012 JB	0.011 JB	0.011 JB	0.010 JB	0.010 JB	0.01 JB	0.012 JB	0.012 JB	
METHYLENE CHLORIDE		<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0052	<0.0054	<0.0054	
STYRENE		<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0052	<0.0054	<0.0054	
TETRACHLOROETHYLENE(PCE)		<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0052	<0.0054	<0.0054	
TOLUENE		<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0052	<0.0054	<0.0054	
TRICHLOROETHYLENE (TCE)		<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0052	<0.0054	<0.0054	
VINYL ACETATE		<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.01	<0.011	<0.011	
VINYL CHLORIDE		<0.0022	<0.0023	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0021	<0.0022	<0.0022	
cis-1,3-DICHLOROPROPENE		<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	<0.001	<0.0011	<0.0011	
trans-1,2-DICHLOROETHENE		<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0052	<0.0054	<0.0054	
trans-1,3-DICHLOROPROPENE		<0.0055	<0.0057	<0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0052	<0.0054	<0.0054	
Surrogates, (%)		107	107	108	110	110	110	110	103	109	109	
1,2-DICHLOROETHANE-D4		98	98	98	98	98	98	98	98	98	98	
1-BROMO-4-FLUOROBENZENE		95	94	94	93	93	92	92	96	92	92	
TOLUENE-D8												

JH - Estimated quantitation - possibly biased high based upon QC data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

CONFIDENTIAL

ANALYTICAL DATA SUMMARY TABLES
 DO #21 SOIL SAMPLES
 BUILDING 4210
 CARSWELL AFB

PARAMETER	Sample Date: 04/21/94 Depth: 10-12	421001SBF	421001SBG	421002SBC	421002SBH	421003SBC	421003SBG	Sample 421004SBF	Duplicate 4210DDPSB1	421004SBG
D2216/METHOD (%)										
SOLIDS, PERCENT										
SW6010/SW3050 MG/KG										
ALUMINUM		7200	8100	7200	4800	9800	7200	6000	5100	8300
ANTIMONY		<4.5	<4.7	<5.0	<4.6	<4.9 JL	<4.7	<4.7	<4.7	<5.0
BARIUM		86	75	75	47	110	48	46	42	48
BERYLLIUM		<1.6	<1.7	0.53	<1.6	0.36	<1.7	<1.7	<1.7	<1.8
CADMIUM		1.1	1.6	1.2	0.81	1.8	1.5	1.6	0.84	1.8
CALCIUM		120000	130000	25000	130000	62000	99000	130000	140000	120000
CHROMIUM, TOTAL		8.2	8.6	10	6.7	14	9.7	8.6	7.1	10
COBALT		7.0	7.9	4.7	4.6	5.2	6.0	7.5	5.6	12
COPPER	20 JH	20 JH	20 JH	8.0 JH	27 JH	12 JH	16 JH	52 JH	34 JH	27 JH
IRON	11000	12000	9300	7600	13000	14000	14000	16000 J	8300 J	17000
LEAD	8.2	11	16	58	36	1700	8.8	11	8.21	13
MAGNESIUM	2200	2400	1200	1900	220	2200	180	2000	1900	2400
MANGANESE	660	600	160	270	220	180	180	320	280	270
MOLYBDENUM	<2.9	<3.0	<3.2	<2.9	<3.2	<3.0	<3.0	<3.0	<3.0	<3.2
NICKEL	16	16	8.4	9.5	11	11	12	14	9.5	16
POTASSIUM	1300	1400	980	830	1300	1300	1200	960	800	1400
SELENIUM	<63	<66	<7.0	<6.4	<7.0	<0.70	<6.6	<6.6	<6.6	<7.0
SILVER	<0.64	<0.67	<0.71	<0.65	<0.67	<0.67	<0.67	<0.67	<0.67	<0.71
SODIUM	68	64	33	68	47	53	53	62	62	67
THALLIUM	<5.8	<60	<6.4	<5.8	<6.3	<6.3	<60	<60	<6.0	<64
VANADIUM	19	17	22	15	28	28	24	38	23	32
ZINC	20 JH	22 JH	16 JH	18 JH	27 JH	23 JH	23 JH	32 JH	19 JH	27 JH

PARAMETER	Sample Date: 04/21/94 Depth: 10-12	421001SBF	421001SBG	421002SBC	421002SBH	421003SBC	421003SBG	Sample 421004SBF	Duplicate 4210DDPSB1	421004SBG
SW6240/SW5030 MG/KG										
1,1,1-TRICHLOROETHANE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
1,1,2,2-TETRACHLOROETHANE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
1,1,2-TRICHLOROETHANE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
1,1-DICHLOROETHANE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
1,1-DICHLOROETHENE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
1,2-DICHLOROETHANE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
1,2-DICHLOROPROPANE		<0.0012 J	<0.0011 J	<0.0012 J						
2-CHLOROETHYL VINYL ETHER		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
2-HEXANONE		<0.012	0.021	<0.012	<0.012	0.034	<0.012	<0.012	<0.011	<0.012
ACETONE		<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.011	<0.012
BENZENE		<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0011	<0.0012
BROMODICHLOROMETHANE		<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0011	<0.0012
BROMOFORM		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
BROMOMETHANE		<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0011	<0.0012
CARBON DISULFIDE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
CARBON TETRACHLORIDE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
CHLOROBENZENE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
CHLOROFORM		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
CHLOROPROPANE		<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0011	<0.0012
CHLOROMETHANE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
DI-BROMO-CHLOROMETHANE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
ETHYL BENZENE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
M,P-XYLENE (SUM OF ISOMERS)		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
METHYL ETHYL KETONE (2-BUTANONE)		<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.011	<0.012

ANALYTICAL DATA SUMMARY TABLES
 DO #21 SOIL SAMPLES
 BUILDING 4210
 CARSWELL AFB

PARAMETER	Sample Date:	421001SBF	421001SBG	421002SBC	421002SBH	421003SBC	421003SBG	421004SBF	Duplicate	421004SBG
	Depth:	10-12'	12-14'	4-6'	14-16'	4-6'	12-14'	10-12'	04/21/94	12-14'
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTA		<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.011	<0.012
METHYLENE CHLORIDE		0.021 JH	0.016 JH	0.021 JH	0.019 JH	0.014 JH	0.019 JH	0.016 JH	0.019 JH	0.015 JH
STYRENE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
TETRACHLOROETHYLENE(PCE)		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
TOLUENE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
TRICHLOROETHYLENE (TCE)		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
VINYL ACETATE		<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.011	<0.012
VINYL CHLORIDE		<0.0023	<0.0023	<0.0025	<0.0023	<0.0025	<0.0024	<0.0023	<0.0023	<0.0023
cis-1,3-DICHLOROPROPENE		<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012	<0.0011	<0.0012
trans-1,2-DICHLOROETHENE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
trans-1,3-DICHLOROPROPENE		<0.0058	<0.0058	<0.0062	<0.0058	<0.0062	<0.0059	<0.0058	<0.0057	<0.0058
Sumogates. (%)										
1,2-DICHLOROETHANE-D4		112	116	115	117	113	114	116	116	116
1-BROMO-4-FLUOROBENZENE (4-BROMOFLUOROBE		100	102	98	101	103	103	103	103	103
TOLUENE-D8		104	103	102	103	102	102	102	101	104

J - Estimated quantitation based upon QC data.
 JH - Estimated quantitation - possibly biased high based upon QC data.
 JL - Estimated quantitation - possibly biased low based upon QC data.
 JB - Estimated quantitation - possibly biased high or false positive based upon blank data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

NOVA

**ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
Building 1414
Carswell Air Force Base, Texas**

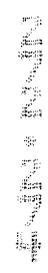
PARAMETER	Sample Date: Depth:	DP1701SBA 04/24/94 1-3'	DP1701SBD 04/24/94 7-9'	DP1702SBB 04/24/94 3-5'	DP1702SBD 04/24/94 7-9'	DP1703SBA 04/24/94 1-3'	DP1703SBD 04/24/94 7-9'
D2216/METHOD PERCENT							
SOLIDS, PERCENT		81	83	81	88	82	87
Metals (SW6010/SW3050),(mg/kg)							
ALUMINUM		7700	9900	11000	5600	6800	12000
ANTIMONY		<5.1	<4.4	<4.6	<4.6	<4.9	<4.8
ARSENIC		8.7	<3.3	<3.5	11	4.1	9.7
BARIUM		86	150	67	34	88	38
BERYLLIUM		0.73	0.39	0.75	<1.6	0.7	<1.7
CADMIUM		2.2	1.3	1.2	1.2	1.4	1.6
CALCIUM		12000 JH	46000 JH	4600 JH	220000 JH	5200 JH	20000 JH
CHROMIUM, TOTAL		8.6	9.4	10	6.5	8.1	9.5
COBALT		16	4.8	6.1	2.8	7.7	6.1
COPPER		7.9	8.0	5.2	17	9.9	18
IRON		16000 JH	9400 JH	11000 JH	6800 JH	8100 JH	12000 JH
LEAD		51	11	13	6.6	11	8.0
MAGNESIUM		1200	2000	1300	270	1100	3100
MANGANESE		430	190	170	23	110	500
MOLYBDENUM		<3.3	<2.8	<3.0	<3.0	<3.2	<3.1
NICKEL		16	11	9.6	7.4	10	11
POTASSIUM		820	1100	740	910	700	1400
SELENIUM		<7.2	<6.2	<6.6	<6.5	<7.0	<6.8
SILVER		<0.73	<0.62	<0.66	<0.66	<0.7	<0.69
SODIUM		270	490	480	320	200	460
THALLIUM		<6.6	<5.6	<6.0	<5.9	<6.3	<6.2
VANADIUM		25	16	16	13	17	22
ZINC		13 JH	16 JH	12 JH	12 JH	13 JH	19 JH
Volatile Organics (SW8240/SW5030),(mg/kg)							
1,1,1-TRICHLOROETHANE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
1,1,2,2-TETRACHLOROETHANE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
1,1,2-TRICHLOROETHANE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
1,1-DICHLOROETHANE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
1,1-DICHLOROETHENE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
1,2-DICHLOROETHANE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
1,2-DICHLOROPROPANE		<0.0012	<0.0012	<0.0012	<0.0011	<0.0012	<0.0011
2-CHLOROETHYL VINYL ETHER		<0.012 J	<0.012 J	<0.012 J	<0.011 J	<0.012 J	<0.011 J
2-HEXANONE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
ACETONE		<0.012	<0.012	0.066	<0.011	0.038	<0.011
BENZENE		<0.0012	<0.0012	<0.0012	<0.0011	<0.0012	<0.0011
BROMODICHLOROMETHANE		<0.0012	<0.0012	<0.0012	<0.0011	<0.0012	<0.0011
BROMOFORM		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
BROMOMETHANE		<0.0012	<0.0012	<0.0012	<0.0011	<0.0012	<0.0011
CARBON DISULFIDE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
CARBON TETRACHLORIDE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
CHLOROETHANE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
CHLOROETHENE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
CHLOROFORM		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
CHLOROMETHANE		<0.0012	<0.0012	<0.0012	<0.0011	<0.0012	<0.0011
DIBROMOCHLOROMETHANE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
ETHYLBENZENE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
TOTAL-XYLENE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
METHYL ETHYL KETONE		<0.012 J	<0.012 J	<0.012 J	<0.011 J	<0.012 J	<0.011 J
METHYL ISOBUTYL KETONE		<0.012	<0.012	<0.012	<0.011	<0.012	<0.011
METHYLENE CHLORIDE		0.019	0.021	0.018	0.02	0.022	0.018
STYRENE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
TETRACHLOROETHYLENE(PCE)		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
TOLUENE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
TRICHLOROETHYLENE (TCE)		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
VINYL ACETATE		<0.012	<0.012	<0.012	<0.011	<0.012	<0.011
VINYL CHLORIDE		<0.0024	<0.0023	<0.0025	<0.0024	<0.0024	<0.0023
cis-1,3-DICHLOROPROPENE		<0.0012	<0.0012	<0.0012	<0.0011	<0.0012	<0.0011
trans-1,2-DICHLOROETHENE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
trans-1,3-DICHLOROPROPENE		<0.006	<0.0058	<0.0062	<0.0056	<0.006	<0.0057
Surrogates, (%)							
1,2-DICHLOROETHANE-D4		113	117	113	116	115	112
1-BROMO-4-FLUOROBENZENE		100	103	100	106	99	104
TOLUENE-D8		103	103	105	103	102	103

J -Estimated quantitation based upon QC data.
 JH -Estimated quantitation - possibly biased high based upon QC data.
 JL -Estimated quantitation - possibly biased low based upon QC data.
 JB -Estimated quantitation - possibly biased high or false positive based upon blank data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
Building 1145
Carswell Air Force Base, Texas

PARAMETER	114501SBD	114501SBE	114502SBD	114502SBE	114503SBA	114503SBE	Sample	Duplicate	114504SBE
	04/24/94 4-7	04/24/94 7-9	04/24/94 6-8	04/24/94 8-10	04/24/94 1-2	04/24/94 8-10	114504SBA 04/24/94 0-2	114504SBI 04/24/94 0-2	114504SBE 04/24/94 8-10
DEPTH	83	81	85	82	91	81	84	91	89
2216/METHOD PERCENT SOLDS. PERCENT									
Metals (SW6010/SW3050).(mg/kg)									
ALUMINUM	12000	12000	13000	16000	4500	13000	2600 J	5800 J	16000
ANTIMONY	<4.9	<5.0	<4.6	<5.1	<4.8	<5.2 JL	<5.9	<4.5	<4.3
ARSENIC	<3.7	<3.7	9.4	<3.8	17	<3.9	<3.8	5.4	<3.2
BARIUM	120	99	120	110	75	89	23 J	51 J	100
BERYLLIUM	<0.18	<0.18	<0.18	<0.18	<1.7	<1.9	0.27	<0.16	<0.16
CADMIUM	2.1	2.0	2.7	3.2	2.3	2.4	0.99 J	2.3 J	2.7
CALCIUM	150000 JH	140000 JH	180000 JH	160000 JH	310000 JH	160000 JH	110000 J	110000 J	160000 JH
CHROMIUM, TOTAL	10	9.7	11	14	6.8	12	0.72 J	7.1 J	12
COBALT	3.0	3.3	5.1	4.6	4.6	3.8	3.2	3.3	4.7
COPPER	10 JH	7.9 JH	13 JH	11 JH	14 JH	11 JH	4.0 J	8.4 J	9.3 JH
IRON	7900	7700	10000	13000	8100	9000	3600 J	9700 J	12000
LEAD	10	11	11	11	6.3	11	7.3 J	21 J	11
MAGNESIUM	1900	1900	2200	2900	2600	2200	560 J	1600 J	2200
MANGANESE	77	16	200	94	290	190	25 J	140 J	120
MOLYBDENUM	<3.2	<3.2	<3.1	<3.2	<3.1	<3.4 JL	<2.9	<2.8	<2.8
NICKEL	7.7	7.4	8.5	9.1	8.8	9.9	2.7	7.0	8.3
POTASSIUM	1300	1300	1300	1700	700	1600	300 J	920 J	170
SELENIUM	<7.0	<7.0	<6.6	<7.1	<6.7	<7.4	<0.72	<6.3	<6.1
SILVER	<0.7	<0.71	<0.68	<0.73	<0.68	<0.74	<0.72	<0.64	<0.62
SODIUM	55	63	61	78	180	98	19	72	74
THALLIUM	<0.3	<0.4	<0.0	<0.6	<0.1	<6.7	<5.6	<5.6	<5.6
VANADIUM	18	16	27	23	18	27	2.7 J	13 J	24
ZINC	21 JH	18 JH	21 JH	25 JH	15 JH	21 JH	3.1 J	22 J	23 JH
Volatile Organics (SW6240/SW5030).(mg/kg)									
1,1,1-TRICHLOROETHANE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
1,1,2-TRICHLOROETHANE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
1,1,2-TRICHLOROETHANE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
1,1-DICHLOROETHANE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
1,1-DICHLOROETHENE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
1,2-DICHLOROETHANE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
1,2-DICHLOROPROPANE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
2-CHLOROETHYL VINYL ETHER	<0.012 J	<0.012 J	<0.012 J	<0.012 J	<0.011 J	<0.012 J	<0.011 J	<0.011 J	<0.012 J
2-HEXANONE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
ACETONE	<0.012	<0.012	0.03	0.048	0.073	<0.012	<0.011	<0.011	<0.012
BENZENE	<0.0012	<0.0012	<0.0012	<0.0012	<0.0011	<0.0012	<0.0011	<0.0011	<0.0012
BROMODICHLOROMETHANE	<0.0012	<0.0012	<0.0012	<0.0012	<0.0011	<0.0012	<0.0011	<0.0011	<0.0012
BROMOFORM	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
BROMOMETHANE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
CARBON DISULFIDE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
CARBON TETRACHLORIDE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
CHLOROBENZENE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
CHLOROETHANE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
CHLOROFORM	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
CHLOROMETHANE	<0.0012	<0.0012	<0.0012	<0.0012	<0.0011	<0.0012	<0.0011	<0.0011	<0.0012
DIBROMOCHLOROMETHANE	<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006



ANALYTICAL DATA SUMMARY TABLES
 DO #21 SOIL SAMPLES
 Building 1145
 Carswell Air Force Base, Texas

PARAMETER	Sample Date: Depth:	114501SBD 04/24/94 4-7'	114501SBE 04/24/94 7-9'	114502SBD 04/24/94 5-6'	114502SBE 04/24/94 8-10'	114503SBA 04/24/94 1-2'	114503SBE 04/24/94 8-10'	Sample 114504SBA 04/24/94 0-2'	Duplicate 11450P S81 04/24/94 0-2'	114504SBE 04/24/94 8-10'
ETHYLBENZENE		<0.006	<0.006	<0.006	0.01	<0.0056	<0.006	<0.0054	<0.0054	<0.006
TOTAL-XYLENE		<0.006	0.049	<0.006	0.045	<0.0056	<0.006	<0.0054	<0.0054	<0.006
METHYL ETHYL KETONE		<0.012	<0.012	<0.012	<0.012	<0.011	<0.012	<0.011	<0.011	<0.012
METHYL ISOBUTYL KETONE		<0.012	<0.012	<0.012	<0.012	<0.011	<0.012	<0.011	<0.011	<0.012
METHYLENE CHLORIDE		0.016	0.014	0.017	0.017	0.017	0.015	0.014	0.014	0.015
STYRENE		<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
TETRACHLOROETHYLENE(PCE)		<0.006	<0.00094	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
TOLUENE		<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
TRICHLOROETHYLENE (TCE)		<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
VINYL ACETATE		<0.012	<0.012	<0.012	<0.012	<0.011	<0.012	<0.011	<0.011	<0.012
VINYL CHLORIDE		<0.0024	<0.0024	<0.0024	<0.0024	<0.0023	<0.0024	<0.0022	<0.0022	<0.0024
trans-1,3-DICHLOROPROPENE		<0.0012	<0.0012	<0.0012	<0.0012	<0.0011	<0.0012	<0.0011	<0.0011	<0.0012
cis-1,3-DICHLOROPROPENE		<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
trans-1,3-DICHLOROPROPENE		<0.006	<0.006	<0.006	<0.006	<0.0056	<0.006	<0.0054	<0.0054	<0.006
Sumrogates, (%)										
1,2-DICHLOROETHANE-D4		110	114	111	112	111	112	112	109	111
1-BROMO-4-FLUOROBENZENE		98	101	100	98	94	103	98	90	100
TOLUENE-D8		102	104	103	101	99	104	102	100	104

J - Estimated quantitation based upon OC data.
 JH - Estimated quantitation - possibly biased high based upon OC data.
 JL - Estimated quantitation - possibly biased low based upon OC data.
 JB - Estimated quantitation - possibly biased high or false positive based upon blank data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

**ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
BUILDING 1190
CARSWELL AFB**

PARAMETER	Sample		Duplicate		
	Date Sampled: Depth	119001SBA 04/26/94 0-2'	1190DPSB1 04/26/94 0-2'	119002SBA 04/26/94 0-2'	119003SBA 04/26/94 0-2'
D2216/METHOD,PERCENT					
SOLIDS, PERCENT		86	84	85	85
Metals (SW6010/SW3050),(MG/KG)					
ALUMINUM		3200 J	5600 J	6600	10000
ANTIMONY		<4.9	<4.4	<4.4	<4.6
ARSENIC		<3.7	4.4	4.3	7.6
BARIUM		36 J	61 J	57	76
BERYLLIUM		<0.18	<0.16	<0.16	0.33
CADMIUM		1.8 J	5.4 J	2.1	3.6
CALCIUM		150000	110000	87000	46000
CHROMIUM, TOTAL		6.3 J	17 J	9.8	11
COBALT		2.0	3.1	2.5	5.2
COPPER		7.5 J	19 J	5.1	5.9
IRON		5300	7600	6800	12000
LEAD		8.8 J	88 J	10	12
MAGNESIUM		1200	1400	1100	160
MANGANESE		180	200	92	260
MOLYBDENUM		<3.2	<2.8	<2.8	<3.0
NICKEL		5.9	7.6	5.8	10
POTASSIUM		460 J	870 J	680	1200
SELENIUM		<7.0	<6.2	<6.2	<6.5
SILVER		<0.7	<0.62	<0.62	<0.66
SODIUM		67	54	39	45
THALLIUM		<6.3	<5.6	<5.6	<5.9
VANADIUM		12	16	20	19
ZINC		10 J	46 J	18	17
Volatile Organics (SW8240/SW5030),(MG/KG)					
1,1,1-TRICHLOROETHANE		<0.0058	<0.0062	<0.006	<0.0058
1,1,2,2-TETRACHLOROETHANE		<0.0058	<0.0062	<0.006	<0.0058
1,1,2-TRICHLOROETHANE		<0.0058	<0.0062	<0.006	<0.0058
1,1-DICHLOROETHANE		<0.0058	<0.0062	<0.006	<0.0058
1,1-DICHLOROETHENE		<0.0058	<0.0062	<0.006	<0.0058
1,2-DICHLOROETHANE		<0.0058	<0.0062	<0.006	<0.0058
1,2-DICHLOROPROPANE		<0.0012	<0.0012	<0.0012	<0.0012
2-CHLOROETHYL VINYL ETHER		<0.012 J	<0.012 J	<0.012 J	<0.012 J
2-HEXANONE		<0.0058	<0.0062	<0.006	<0.0058
ACETONE		<0.012	<0.012	<0.012	<0.012
BENZENE		<0.0012	<0.0012	<0.0012	<0.0012
BROMODICHLOROMETHANE		<0.0012	<0.0012	<0.0012	<0.0012
BROMOFORM		<0.0058	<0.0062	<0.006	<0.0058
BROMOMETHANE		<0.0012	<0.0012	<0.0012	<0.0012
CARBON DISULFIDE		<0.0058	<0.0062	<0.006	<0.0058
CARBON TETRACHLORIDE		<0.0058	<0.0062	<0.006	<0.0058
CHLOROBENZENE		<0.0058	<0.0062	<0.006	<0.0058
CHLOROETHANE		<0.0058	<0.0062	<0.006	<0.0058
CHLOROFORM		<0.0058	<0.0062	<0.006	<0.0058
CHLOROMETHANE		<0.0012	<0.0012	<0.0012	<0.0012
DIBROMOCHLOROMETHANE		<0.0058	<0.0062	<0.006	<0.0058
ETHYLBENZENE		<0.0058	<0.0062	<0.006	<0.0058
TOTAL-XYLENE		<0.0058	<0.0062	<0.006	<0.0058
METHYL ETHYL KETONE		<0.012	<0.012	<0.012	<0.012
METHYL ISOBUTYL KETONE		<0.012	<0.012	<0.012	<0.012
METHYLENE CHLORIDE		0.016	0.0068 JB	0.002 JB	0.011
STYRENE		<0.0058	<0.0062	<0.006	<0.0058
TETRACHLOROETHYLENE(PCE)		<0.0058	<0.0062	<0.006	<0.0058
TOLUENE		<0.0058	<0.0062	<0.006	<0.0017
TRICHLOROETHYLENE (TCE)		<0.0058	<0.0062	<0.006	<0.0058
VINYL ACETATE		<0.012	<0.012	<0.012	<0.012
VINYL CHLORIDE		<0.0023	<0.0025	<0.0024	<0.0023
cis-1,3-DICHLOROPROPENE		<0.0012	<0.0012	<0.0012	<0.0012
trans-1,2-DICHLOROETHENE		<0.0058	<0.0062	<0.006	<0.0058
trans-1,3-DICHLOROPROPENE		<0.0058	<0.0062	<0.006	<0.0058
Surrogates, (%):					
1,2-DICHLOROETHANE-D4		110	111	111	109
1-BROMO-4-FLUOROBENZENE		94	96	94	98
TOLUENE-D8		96	96	97	98

J - Estimated quantitation based upon QC data.
 JH - Estimated quantitation - possibly biased high based upon QC data.
 JL - Estimated quantitation - possibly biased low based upon QC data.
 JB - Estimated quantitation - possibly biased high or false positive based upon blank data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
Building 1191
Carswell Air Force Base, Texas

PARAMETER	119101SBB		119101SBC		Sample	Duplicate	119103SBB
	Sample Date:	04/25/94	04/25/94	04/25/94	119102SBB	1191DPSB1	04/25/94
	Depth:	1-3'	3-5'	3-5'	04/25/94 2-4'	04/25/94 2-4'	04/25/94 2-4'
D2216/METHOD PERCENT							
SOLIDS, PERCENT		94	88		95	96	88
Metals (SW6010/SW3050), (mg/kg)							
ALUMINUM		550	3600		630	530	690
ANTIMONY		<4.3	<4.6		<4.1	<4.2	<4.3
ARSENIC		13	6.6		13	13	14
BARIUM		4.9	38		5.3	6.8	8.9
BERYLLIUM		<1.6	<0.16		<1.5	<1.5	<1.6
CADMIUM		0.38	2.7		0.66	0.45	1.0
CALCIUM		360000 JH	390000 JH		350000 JH	410000 JH	370000 JH
CHROMIUM, TOTAL		2.1	5.7		2.7	2.3	2.7
COBALT		2.3	4.1		1.7	2.1	0.23
COPPER		9.2	8.1		14	14	16
IRON		1900 JH	11000 JH		1900 J	180 J	3400 JH
LEAD		<2.8	7.9		<2.7	<2.8	<2.8
MAGNESIUM		1900	680		2300	2400	2000
MANGANESE		120	330		130	130	180
MOLYBDENUM		<2.8	<3.0		<2.6	<2.7	<2.8
NICKEL		<1.9	6.2		<1.8	<1.9	2.6
POTASSIUM		110	540		120	100	130
SELENIUM		<6.1	<6.5		<5.8	<5.9	<6.1
SILVER		<0.62	<0.66		<0.58	<0.6	<0.62
SODIUM		110	45		100	100	120
THALLIUM		<5.6	<5.9		<5.3	<5.4	<5.6
VANADIUM		<7.7	14		<7.3	<7.5	<7.7
ZINC		5.1	20		5.1	7.6	39
Volatile Organics (SW8240/SW5030), (mg/kg)							
1,1,1-TRICHLOROETHANE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
1,1,2,2-TETRACHLOROETHANE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
1,1,2-TRICHLOROETHANE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
1,1-DICHLOROETHANE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
1,1-DICHLOROETHENE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
1,2-DICHLOROETHANE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
1,2-DICHLOROPROPANE		<0.0011	<0.0011		<0.0011	<0.0011	<0.0011
2-CHLOROETHYL VINYL ETHER		<0.011 J	<0.011 J		<0.011 J	<0.011 J	<0.011 J
2-HEXANONE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
ACETONE		<0.011	<0.011		<0.011	<0.011	<0.011
BENZENE		<0.0011	<0.0011		<0.0011	<0.0011	<0.0011
BROMODICHLOROMETHANE		<0.0011	<0.0011		<0.0011	<0.0011	<0.0011
BROMOFORM		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
BROMOMETHANE		<0.0011	<0.0011		<0.0011	<0.0011	<0.0011
CARBON DISULFIDE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
CARBON TETRACHLORIDE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
CHLOROETHANE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
CHLOROETHENE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
CHLOROETHANE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
CHLOROFORM		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
CHLOROMETHANE		<0.0011	<0.0011		<0.0011	<0.0011	<0.0011
DIBROMOCHLOROMETHANE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
ETHYLBENZENE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
TOTAL-XYLENE (SUM OF ISOMERS)		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
METHYL ETHYL KETONE (2-BUTANONE)		<0.011	<0.011		<0.011	<0.011	<0.011
METHYL ISOBUTYL KETONE		<0.011	<0.011		<0.011	<0.011	<0.011
METHYLENE CHLORIDE		0.017	0.016		0.018	0.02	0.018
STYRENE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
TETRACHLOROETHYLENE(PCE)		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
TOLUENE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
TRICHLOROETHYLENE (TCE)		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
VINYL ACETATE		<0.011	<0.011		<0.011	<0.011	<0.011
VINYL CHLORIDE		<0.0023	<0.0021		<0.0021	<0.0021	<0.0021
cis-1,3-DICHLOROPROPENE		<0.0011	<0.0011		<0.0011	<0.0011	<0.0011
trans-1,2-DICHLOROETHENE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
trans-1,3-DICHLOROPROPENE		<0.0056	<0.0054		<0.0053	<0.0054	<0.0053
Surrogates, (%):							
1,2-DICHLOROETHANE-D4		116	112		114	116	114
1-BROMO-4-FLUOROBENZENE		103	100		98	98	91
TOLUENE-D8		102	100		102	102	98

JH -Estimated quantitation - possibly biased high based upon GC data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
Building 1194
Carswell Air Force Base, Texas

PARAMETER	119401SBB Sample Date: 04/25/94 Depth: 3-5'	119401SBD 04/25/94 7-9'	119402SBA 04/25/94 1-3'	119402SBB 04/25/94 3-5'	119403SBB 04/25/94 3-5'	119403SBC 04/25/94 5-7'
<u>D2216/METHOD,PERCENT</u>						
SOLIDS, PERCENT	85	86	83	91	89	87
<u>Metals (SW6010/SW3050), (mg/kg)</u>						
ALUMINUM	9200	7600	7300	5000	3300	8900
ANTIMONY	<4.6 JL	<4.9	<4.8	<4.1	<4.5	<4.5
ARSENIC	4.0	<3.6	5.2	5.7	4.7	5.0
BARIUM	90	80	99	46	27	87
BERYLLIUM	0.66	<0.17	0.6	0.15	0.24	0.32
CADMIUM	2.7	2.1	2.4	3.4	2.7	2.6
CALCIUM	10000 JH	67000 JH	13000 JH	33000 JH	4500 JH	27000 JH
CHROMIUM, TOTAL	12	8.0	11	9.8	5.9	11
COBALT	4.6	4.3	11	4.6	3.7	4.9
COPPER	6.8	3.4	24	5.0	3.8	7.8
IRON	10000 JH	8200 JH	9600 JH	13000 JH	11000 JH	10000 JH
LEAD	11	8.3	12	9.2	4.6	9.4
MAGNESIUM	1100	1100	1000	1100	540	1600
MANGANESE	370	220	240	140	84	310
MOLYBDENUM	<3.0	<3.1	<3.1	<2.6	<2.9	<2.9
NICKEL	9.7	6.7	9.4	8.4	7.1	8.8
POTASSIUM	910	720	770	720	490	1100
SELENIUM	<6.6	<6.9	<6.8	<5.8	<6.3	<6.3
SILVER	<0.66	<0.7	<0.69	<0.58	<0.64	<0.64
SODIUM	44	100	44	34	23	87
THALLIUM	<6.0	<6.3	<6.2	<5.3	<5.8	<5.8
VANADIUM	21	16	27	17	13	20
ZINC	13	12	18	16	13	16
<u>Volatiles Organics (SW8240/SW5030), (mg/kg)</u>						
1,1,1-TRICHLOROETHANE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
1,1,2-TRICHLOROETHANE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
1,1,2-TRICHLOROETHANE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
1,1-DICHLOROETHANE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
1,1-DICHLOROETHENE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
1,2-DICHLOROETHANE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
1,2-DICHLOROPROPANE	<0.0012	<0.0011	<0.0012	<0.0011	<0.0011	<0.0011
2-CHLOROETHYL VINYL ETHER	<0.012 J	<0.011 J	<0.012 J	<0.011 J	<0.011 J	<0.011 J
2-HEXANONE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
ACETONE	0.027	<0.011	0.013	<0.011	<0.011	<0.011
BENZENE	0.0013	<0.0011	0.0016	<0.0011	<0.0011	<0.0011
BROMODICHLOROMETHANE	<0.0012	<0.0011	<0.0012	<0.0011	<0.0011	<0.0011
BROMOFORM	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
BROMOMETHANE	<0.0012	<0.0011	<0.0012	<0.0011	<0.0011	<0.0011
CARBON DISULFIDE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
CARBON TETRACHLORIDE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
CHLOROETHANE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
CHLOROETHENE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
CHLOROFORM	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
CHLOROMETHANE	<0.0012	<0.0011	<0.0012	<0.0011	<0.0011	<0.0011
DIBROMOCHLOROMETHANE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
ETHYLBENZENE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
TOTAL-XYLENE	<0.0058	<0.0057	<0.0031	<0.0056	<0.0056	<0.0056
METHYL ETHYL KETONE	<0.012	<0.011	<0.012	<0.011	<0.011	<0.011
METHYL ISOBUTYL KETONE	<0.012	<0.011	<0.012	<0.011	<0.011	<0.011
METHYLENE CHLORIDE	0.018	0.019	0.015	0.017	0.017	0.017
STYRENE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
TETRACHLOROETHYLENE(PCE)	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
TOLUENE	<0.0025	<0.0057	<0.0024	<0.0056	<0.0056	<0.0056
TRICHLOROETHYLENE (TCE)	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
VINYL ACETATE	<0.012	<0.011	<0.012	<0.011	<0.011	<0.011
VINYL CHLORIDE	<0.0023	<0.0023	<0.0023	<0.0022	<0.0022	<0.0023
cis-1,3-DICHLOROPROPENE	<0.0012	<0.0011	<0.0012	<0.0011	<0.0011	<0.0011
trans-1,2-DICHLOROETHENE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
trans-1,3-DICHLOROPROPENE	<0.0058	<0.0057	<0.0058	<0.0056	<0.0056	<0.0056
<u>Surrogates, (%):</u>						
1,2-DICHLOROETHANE-D4	111	112	113	113	110	112
1-BROMO-4-FLUOROBENZENE	95	95	96	99	98	101
TOLUENE-D8	99	92	96	95	96	103

J -Estimated quantitation based upon QC data.
 JH -Estimated quantitation - possibly biased high based upon QC data.
 JL -Estimated quantitation - possibly biased low based upon QC data.
 JB -Estimated quantitation - possibly biased high or false positive based upon blank data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

MVA - 11/11/11

ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
BACKGROUND
CARSWELL AFB

PARAMETER	Sample Date:		Sample		Duplicate		Sample		Duplicate	
	SD13MWW05A	SD13MWW05B	SD13MWW05C	SD13MWW05D	SD13MWWDP1	SD13MWW05D	BKGD02SBA	BKGD02SBD		
	03/25/94	03/25/94	03/25/94	03/25/94	03/25/94	03/25/94	04/26/94	04/26/94		
	Depth: 0-2'	2-4'	4-6'	6-8'	4-6'	6-8'	0-2'	6-8'		
D2216/METHOD PERCENT SOLIDS, PERCENT										
84	86	86	85	82	91	79				
Metals (SW6010/SW3050) (MG/KG)										
ALUMINUM	6600	4100	4100	4900	350	7300	7900			
ANTIMONY	<4.8 JL	<4.7	<4.8	<4.7	<4.7	<4.6	<5.0			
ARSENIC	3.7	12	6.0	7.5	<3.5	5.3	4.1			
BARIUM	106	110	130	120	4.9	62	67			
BERYLLIUM	0.52	<1.7	<1.7	<1.7	<0.17	<1.6	<0.18			
CADMIUM	1.2	1.5	0.85	0.76	<0.34	1.8	4.0			
CALCIUM	27000 JH	21000 JH	16000 JH	15000 JH	350 JH	19000	72000			
CHROMIUM, TOTAL	6.6	4.4	3.8	4.9	<0.67	9.6	9.0			
COBALT	3.4	4.4	2.0	2.5	<1.1	2.2	6.1			
COPPER	21 J	66 JH	44 JH	37 JH	20 JH	6.6	7.7			
IRON	8000	8000	4200	4800	543	6000	16000			
LEAD	11 JH	6.5	6.1	6.8	<3.1	6.1	11			
MANGANESE	1200	1500	1100	1100	65	1900	2200			
MOLYBDENUM	108 JH	340	100	94	1.8	200	94			
NICKEL	<3.1 JL	<3.0	<3.1	<3.0	<3.0	<3.0	<3.2			
POTASSIUM	76	6.2	3.0	4.2	<2.1	4.7	15			
SELENIUM	990	420	410	540	90	750	2200			
SILVER	<6.8	<6.6	<6.7	<6.6	<6.6	<6.5	<7.0			
SODIUM	<0.69	<0.67	<0.68	<0.67	<0.67	<0.66	<0.71			
THALLIUM	47	110	80 J	15 J	<22	120	190			
VANADIUM	<6.2	<6.0	<6.1	<6.0	<6.0	<5.9	<6.4			
ZINC	13	16	<8.5	<8.4	1.0	16	13			
	19 JH	30 JH	24 JH	21 JH	10 JH	10	20			
Volatile Organics (SW8240/SW5030) (MG/KG)										
1,1,1-TRICHLOROETHANE	<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056			
1,1,2,2-TETRACHLOROETHANE	<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056			
1,1,2-TRICHLOROETHANE	<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056			
1,1-DICHLOROETHANE	<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056			
1,1-DICHLOROETHANE	<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056			
1,2-DICHLOROETHANE	<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056			
1,2-DICHLOROETHANE	<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056			
2-CHLOROETHYL VINYL ETHER	<0.0012 J	<0.012 J	<0.0011 J	<0.011 J	<0.012 J	<0.011 J	<0.011 J			
2-HEXANONE	<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056			

ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
BACKGROUND
CARSWELL AFB

PARAMETER	Sample Date: Depth:	SD13MW05A 03/25/94 0-2'	SD13MW05B 03/25/94 2-4'	Sample SD13MW05C 03/25/94 4-6'	Duplicate SD13MWDP1 03/25/94 4-6'	SD13MW05D 03/25/94 6-8'	BKGD02SBA 04/26/94 0-2'	BKGD02SBD 04/26/94 6-8'
ACETONE		<0.012	<0.012	0.023	0.022	<0.012	<0.011	<0.011
BENZENE		<0.0012	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0011
BROMODICHLOROMETHANE		<0.0012	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0011
BROMOFORM		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
BROMOMETHANE		<0.0012	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0011
CARBON DISULFIDE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
CARBON TETRACHLORIDE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
CHLOROBENZENE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
CHLOROETHANE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
CHLOROFORM		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
CHLOROMETHANE		<0.0012	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0011
DIBROMOCHLOROMETHANE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
ETHYLBENZENE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
TOTAL-XYLENE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
METHYL ETHYL KETONE		<0.012	<0.012 J	<0.011 J	<0.011 J	<0.012 J	<0.011	<0.011
METHYL ISOBUTYL KETONE		<0.012	<0.012	<0.011	<0.011	<0.012	<0.011	<0.011
METHYLENE CHLORIDE		0.014	0.0098	0.014	0.0092	0.016	0.019	0.019
STYRENE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
TETRACHLOROETHYLENE(PCE)		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
TOLUENE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
TRICHLOROETHYLENE (TCE)		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
VINYL ACETATE		<0.012	<0.012	<0.011	<0.011	<0.012	<0.011	<0.011
VINYL CHLORIDE		<0.0023	<0.0024	<0.0022	<0.0022	<0.0023	<0.0022	<0.0022
cis-1,3-DICHLOROPROPENE		<0.0012	<0.0012	<0.0011	<0.0011	<0.0012	<0.0011	<0.0011
trans-1,2-DICHLOROETHENE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
trans-1,3-DICHLOROPROPENE		<0.0058	<0.006	<0.0056	<0.0056	<0.0058	<0.0056	<0.0056
Surrogates_(%)		110	86	91	98	94	110	109
1,2-DICHLOROETHANE-D4		102	90	95	97	94	93	95
1-BROMO-4-FLUOROBENZENE		97	106	104	105	101	95	96
TOLUENE-D8								

J - Estimated quantitation based upon QC data.
JH - Estimated quantitation - possibly biased high based upon QC data.
JL - Estimated quantitation - possibly biased low based upon QC data.
JB - Estimated quantitation - possibly biased high or false positive based upon blank data.

ANALYTICAL DATA SUMMARY TABLES
DO #21 SOIL SAMPLES
BACKGROUND
CARSWELL AFB

PARAMETER	Sample Date:	BKGD03SSBA	BKGD03SSB	BKGD04SSB	BKGD04SBC	BKGD05SSB	BKGD05SBF
	Depth:	0-2'	2-4'	2-4'	4-6'	2-4'	10-12'
D2216/METHOD,PERCENT		88	91	88	75	87	88
SOLIDS, PERCENT							

Metals (SW6010/SW3050), (MG/KG)	16000	13000	9000	5200	8000	4800
ALUMINUM	<4.9	<4.8	<4.8	<5.5	<4.7	<4.6
ANTIMONY	4.9	12	11	6.4	<3.5	<3.4
ARSENIC	130	130	85	64	40	30
BARIUM	0.87	<1.7	0.42	<0.2	0.42	<0.16
BERYLLIUM	4.4	3.6	6.8	2.3	1.3	1.5
CADMIUM	6200	20000	41000	10000	3500	89000
CALCIUM	18	13	11	11	9.2	5.9
CHROMIUM, TOTAL	6.3	7.1	7.6	3.4	2.9	2.3
COBALT	8.0	25	5.6	28	5.0	5.3
COPPER	17000	14000	24000	6800	5600	5400
IRON	16	12	14	88	10	6.3
LEAD	1600	3100	1400	1800	650	1600
MAGNESIUM	250	920	600	230	140	60
MANGANESE	<3.1	<3.1	<3.1	<3.6	<3.0	<3.0
MOLYBDENUM	12	15	12	7.1	4.3	6.4
NICKEL	1400	1400	970	1200	840	1100
POTASSIUM	<6.9	<6.7	<6.7	<7.8	<6.6	<6.5
SELENIUM	<0.7	<0.68	<0.68	<0.79	<0.67	<0.66
SILVER	36	170	71	80	36	260
SODIUM	<6.3	<6.1	<6.1	<7.1	<6.0	<5.9
THALLIUM	37	29	26	12	16	9.3
VANADIUM	26	24	21	54	8.3	1.2
ZINC						

Volatile Organics (SW6240/SW5030), (MG/KG)	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
1,1,1-TRICHLOROETHANE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
1,1,2,2-TETRACHLOROETHANE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
1,1,2-TRICHLOROETHANE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
1,1-DICHLOROETHANE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
1,1-DICHLOROETHENE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
1,2-DICHLOROETHANE	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	<0.0011
1,2-DICHLOROETHANE	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	<0.0011
2-CHLOROETHYL VINYL ETHER	<0.011 J	<0.011 J	<0.012 J	<0.011 J	<0.012 J	<0.011 J
2-HEXANONE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056

ANALYTICAL DATA SUMMARY TABLES
 DO #21 SOIL SAMPLES
 BACKGROUND
 CARSWELL AFB

PARAMETER	BKGD03SBA 04/26/94 0-2'	BKGD03SBB 04/26/94 2-4'	BKGD04SBB 04/26/94 2-4'	BKGD04SBC 04/26/94 4-6'	BKGD05SBB 04/26/94 2-4'	BKGD05SBB 04/26/94 2-4'
ACETONE	<0.011	<0.011	<0.012	<0.011	<0.012	<0.011
BENZENE	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	<0.0011
BROMODICHLOROMETHANE	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	<0.0011
BROMOFORM	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
BROMOMETHANE	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	<0.0011
CARBON DISULFIDE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
CARBON TETRACHLORIDE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
CHLOROBENZENE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
CHLOROETHANE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
CHLOROFORM	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
CHLOROMETHANE	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	<0.0011
DIBROMOCHLOROMETHANE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
ETHYLBENZENE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
TOTAL-XYLENE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
METHYL ETHYL KETONE	<0.011	<0.011	<0.012	<0.011	<0.012	<0.011
METHYL ISOBUTYL KETONE	<0.011	<0.011	<0.012	<0.011	<0.012	<0.011
METHYLENE CHLORIDE	0.019	0.02	0.018	0.018	0.018	0.019
STYRENE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
TETRACHLOROETHYLENE(PCE)	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
TOLUENE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
TRICHLOROETHYLENE (TCE)	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
VINYL ACETATE	<0.011	<0.011	<0.012	<0.011	<0.012	<0.011
VINYL CHLORIDE	<0.0023	<0.0022	<0.0024	<0.0022	<0.0024	<0.0023
cis-1,3-DICHLOROPROPENE	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012	<0.0011
trans-1,2-DICHLOROETHENE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
trans-1,3-DICHLOROPROPENE	<0.0057	<0.0054	<0.0059	<0.0056	<0.0061	<0.0056
Surrogates, (%)	110	112	108	110	112	112
1,2-DICHLOROETHANE-D4	91	95	96	95	96	98
1-BROMO-4-FLUOROBENZENE	95	95	95	93	94	94
TOLUENE-D8						

J - Estimated quantitation based upon QC data.
 JH - Estimated quantitation - possibly biased high based upon QC data.
 JL - Estimated quantitation - possibly biased low based upon QC data.
 JB - Estimated quantitation - possibly biased high or false positive based upon blank data.

PREPARED BY/DATE: _____
 CHECKED BY/DATE: _____
 APPROVED BY/DATE: _____

FINAL PAGE

ADMINISTRATIVE RECORD

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