CAFB 98

DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 27th FIGHTER WING (ACC)
CANNON AIR FORCE BASE, NEW MEXICO

ENTERED

12 JAN 1998

Colonel James A. Thomas III
Commander, 27th Support Group
110 E Sextant Avenue Suite 1098
Cannon AFB NM 88103-5323

Mr. Benito J. Garcia, Chief
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2044 Galisteo Street
PO Box 26110
Santa Fe NM 87502

Dear Mr. Garcia

Enclosed for your information is a report entitled: *Annual Evaluation of Bioventing Soil Remediation at Solid Waste Management Unit (SWMU) 70, Oil/Water Separator No. 326.* The report provides data on the progress of the SWMU 70 bioventing pilot study.

SWMU 70 is the former location of an oil-water separator and leach well which serviced the fuel truck maintenance facility at Cannon AFB. The site has petroleum based contamination to a depth of approximately 70 feet.

If you should have any questions about this report, please contact Mr. John Pike or Mr. Sanford Hutsell of my environmental staff, at (505) 784-1092 or (505) 784-6378.

Sincerely

James A. Thomas III

JAMES A. THOMAS III, Colonel, USAF

Attachment:
Bioventing Report

cc:
NMED w/o Atch (C. Will)
NMED GW Bureau (J. Jacobs)
EPA Region VI (D. Neleigh)
HQ ACC w/o Atch (R. Shannon)

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Annual Evaluation of Bioventing Soil Remediation at SWMU #70, Oil/Water Separator No. 326 Cannon Air Force Base, New Mexico

Prepared for

United States Air Force Air Combat Command
Cannon Air Force Base, New Mexico 88103

December 1997

Prepared by

U.S. Geological Survey, Water Resources Division
4501 Indian School Road NE
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Albuquerque, New Mexico 87110

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INTRODUCTION

This report presents the results of the soil-gas and soil samples collected for the 1997 evaluation of bioventing soil remediation at Solid Waste Management Unit (SWMU) number 70-Oil/Water Separator No. 326 on Cannon Air Force Base (CAFB), New Mexico. Soil-gas and soil samples were collected by the U.S. Geological Survey July 21-22, and August 7-8, 1997. CAFB is located in east-central New Mexico about 7 miles west of Clovis as shown on figure 1. The sampling site (SWMU #70) is located on the north side of the base as shown on figure 2. The SWMU was used for the recovery of petroleum products generated from wash water effluent from JP-4 fuel truck maintenance operations at Building 326 (fig. 3). This effluent contained JP-4 fuel, and petroleum and synthetic lubricating oils. The oil/water separator, active since 1960, is a two-compartment underground unit with a 50-gallon oil/water separator compartment and a detached 220-gallon underground oil storage tank. Recovered petroleum products were directed to the 220-gallon holding tank and the wastewater was discharged into a leach well. The leach well is approximately 5 feet in diameter and 5 feet deep. Overflows from the oil/water separator that discharged into the leach well are the suspected source of contamination. Soil-gas and soil monitoring was initiated in May 1994 by Engineering Science, Inc. under a "bioventing pilot test." A detailed work plan for the pilot test and interim pilot test results are found in Engineering-Science, Inc. (1994a and 1994b respectively). Soil-gas and soil sampling was performed in this investigation to evaluate if concentrations of fuel contaminants have been below regulatory standards. This sampling is performed in accordance with the Bioventing Field Sampling Plan (Engineering Science Inc., 1992).

METHOD OF STUDY AND RESULTS

The purpose of the initial field soil-gas sampling on July 21-22, 1997 was to determine if an in situ respiration test would be needed. The objective of the in situ respiration test is to determine the rate at which soil bacteria are degrading petroleum hydrocarbons. The respiration test would be performed at any vapor MP where bacterial biodegradation of hydrocarbons is indicated by low oxygen levels (0 to 2 percent (%)) and elevated carbon dioxide concentrations in the soil gas (5 to 20 %) (Hinchee and others, 1992). The soil-gas monitoring locations at SWMU 70 are three vapor monitoring point wells (MPA, MPB, and MPC), and one vent well (VW) as shown in figure 3. Construction diagram of a MP and a VW are shown in figures 4 and 5, respectively. Field soil-gas measurements were taken from all MP's and the VW (table 1). Samples were tested in the field using flow-through gas

chamber and peristaltic pump for the following constituents: carbon dioxide using Dragger tubes; oxygen using an oxygen meter (MSA Oxygen Indicator, model 246RA); volatile hydrocarbons using a HNU photoionization detector (PID), model PI101; and benzene, toluene, ethylbenzene, and xylenes (BTEX) using portable gas chromatograph (GC), Photovac photoionization gas chromatograph , model 10550. As indicated by the results in the table 1, none of the vapor MP's had low oxygen levels; MPB at depth of 25 feet had carbon dioxide concentration of 5 %. Thus, in situ respiration tests were not performed.

Soil-gas samples were also collected for laboratory analysis (table 2) from monitoring points that were originally sampled (VW, MPA-5, and MPC-50 sampled by Engineering-Science, Inc. on May 2 - 16, 1994) to confirm the field soil-gas measurements. The soil-gas samples were collected in one-liter SUMMA® canisters and sent to Quanterra Environmental Services, City of Industry, California and analyzed for BTEX and total volatile petroleum hydrocarbons by U.S. Environmental Protection Agency method TO-3.

Soil samples were collected from two auger holes on August 7-8, 1997. The auger holes were drilled adjacent to the MP's (fig. 3) and soil samples were collected from cores at the same depths as the MP's (6 or 6.5, 25, 50, 70, & 110 feet). The soil samples were tested in the field for volatile hydrocarbons using a PID and BTEX using a GC. Assumptions for estimates of concentrations of BTEX are as follows:

1) The soil is 100 % quartz sand (Ogallala Formation), with a density of 2.65. A visual examination of cores from auger holes 1 and 2 indicates this is generally true with a minor amounts of silt.
2) The soil porosity is 32.5 % based on an average porosity of 30-35 % for fine- to medium-grained sands.
3) All target compounds in a 10 cubic centimeter soil sample completely dissolve into the 20 milliliter (ml) of blank water when the mixture is agitated in a 40 ml vial for one minute.
4) The target compounds partition between the blank water and the headspace in the vial in the same proportions as the field standard samples (same partitioning coefficient).

A summary of soil gas field measurements from auger holes 1 and 2 during soil sampling are presented in table 3. Soil samples for laboratory analysis were sent to Quanterra Environmental Services, Arvada, Colorado and analyzed for BTEX by method SW8020, Diesel Range Organics (DRO) by method SW8015M, and Soil

Moisture by D2216 (table 4). Benzene and toluene were not detected in any of the samples. Ethylbenzene and xylenes were detected in the sample from auger hole 1 at a depth of 50 feet at concentrations of 7,400 and 67,000 micrograms per kilogram, respectively. DRO was detected in the samples from auger hole 1 at depths of 6.5, 25, and 50 feet at concentrations of 9.3, 1,600, and 2,300 milligrams per kilogram, respectively. Soil moisture is greater (9.7 to 11 %) at depths of 6 or 25 feet below ground surface than at depths of 50, 70 or 110 feet (3.2 to 8.1 %).

SUMMARY AND CONCLUSIONS

The amount of oxygen versus carbon dioxide measured (table 1) in the monitoring points suggest a very low level of biological activity. The larger concentrations of DRO constituents found in the soil in the upper fifty feet of the auger hole 1 (table 4) and corresponding large ethylbenzene and xylene concentrations in MPB and MPC at the same depth interval (table 1) suggest that the organics have not been degraded around the vent well and that vapors may be moving along the different horizons away from the site.

It is unknown at what level of soil moisture that biological activity may begin decreasing, but the low initial levels in New Mexico would make for a very fragile system. The lack of moisture in soil zones in desert climates can contribute to the decrease in biological activity (Frank Chapelle, U.S. Geological Survey oral communication, 1997). In order to restart the activity, some quantity of an oxygen releasing compound, such as magnesium peroxide, could be suspended in the vent well and a humidifier could be put in line with the air injection pump to inject humidified air into the vent well. The oxygenated and moisture enriched air could restart the biological activity and improve the effectiveness of the bioventing program.

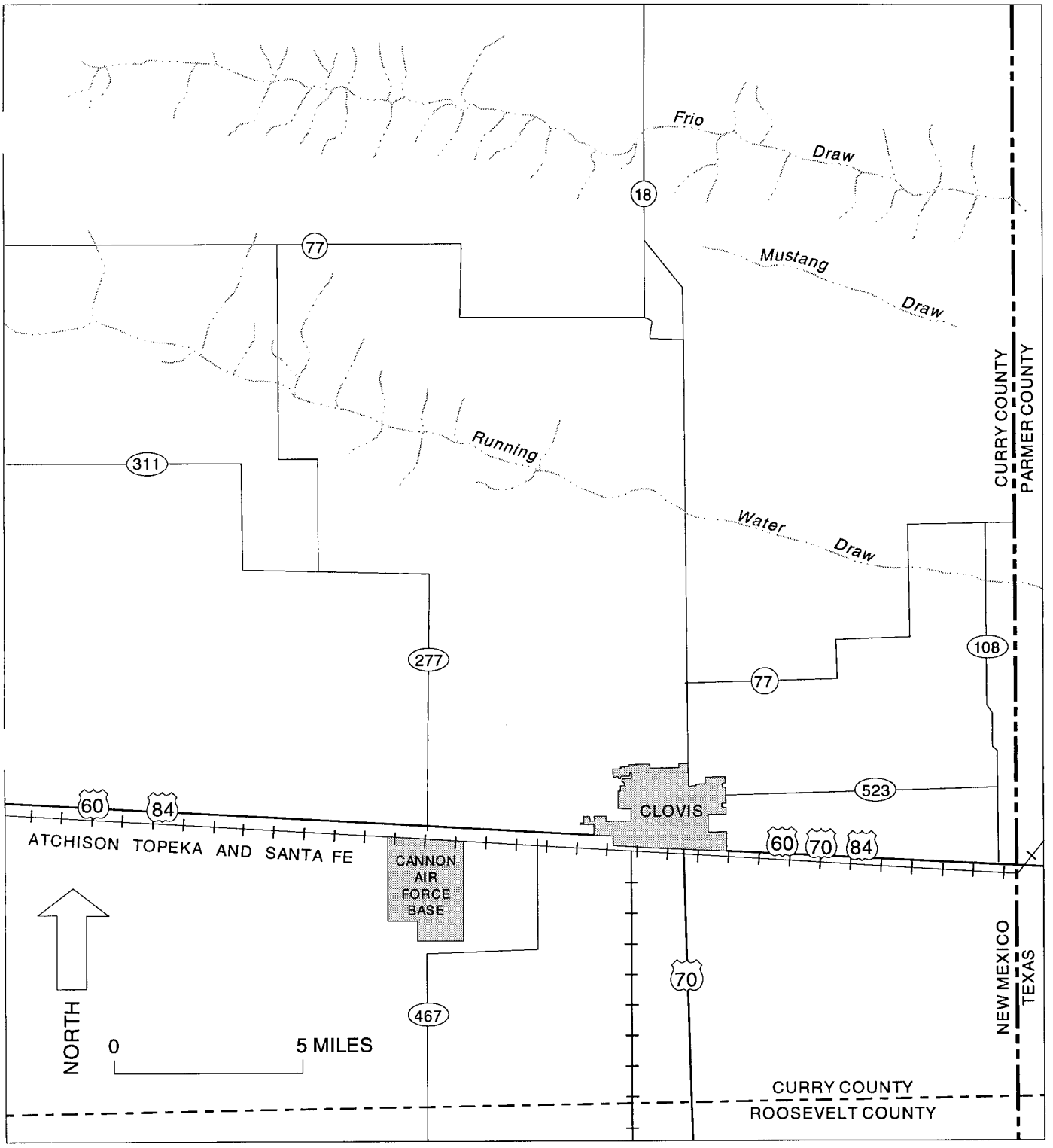
REFERENCES

Engineering-Science, Inc., 1992, Field Sampling Plan for AFCEE Bioventing: Report prepared for the Air Force Center for Environmental Excellence, Brooks Air Force Base, Texas by Engineering-Science, Inc., January 1992.

Engineering-Science, Inc., 1994a, Draft Part I, Pilot Test Work Plan for SWMU #70-Oil/Water Separator No. 326, Cannon AFB, New Mexico: Report prepared for the Air Force Center for Environmental Excellence, Brooks Air Force Base, Texas, and 27 CES/CEV Cannon AFB, New Mexico by Engineering-Science, Inc., August 1994, 15 p. and appendixes.

Engineering-Science, Inc., 1994b, Draft Part II, Interim Pilot Test Results Report for SWMU #70-Oil/Water Separator No. 326, Cannon AFB, New Mexico: Report prepared for the Air Force Center for Environmental Excellence, Brooks Air Force Base, Texas, and 27 CES/CEV, Cannon Air Force Base, New Mexico, by Engineering-Science, Inc., August 1994, 31 p. and appendixes.

Hinchee, R.E., S.K. Ong, R.N. Miller, D.C. Downey, and R. Frandt, 1992, Test Plan and Technical Protocol for a Field Treatability Test for Bioventing: Report prepared for the USAF Center for Environmental Excellence, Brooks Air Force Base, Texas by Hinchee et.al., May 1992.



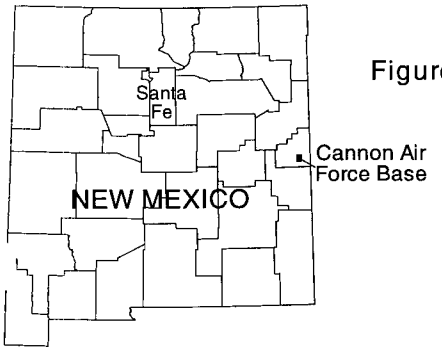


Figure 1.--Location of Cannon Air Force Base, New Mexico.

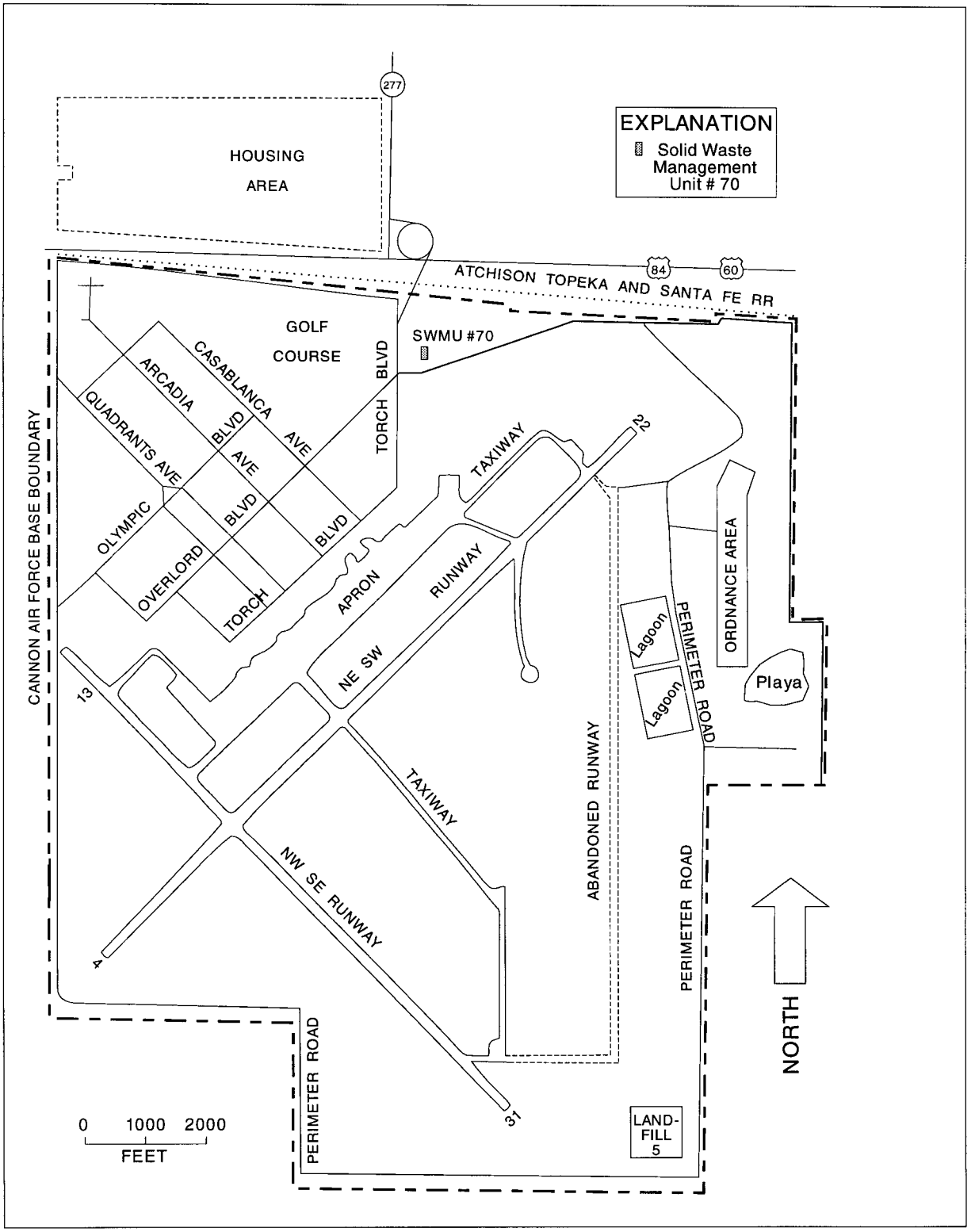


Figure 2.--Cannon Air Force Base and location of Solid Waste Management Unit (SWMU) # 70 Oil/Water Separator No. 326.

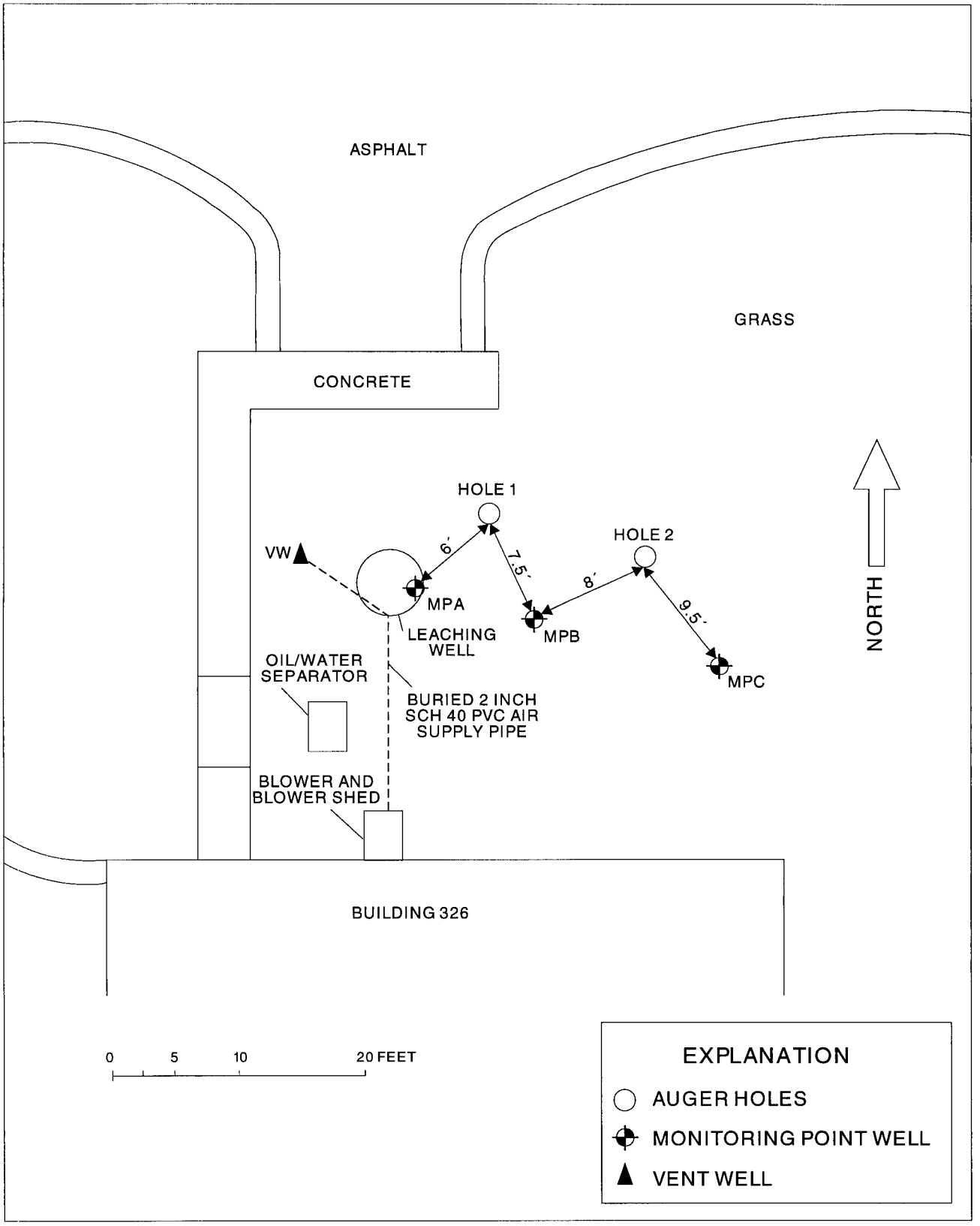


Figure 3.--Location of vent well, monitoring point wells, and auger holes, Solid Waste Management Unit (SWMU) # 70 Oil/Water Separator No. 326 at Cannon Air Force Base, New Mexico.

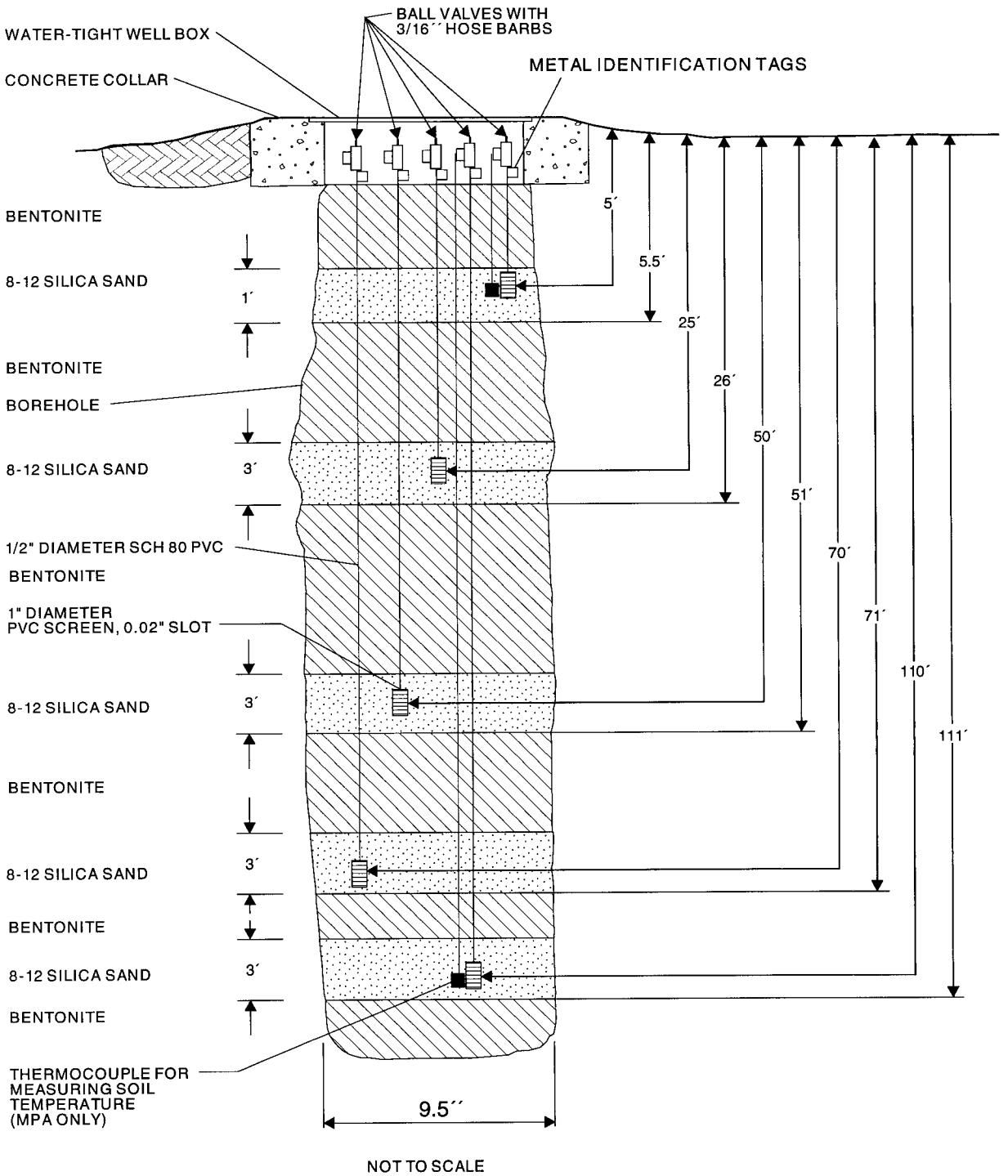


Figure 4.--Monitoring point well construction diagram.

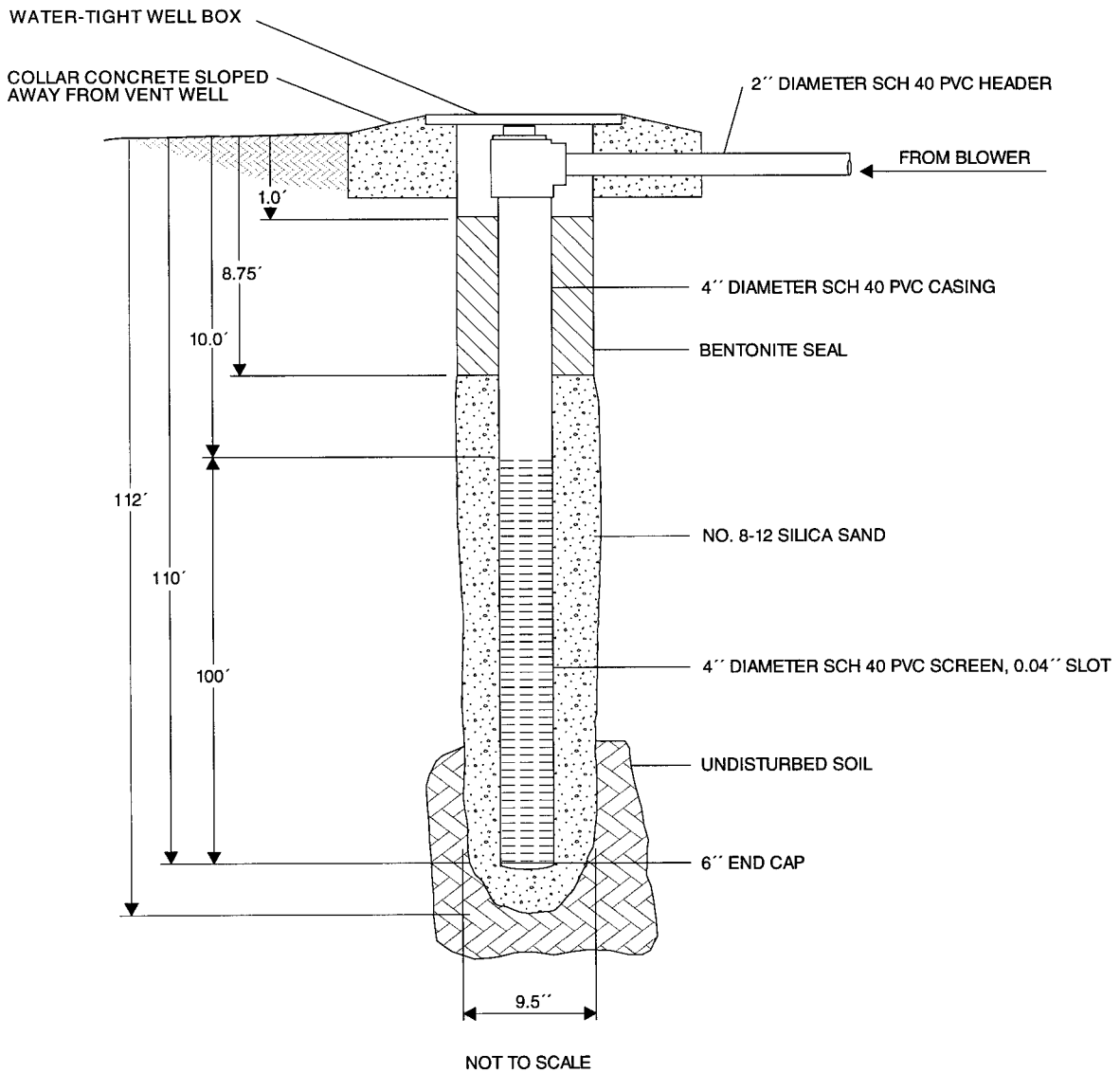


Figure 5.--Vent well construction diagram.

Table 1.-- Summary of soil-gas field measurements from the vent well (VW) and vapor monitoring point wells MPA, MPB, and MPC at SWMU #70 (Oil/Water Separator No. 326) Cannon Air Force Base, New Mexico, July 21-22, 1997

[O_2, oxygen; CO_2, carbon dioxide; PID, photoionization detector; %, percent; ppm, parts per million; µg/L, micrograms per liter; >, greater than; <, less than]

Vapor monitoring point-Depth (feet)	O_2 (%)	CO_2 (%)	PID (ppm)	Portable gas chromatograph*	
				Ethylbenzene (µg/L)	Xylene (µg/L)
VW-10 to 110	20.6	0.0	0	20	28
MPA-5	19.7	0.0	0	0	0
MPA-25	19.3	1.0	15	0	0
MPA-50	18.4	1.5	69	>415	0
MPA-70	19.8	0.0	55	56	0
MPA-110	20.7	0.0	45	28	0
MPB-5	20.8	0.0	40	29	0
MPB-25	11.4	5.0	63	117	0
MPB-50	18.2	2.0	284	2,140	2,250
MPB-70	20.2	1.0	125	>476	>490
MPB-110	19.7	1.0	102	238	375
MPC-5	15.4	2.0	23	127	176
MPC-25	13.3	4.0	20	58	71
MPC-50	15.9	2.0	70	416	141
MPC-70	20.1	<1.0	0	35	35
MPC-110	18.8	1.0	0	31	40

*. Compound identifications using portable gas chromatograph are tentative and the reported concentrations should be viewed as estimates.

Table 2.--Analytical results of soil-gas samples from the vent well (VW), and vapor monitoring point wells MPA-5 and MPC-50 at SWMU #70 (Oil/Water Separator No. 326) Cannon Air Force Base, New Mexico, July 21, 1997

[ppmv, parts per million-volume per volume; ppm, parts per million; RL, reporting limit; ND, not detected; q, sample has gas chromatograph/flame ionization detector characteristics for which reliable identification of a product could not be achieved]

Sample location	Analyte, Method, and Unit									
	Benzene, TO-3, ppmv		Toluene, TO-3, ppmv		Ethylbenzene, TO-3, ppmv		Xylenes, (total) TO-3, ppmv		Total volatile petroleum hydrocarbons, TO-3, ppm	
	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
VW	ND	0.044	0.16	0.044	0.26	0.044	0.66	0.044	35 q	2.2
MPA-5	ND	0.042	ND	0.042	ND	0.042	0.068	0.042	24 q	2.1
MPC-50	ND	1.7	11	1.7	13	1.7	31	1.7	1,600 q	84
AMBIENT BLANK	ND	0.042	ND	0.042	ND	0.042	ND	0.042	ND	2.1

Table 3.-- Summary of soil-gas field measurements from auger holes 1 and 2 at SWMU #70 (Oil/Water Separator No. 326) Cannon Air Force Base, New Mexico, August 7-8, 1997

[PID, photoionization detector; ppm, parts per million; µg/kg, micrograms per kilogram; --, no data]

Auger hole	Depth (feet)	PID (ppm)	Portable gas chromatograph*		
			Toluene (µg/kg)	Ethylbenzene (µg/kg)	Xylene (µg/kg)
1	3.5	0.5	--	--	--
1	5.0	--	0.0	0.0	0.0
1	6.5	--	0.0	0.0	0.0
1	8.5	1.1	--	--	--
1	13.5	0.0	--	--	--
1	18.5	3.3	--	--	--
1	23.5	1.3	--	--	--
1	25.0	57.0	0.0	0.0	0.0
1	26.5	3.5	--	--	--
1	28.0	101	0.0	0.0	0.0
1	28.5	88.0	--	--	--
1	33.5	12.7	--	--	--
1	38.5	0.0	--	--	--
1	43.5	2.6	--	--	--
1	48.5	0.0	--	--	--
1	50.0	962	750	2,600	3,800
1	51.5	5.8	--	--	--
1	53.5	67.0	--	--	--
1	58.5	35.2	--	--	--
1	63.5	156	--	--	--
1	68.5	1,105	--	--	--
1	70.0	69.7	0.0	0.0	0.0
1	73.5	1,367	--	--	--
1	78.5	1,332	--	--	--

Table 3.-- Summary of soil-gas field measurements from auger holes 1 and 2 at SWMU #70 (Oil/Water Separator No. 326) Cannon Air Force Base, New Mexico, August 7-8, 1997--Continued

[PID, photoionization detector; ppm, parts per million; µg/kg, micrograms per kilogram; --, no data]

Auger hole	Depth (feet)	PID (ppm)	Portable gas chromatograph*		
			Toluene (µg/kg)	Ethylbenzene (µg/kg)	Xylene (µg/kg)
1	83.5	1,063	--	--	--
1	88.5	1,072	--	--	--
1	93.5	802	--	--	--
1	98.5	430	--	--	--
1	103.5	1,001	--	--	--
1	108.5	801	--	--	--
1	110	8.1	0.0	0.0	0.0
1	111	627	--	--	--
2	3.5	1.7	--	--	--
2	6.0	10.3	0.0	0.0	0.0
2	6.5	0.4	--	--	--
2	8.5	18.4	--	--	--
2	13.5	22.1	--	--	--
2	18.5	5.0	--	--	--
2	23.5	3.7	--	--	--
2	25.0	2.1	0.0	0.0	0.0
2	26.5	0.2	--	--	--
2	28.5	7.3	--	--	--
2	33.5	1.0	--	--	--
2	38.5	0.6	--	--	--
2	43.5	5.0	--	--	--
2	48.5	1.7	--	--	--
2	50.0	34.3	0.0	0.0	0.0
2	51.5	3.3	--	--	--
2	53.5	126	--	--	--

Table 3.-- Summary of soil-gas field measurements from auger holes 1 and 2 at SWMU #70 (Oil/Water Separator No. 326) Cannon Air Force Base, New Mexico, August 7-8, 1997--Concluded

[PID, photoionization detector; ppm, parts per million; µg/kg, micrograms per kilogram; --, no data]

Auger hole	Depth (feet)	PID (ppm)	Portable gas chromatograph*		
			Toluene (µg/kg)	Ethylbenzene (µg/kg)	Xylene (µg/kg)
2	58.5	38.1	--	--	--
2	63.5	124	--	--	--
2	68.5	647	--	--	--
2	70.0	1.8	0.0	0.0	0.0
2	71.5	252	--	--	--
2	73.5	81.0	--	--	--
2	78.5	82.2	--	--	--
2	83.5	54.1	--	--	--
2	88.5	78.7	--	--	--
2	93.5	26.2	--	--	--
2	98.5	41.1	--	--	--
2	103.5	31.3	--	--	--
2	108.5	25.5	--	--	--
2	110	2.2	0.0	0.0	0.0
2	111.5	28.0	--	--	--

*. Compound identifications using the portable gas chromatograph are tentative, and the reported concentrations should be viewed as estimates.

Table 4.-- Analytical results of soil samples from auger holes 1 and 2 at SWMU #70 (Oil/Water Separator No. 326) Cannon Air Force Base, New Mexico, August 7-8, 1997

[µg/kg, micrograms per kilogram; mg/kg, milligrams per kilogram; %, percent; RL, reporting limit; ND, not detected; l, sample resembles a hydrocarbon product occuring within the n-alkane range of C10-C28; q, this sample has gas chromatograph/flame ionization detector characteristics for which reliable identification of a product could not be achieved; G, reporting limit raised due to matrix of the sample; b, associated surrogate recovery sample results did not meet quality control acceptance limits; t, sample diluted due to the concentration of target compounds; v, secondary column result is the preferred value; mg/L, milligrams per liter; --, no data]

Auger hole/Depth (feet below ground surface)	Analyte, Method, and Unit											
	Benzene, SW8020, µg/kg		Toluene, SW8020, µg/kg		Ethylbenzene, SW8020, µg/kg		Xylenes, (total) SW8020, µg/kg		Diesel Range Organics, SW8015M, mg/kg		Soil moisture, D2216, %	
	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
HOLE-1/6.5	ND	5.0	ND	5.0	ND	5.0	ND	5.0	9.3 lq	4.0	10	0.10
HOLE-1/25	ND Gb	1,000	ND Gb	1,000	ND Gb	1,000	ND Gb	1,000	1,600 tlqb	80	11	0.10
HOLE-1/50(Secondary column test)	ND tb	2,500	ND tb	2,500	7,400 tvb	2,500	67,000 tvb	2,500	2,300 tlqb	80	8.1	0.10
HOLE-1/70	ND	5.0	ND	5.0	ND	5.0	ND	5.0	ND	4.0	3.2	0.10
HOLE-1/70 (Duplicate)	ND	5.0	ND	5.0	ND	5.0	ND	5.0	ND	4.0	3.3	0.10
HOLE-1/110	ND	5.0	ND	5.0	ND	5.0	ND	5.0	ND	4.0	5.1	0.10
HOLE-2/6	ND	5.0	ND	5.0	ND	5.0	ND	5.0	ND	4.0	11	0.10
HOLE-2/25	ND	5.0	ND	5.0	ND	5.0	ND	5.0	ND	4.0	9.7	0.10
HOLE-2/50	ND	5.0	ND	5.0	ND	5.0	ND	5.0	ND	4.0	6.5	0.10
HOLE-2/70	ND	5.0	ND	5.0			[illegible]	5.0	ND	4.0	3.3	0.10
HOLE-2/110	ND	5.0	ND	5.0						4.0	4.4	0.10
EQUIPMET BLANK, mg/L	ND	0.50	ND	0.50						0.10	--	--
TRIP BLANK, mg/L	ND	0.50	ND	0.50						--	--	--

equipment
at pollution

APPENDIX I

Analytical Results from Quanterra Environmental Services Laboratory

Quanterra
Environmental Services

Quanterra Incorporated
4955 Yarrow Street
Arvada, Colorado 80002

303 421-6611 Telephone
303 431-7171 Fax

ANALYTICAL RESULTS

FOR

U.S. GEOLOGICAL SURVEY

QUANTERRA NO. 056353

AUGUST 11, 1997

Prepared by: _____
Lindsay Breyer

Reviewed by: _____
Mark D. Stella

Quanterra
Environmental Services

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• Miscellaneous		
Supporting Documentation		
[Please Note: A one-page "Description of Supporting Documentation" is provided in the Supporting Documentation section(s).]		
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NARRATIVE

On July 23, 1997, Quanterra Environmental Services, City of Industry received four air samples from the U.S. Geological Survey.

This report presents the analytical results as well as supporting information to aid in the evaluation and interpretation of the data.

With the exceptions noted below or on the data sheets, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. All laboratory QC samples analyzed in conjunction with the samples in this project were within established control limits.

LIMs Report Key

Section	Description
Cover Letter	Signature page, report narrative as applicable.
Sample Description Information	Tabulated cross-reference between the Lab ID and Client ID, including matrix, date and time sampled, and the date received for all samples in the project.
Sample Analysis Results Sheets	Lists sample results, test components, reporting limits, dates prepared and analyzed, and any data qualifiers. Pages are organized by test.
QC LOT Assignment Report	Cross-reference between lab IDs and applicable QC batches (DCS, LCS, Blank, MS/SD, DU)
Duplicate Control Sample Report	Percent recovery and RPD results, with acceptance limits, for the laboratory duplicate control samples for each test are tabulated in this report. These are measures of accuracy and precision for each test. Acceptance limits are based upon laboratory historical data.
Laboratory Control Sample Report	Percent recovery results for a single Laboratory Control Sample (if applicable) are tabulated in this report, with the applicable acceptance limits for each test.
Matrix Spike/Matrix Spike Duplicate Report	Percent recovery and RPD results for matrix-specific QC samples and acceptance limits, where applicable. This report can be used to assess matrix effects on an analysis.
Single Control Sample Report	A tabulation of the surrogate recoveries for the blank for organic analyses.
Method Blank Report	A summary of the results of the analysis of the method blank for each test.

List of Abbreviations and Terms

Abbreviation	Term	Abbreviation	Term
DCS	Duplicate Control Sample	MSD	Matrix Spike Duplicate
DU	Sample Duplicate	QC Run	Preparation Batch
EB	Equipment Blank	QC Category	LIMs QC Category
FB	Field Blank	QC Lot	DCS Batch
FD	Field Duplicate	ND	Not Detected at or above the reporting limit expressed
IDL	Instrument Detection Limit (Metals)	QC Matrix	Matrix of the laboratory control sample(s)
LCS	Laboratory Control Sample	RL	Reporting Limit
MB	Method Blank	QC	Quality Control
MDL	Method Detection Limit	SA	Sample
MS	Matrix Spike	SD	Spike Duplicate
RPD	Relative Percent Difference	TB	Trip Blank
ppm (part-per-million)	mg/L or mg/kg (usually)	ppb (part-per-billion)	ug/L or ug/kg (usually)
QUAL	Qualifier flag	DIL	Dilution Factor

SAMPLE DESCRIPTION INFORMATION/ANALYTICAL TEST REQUESTS

Sample Description Information

The Sample Description Information lists all of the samples received in this project together with the internal laboratory identification number assigned for each sample. Each project received at Quanterra's Denver laboratory is assigned a unique six digit number. Samples within the project are numbered sequentially. The laboratory identification number is a combination of the six digit project code and the sample sequence number.

Also given in the Sample Description Information is the Sample Type (matrix), Date of Sampling (if known) and Date of Receipt at the laboratory.

Analytical Test Requests

The Analytical Test Requests lists the analyses that were performed on each sample. The Custom Test column indicates where tests have been modified to conform to the specific requirements of this project.

Quanterra
Environmental Services

SAMPLE DESCRIPTION INFORMATION
for
U.S. Geological Survey

Lab ID	Client ID	Matrix	Sampled Date	Sampled Time	Received Date
056353-0001-SA	MPA5-0797	AIR	21 JUL 97	13:15	23 JUL 97
056353-0002-SA	MPC50-0797	AIR	21 JUL 97	13:32	23 JUL 97
056353-0003-SA	VW-0797	AIR	21 JUL 97	13:50	23 JUL 97
056353-0004-SA	AMBIENT BLANK-0797	AIR	21 JUL 97	14:30	23 JUL 97

Quanterra
Environmental Services

ANALYTICAL TEST REQUESTS
for
U.S. Geological Survey

Lab ID: 056353	Group Code	Analysis Description	Custom Test?
0001 - 0004	A	TO-3 - BTEX	N
		TO-3 - TVPH by GC	N

ANALYTICAL RESULTS

The analytical results for this project are presented in the following data tables. Each data table includes sample identification information, and when available and appropriate, dates sampled, received, authorized, prepared and analyzed. The authorization date is the date when the project was defined by the client such that laboratory work could begin. The date prepared is typically the date an extraction or digestion was initiated. For volatile organic compounds in water, the date prepared is the date the screening of the sample was performed.

Data sheets contain a listing of the parameters measured in each test, the analytical results and the Quanterra reporting limit. Reporting limits are adjusted to reflect dilution of the sample, when appropriate. Solid and waste samples are reported on an "as received" basis, i.e. no correction is made for moisture content.

Quanterra does not routinely blank-correct analytical data. Uncorrected analytical results are reported, along with associated blank results, for all organic and metals analyses. Analytical results and blank results are reported for conventional inorganic parameters as specified in the method. In addition, surrogate recovery data is presented for all GC/MS analyses. The surrogate recovery is an indication of the affect of the sample matrix on the performance of the method.

Quanterra
Environmental Services

TO-3 - BTEX
Method TO-3

Client Name: U.S. Geological Survey
Client ID: MPA5-0797
Lab ID: 056353-0001-SA
Matrix: AIR
Authorized: 28 JUL 97

Sampled: 21 JUL 97
Received: 23 JUL 97

Prepared: NA
Analyzed: 30 JUL 97

Parameter	Result	Units	Reporting Limit
Benzene	ND	ppmv	0.042
Toluene	ND	ppmv	0.042
Ethylbenzene	ND	ppmv	0.042
Xylenes (total)	0.068	ppmv	0.042

Dilution factor is 2.1. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: JKITTLESON

Approved By: DMAI

Quanterra
Environmental Services

TO-3 - BTEX
Method TO-3

Client Name: U.S. Geological Survey
Client ID: MPC50-0797
Lab ID: 056353-0002-SA
Matrix: AIR
Authorized: 28 JUL 97

Sampled: 21 JUL 97
Received: 23 JUL 97

Prepared: NA
Analyzed: 30 JUL 97

Parameter	Result	Units	Reporting Limit
Benzene	ND	ppmv	1.7
Toluene	11	ppmv	1.7
Ethylbenzene	13	ppmv	1.7
Xylenes (total)	31	ppmv	1.7

Dilution factor is 84. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: JKITTLESON

Approved By: DMAI

Quanterra
Environmental Services

TO-3 - BTEX
Method TO-3

Client Name: U.S. Geological Survey
Client ID: VW-0797
Lab ID: 056353-0003-SA
Matrix: AIR
Authorized: 28 JUL 97

Sampled: 21 JUL 97
Received: 23 JUL 97

Prepared: NA
Analyzed: 30 JUL 97

Parameter	Result	Units	Reporting Limit
Benzene	ND	ppmv	0.044
Toluene	0.16	ppmv	0.044
Ethylbenzene	0.26	ppmv	0.044
Xylenes (total)	0.66	ppmv	0.044

Dilution factor is 2.2. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: JKITTLESON

Approved By: DMAI

Quanterra
Environmental Services

TO-3 - BTEX
Method TO-3

Client Name: U.S. Geological Survey
Client ID: AMBIENT BLANK-0797
Lab ID: 056353-0004-SA
Matrix: AIR
Authorized: 28 JUL 97

Sampled: 21 JUL 97
Received: 23 JUL 97

Prepared: NA
Analyzed: 30 JUL 97

Parameter	Result	Units	Reporting Limit
Benzene	ND	ppmv	0.042
Toluene	ND	ppmv	0.042
Ethylbenzene	ND	ppmv	0.042
Xylenes (total)	ND	ppmv	0.042

Dilution factor is 2.1. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: JKITTLESON

Approved By: DMAI

Quanterra
Environmental Services

TO-3 - TVPH by GC
Method TO-3

Client Name: U.S. Geological Survey
Client ID: MPA5-0797
Lab ID: 056353-0001-SA
Matrix: AIR Sampled: 21 JUL 97 Prepared: NA
Authorized: 28 JUL 97 Received: 23 JUL 97 Analyzed: 30 JUL 97

Parameter	Result	Units	Reporting Limit	
TVPH as Gasoline	24	ppm	2.1	q

Dilution factor is 2.1. All results and limits are corrected for dilution.

q = This sample has GC/FID characteristics for which reliable identification of a product could not be achieved.

Reported By: JKITTLESON Approved By: DMAI

Quanterra
Environmental Services

TO-3 - TVPH by GC
Method TO-3

Client Name: U.S. Geological Survey
Client ID: MPC50-0797
Lab ID: 056353-0002-SA
Matrix: AIR
Authorized: 28 JUL 97

Sampled: 21 JUL 97
Received: 23 JUL 97

Prepared: NA
Analyzed: 30 JUL 97

Parameter	Result	Units	Reporting Limit	
TVPH as Gasoline	1600	ppm	84	q

Dilution factor is 84. All results and limits are corrected for dilution.

q = This sample has GC/FID characteristics for which reliable identification of a product could not be achieved.

Reported By: JKITTLESON

Approved By: DMAI

Quanterra
Environmental Services

TO-3 - TVPH by GC
Method TO-3

Client Name: U.S. Geological Survey
Client ID: VW-0797
Lab ID: 056353-0003-SA
Matrix: AIR
Authorized: 28 JUL 97

Sampled: 21 JUL 97
Received: 23 JUL 97

Prepared: NA
Analyzed: 30 JUL 97

Parameter	Result	Units	Reporting Limit	
TVPH as Gasoline	35	ppm	2.2	q

Dilution factor is 2.2. All results and limits are corrected for dilution.

q = This sample has GC/FID characteristics for which reliable identification of a product could not be achieved.

Reported By: JKITTLESON

Approved By: DMAI

Quanterra
Environmental Services

TO-3 - TVPH by GC
Method TO-3

Client Name: U.S. Geological Survey
Client ID: AMBIENT BLANK-0797
Lab ID: 056353-0004-SA
Matrix: AIR
Authorized: 28 JUL 97

Sampled: 21 JUL 97
Received: 23 JUL 97

Prepared: NA
Analyzed: 30 JUL 97

Parameter	Result	Units	Reporting Limit
TVPH as Gasoline	ND	ppm	2.1

Dilution factor is 2.1. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: JKITTLESON

Approved By: DMAI

Quanterra
Environmental Services

TO-3 - TVPH by GC
Method TO-3

Client Name: U.S. Geological Survey
Client ID: AMBIENT BLANK-0797
Lab ID: 056353-0004-SA
Matrix: AIR
Authorized: 28 JUL 97

Sampled: 21 JUL 97
Received: 23 JUL 97

Prepared: NA
Analyzed: 30 JUL 97

Parameter	Result	Units	Reporting Limit
TVPH as Gasoline	ND	ppm	2.1

Dilution factor is 2.1. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: JKITTLESON

Approved By: DMAI

Quanterra
Environmental Services

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303 421-6611 Telephone
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ANALYTICAL RESULTS

FOR

U.S. GEOLOGICAL SURVEY

QUANTERRA NO. 056503

SEPTEMBER 9, 1997

Prepared by: Mark D. Stella

Reviewed by: Lindsay Breyer

Quanterra
Environmental Services

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NARRATIVE

On August 12, 1997, Quanterra Environmental Services, Denver received eleven soil and two aqueous samples from the U.S. Geological Survey.

This report presents the analytical results as well as supporting information to aid in the evaluation and interpretation of the data.

With the exceptions noted below or on the data sheets, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. All laboratory QC samples analyzed in conjunction with the samples in this project were within established control limits.

Method 8020 - BTEX

Samples 056503-0002-SA and -0003-SA were analyzed using the medium level method due to matrix interference or high target analyte concentration. The samples required further dilution because of matrix interferences or the presence of target analytes above the linear range of the GC instrument. Reporting limits were raised accordingly. As a result of the dilutions, the a,a,a-trifluorotoluene surrogate was not recoverable in the mentioned samples and has been reported as "NC." A matrix spike/spike duplicate (MS/SD) analyzed on sample 056503-0002-SA is also reported as "NC." Dilutions performed on the MS/SD reduced the concentration of all spike and surrogate compounds to less than detectable levels.

Diesel Range Organics

The o-terphenyl surrogate is reported as "NC" for samples 056503-0002-SA and -0003-SA. Dilutions performed on the samples due to high target analyte concentrations reduced the surrogate compound to less than detectable levels.

Footnotes and Data Qualifiers

The data sheets contained in this report may contain a variety of footnotes and data qualifiers. Those used to indicate the confidence level for Tentatively Identified Compounds (GC/MS methods) are described

above. Other footnotes are used with specific tests; for example, footnotes used with the GC/FID Petroleum Hydrocarbon methods to indicate (in the analysts judgment) the product that appears to be present. Finally, there are a number of general qualifiers that serve to identify problems and pertinent observations made during sample analysis that may not discussed in the Overview. These are described below:

B Compound is also detected in the blank.

The indicated compound was detected in the sample as well as the method blank. Please note that the B flag is not used when the sample result is ND (Not Detected).

G Reporting limit raised due to the matrix of the sample.

Indicates that reporting limits were raised due to the presence of non-target compounds or other matrix interferences. The sample may or may not have been diluted. For inorganic methods, the footnote applies only to the flagged analyte. For organic methods, the footnote pertains to all analytes determined by the method.

J Result is detected below the reporting limit or is an estimated concentration.

Most commonly, a "J" value indicates that the reported result for the analyte is below the stated reporting limit and is an estimated value. "J" values are generally reported to 1/5 of the reporting limit for GC/MS Volatiles, 1/10 of the reporting limit for GC/MS Semivolatiles, 1/2 the reporting limit for GC and HPLC, or to the Instrument Detection Limit for metals and general inorganics. Analytes which are not detected at or below the reporting limit are reported as "ND" and do not have "J" flags. Because "J" values may represent false positive concentrations, care should be used when interpreting these data. If there is uncertainty about the quantiation of an analyte, this footnote may also indicate that a reported result is an estimated concentration, even if it is above the reporting limit.

t Sample diluted due to the concentration of target compounds.

Indicates that reporting limits were raised due to the presence of target analytes outside the calibration range of the method. For multi-analyte methods, the footnote will appear only for the first analyte but pertains to all analytes determined by the method.

T Preferred values unless footnoted on secondary column test.

This footnote is used with GC tests to indicate the primary column results. The footnote will be listed only for the first compound but pertains to all analytes determined by the method. It is used in conjunction the footnote V.

V Secondary column result is the preferred value.

This footnote is used for GC tests in conjunction the T footnote. It indicates that the value from the second column is preferred over the primary column result and pertains only to the indicated compound.

LIMs Report Key

Section	Description
Cover Letter	Signature page, report narrative as applicable.
Sample Description Information	Tabulated cross-reference between the Lab ID and Client ID, including matrix, date and time sampled, and the date received for all samples in the project.
Sample Analysis Results Sheets	Lists sample results, test components, reporting limits, dates prepared and analyzed, and any data qualifiers. Pages are organized by test.
QC LOT Assignment Report	Cross-reference between lab IDs and applicable QC batches (DCS, LCS, Blank, MS/SD, DU)
Duplicate Control Sample Report	Percent recovery and RPD results, with acceptance limits, for the laboratory duplicate control samples for each test are tabulated in this report. These are measures of accuracy and precision for each test. Acceptance limits are based upon laboratory historical data.
Laboratory Control Sample Report	Percent recovery results for a single Laboratory Control Sample (if applicable) are tabulated in this report, with the applicable acceptance limits for each test.
Matrix Spike/Matrix Spike Duplicate Report	Percent recovery and RPD results for matrix-specific QC samples and acceptance limits, where applicable. This report can be used to assess matrix effects on an analysis.
Single Control Sample Report	A tabulation of the surrogate recoveries for the blank for organic analyses.
Method Blank Report	A summary of the results of the analysis of the method blank for each test.

List of Abbreviations and Terms

Abbreviation	Term	Abbreviation	Term
DCS	Duplicate Control Sample	MSD	Matrix Spike Duplicate
DU	Sample Duplicate	QC Run	Preparation Batch
EB	Equipment Blank	QC Category	LIMs QC Category
FB	Field Blank	QC Lot	DCS Batch
FD	Field Duplicate	ND	Not Detected at or above the reporting limit expressed
IDL	Instrument Detection Limit (Metals)	QC Matrix	Matrix of the laboratory control sample(s)
LCS	Laboratory Control Sample	RL	Reporting Limit
MB	Method Blank	QC	Quality Control
MDL	Method Detection Limit	SA	Sample
MS	Matrix Spike	SD	Spike Duplicate
RPD	Relative Percent Difference	TB	Trip Blank
ppm (part-per-million)	mg/L or mg/kg (usually)	ppb (part-per-billion)	ug/L or ug/kg (usually)
QUAL	Qualifier flag	DIL	Dilution Factor

SAMPLE DESCRIPTION INFORMATION/ANALYTICAL TEST REQUESTS

Sample Description Information

The Sample Description Information lists all of the samples received in this project together with the internal laboratory identification number assigned for each sample. Each project received at Quanterra's Denver laboratory is assigned a unique six digit number. Samples within the project are numbered sequentially. The laboratory identification number is a combination of the six digit project code and the sample sequence number.

Also given in the Sample Description Information is the Sample Type (matrix), Date of Sampling (if known) and Date of Receipt at the laboratory.

Analytical Test Requests

The Analytical Test Requests lists the analyses that were performed on each sample. The Custom Test column indicates where tests have been modified to conform to the specific requirements of this project.

Quanterra
Environmental Services

SAMPLE DESCRIPTION INFORMATION
for
U.S. Geological Survey

Lab ID	Client ID	Matrix	Sampled Date	Sampled Time	Received Date
056503-0001-SA	HOLE 1/6.5	SOIL	07 AUG 97	08:40	12 AUG 97
056503-0002-SA	HOLE 1/25	SOIL	07 AUG 97	09:30	12 AUG 97
056503-0003-SA	HOLE 1/50	SOIL	07 AUG 97	11:10	12 AUG 97
056503-0004-SA	HOLE 1/70	SOIL	07 AUG 97	12:35	12 AUG 97
056503-0004-DU	HOLE 1/70	SOIL	07 AUG 97	12:36	12 AUG 97
056503-0005-SA	HOLE 1/110	SOIL	07 AUG 97	14:55	12 AUG 97
056503-0006-SA	HOLE 2/6	SOIL	08 AUG 97	08:15	12 AUG 97
056503-0007-SA	HOLE 2/25	SOIL	08 AUG 97	09:10	12 AUG 97
056503-0007-MS	HOLE 2/25	SOIL	08 AUG 97	09:10	12 AUG 97
056503-0007-SD	HOLE 2/25	SOIL	08 AUG 97	09:10	12 AUG 97
056503-0008-SA	HOLE 2/50	SOIL	08 AUG 97	10:15	12 AUG 97
056503-0009-SA	HOLE 2/70	SOIL	08 AUG 97	11:20	12 AUG 97
056503-0010-SA	HOLE 2/110	SOIL	08 AUG 97	13:20	12 AUG 97
056503-0011-EB	EQUIPMENT BLANK	AQUEOUS	07 AUG 97	08:20	12 AUG 97
056503-0012-TB	TRIP BLANK	AQUEOUS	07 AUG 97	08:20	12 AUG 97

Quanterra
Environmental Services

ANALYTICAL TEST REQUESTS
for
U.S. Geological Survey

Lab ID: 056503	Group Code	Analysis Description	Custom Test?
0001 - 0010	A	Percent Water: ASTM D2216	N
		Extractable Petroleum Hydrocarbons	N
		Prep - Hydrocarbons by GC	N
		Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)	N
		Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)-2nd column	N
0011	B	Extractable Petroleum Hydrocarbons	N
		Prep - Hydrocarbons by GC	N
		Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)	N
		Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX) - 2nd Column	N
0012	C	Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)	N
		Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX) - 2nd Column	N

ANALYTICAL RESULTS

The analytical results for this project are presented in the following data tables. Each data table includes sample identification information, and when available and appropriate, dates sampled, received, authorized, prepared and analyzed. The authorization date is the date when the project was defined by the client such that laboratory work could begin. The date prepared is typically the date an extraction or digestion was initiated. For volatile organic compounds in water, the date prepared is the date the screening of the sample was performed.

Data sheets contain a listing of the parameters measured in each test, the analytical results and the Quanterra reporting limit. Reporting limits are adjusted to reflect dilution of the sample, when appropriate. Solid and waste samples are reported on an "as received" basis, i.e. no correction is made for moisture content.

Quanterra does not routinely blank-correct analytical data. Uncorrected analytical results are reported, along with associated blank results, for all organic and metals analyses. Analytical results and blank results are reported for conventional inorganic parameters as specified in the method. In addition, surrogate recovery data is presented for all GC/MS analyses. The surrogate recovery is an indication of the affect of the sample matrix on the performance of the method.

Quanterra
Environmental Services

BTEX by Method 8020
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 1/6.5
Lab ID: 056503-0001-SA
Matrix SOIL Sampled: 07 AUG 97 Prepared: NA
Authorized: 12 AUG 97 Received: 12 AUG 97 Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	5.0	T
Toluene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
Xylenes (total)	ND	ug/kg	5.0	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	95	%	84-111

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Shawn Hadley Approved By: Lynn S. Calvin

Quanterra Environmental Services

Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 1/25
Lab ID: 056503-0002-SA
Matrix SOIL Sampled: 07 AUG 97 Prepared: NA
Authorized: 12 AUG 97 Received: 12 AUG 97 Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	1000	TG
Toluene	ND	ug/kg	1000	
Ethylbenzene	ND	ug/kg	1000	
Xylenes (total)	ND	ug/kg	1000	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	NC	%	77-118

Dilution factor is 20. All results and limits are corrected for dilution.

G = Reporting limit raised due to the matrix of the sample.
T = Preferred values unless footnoted on secondary column test.
NC = Not Calculated, calculation not applicable.
ND = Not Detected

Reported By: Shawn Hadley Approved By: Lynn S. Calvin

Quanterra Environmental Services

Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 1/50
Lab-ID: 056503-0003-SA
Matrix SOIL Sampled: 07 AUG 97 Prepared: NA
Authorized: 12 AUG 97 Received: 12 AUG 97 Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	2500	Tt
Toluene	ND	ug/kg	2500	
Ethylbenzene	19000	ug/kg	2500	
Xylenes (total)	120000	ug/kg	2500	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	NC	%	77-118

Dilution factor is 50. All results and limits are corrected for dilution.

t = Sample diluted due to the concentration of target compounds.
T = Preferred values unless footnoted on secondary column test.
NC = Not Calculated, calculation not applicable.
ND = Not Detected

Reported By: Shawn Hadley Approved By: Lynn S. Calvin

Quanterra Environmental Services

Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)-2nd column
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 1/50
Lab ID: 056503-0003-SA
Matrix SOIL Sampled: 07 AUG 97 Prepared: NA
Authorized: 12 AUG 97 Received: 12 AUG 97 Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	2500	t
Toluene	ND	ug/kg	2500	
Ethylbenzene	7400	ug/kg	2500	V
Xylenes (total)	67000	ug/kg	2500	V

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	NC	%	77-118

Dilution factor is 50. All results and limits are corrected for dilution.

t = Sample diluted due to the concentration of target compounds.
V = Secondary column result is the preferred value.
NC = Not Calculated, calculation not applicable.
ND = Not Detected

Reported By: Shawn Hadley Approved By: Lynn S. Calvin

Quanterra
Environmental Services

BTEX by Method 8020
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 1/70
Lab ID: 056503-0004-SA
Matrix SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Received: 12 AUG 97

Prepared: NA
Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	5.0	T
Toluene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
Xylenes (total)	ND	ug/kg	5.0	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	94	%	84-111

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Shawn Hadley

Approved By: Lynn S. Calvin

Quanterra
Environmental Services

BTEX by Method 8020
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 1/70
Lab ID: 056503-0004-DU
Matrix SOIL Sampled: 07 AUG 97 Prepared: NA
Authorized: 12 AUG 97 Received: 12 AUG 97 Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	5.0	T
Toluene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
Xylenes (total)	ND	ug/kg	5.0	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	95	%	84-111

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Shawn Hadley Approved By: Lynn S. Calvin

Quanterra
Environmental Services

BTEX by Method 8020
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 1/110
Lab ID: 056503-0005-SA
Matrix SOIL Sampled: 07 AUG 97 Prepared: NA
Authorized: 12 AUG 97 Received: 12 AUG 97 Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	5.0	T
Toluene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
Xylenes (total)	ND	ug/kg	5.0	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	95	%	84-111

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Shawn Hadley Approved By: Lynn S. Calvin

Quanterra
Environmental Services

BTEX by Method 8020
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 2/6
Lab ID: 056503-0006-SA
Matrix SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Received: 12 AUG 97

Prepared: NA
Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	5.0	T
Toluene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
Xylenes (total)	ND	ug/kg	5.0	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	96	%	84-111

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Shawn Hadley

Approved By: Lynn S. Calvin

Quanterra
Environmental Services

BTEX by Method 8020
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 2/25
Lab-ID: 056503-0007-SA
Matrix SOIL Sampled: 08 AUG 97 Prepared: NA
Authorized: 12 AUG 97 Received: 12 AUG 97 Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	5.0	T
Toluene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
Xylenes (total)	ND	ug/kg	5.0	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	95	%	84-111

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Shawn Hadley Approved By: Lynn S. Calvin

Quanterra
Environmental Services

BTEX by Method 8020
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 2/50
Lab ID: 056503-0008-SA
Matrix SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Received: 12 AUG 97

Prepared: NA
Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	5.0	T
Toluene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
Xylenes (total)	ND	ug/kg	5.0	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	94	%	84-111

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Shawn Hadley

Approved By: Lynn S. Calvin

Quanterra
Environmental Services

BTEX by Method 8020
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 2/70
Lab-ID: 056503-0009-SA
Matrix SOIL Sampled: 08 AUG 97 Prepared: NA
Authorized: 12 AUG 97 Received: 12 AUG 97 Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	5.0	T
Toluene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
Xylenes (total)	ND	ug/kg	5.0	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	94	%	84-111

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Shawn Hadley Approved By: Lynn S. Calvin

Quanterra
Environmental Services

BTEX by Method 8020
Method 8020

Client Name: U.S. Geological Survey
Client ID: HOLE 2/110
Lab ID: 056503-0010-SA
Matrix SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Received: 12 AUG 97

Prepared: NA
Analyzed: 13 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/kg	5.0	T
Toluene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
Xylenes (total)	ND	ug/kg	5.0	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	95	%	84-111

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Shawn Hadley

Approved By: Lynn S. Calvin

Quanterra
Environmental Services

Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)
Method 8020

Client Name: U.S. Geological Survey
Client ID: EQUIPMENT BLANK
Lab-ID: 056503-0011-EB
Matrix AQUEOUS Sampled: 07 AUG 97 Prepared: NA
Authorized: 12 AUG 97 Received: 12 AUG 97 Analyzed: 12 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/L	0.50	T
Toluene	ND	ug/L	0.50	
Ethylbenzene	ND	ug/L	0.50	
Xylenes (total)	ND	ug/L	0.50	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	91	%	82-112

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Dan Appelhans Approved By: Lynn S. Calvin

Quanterra Environmental Services

Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)
Method 8020

Client Name: U.S. Geological Survey
Client ID: TRIP BLANK
Lab ID: 056503-0012-TB
Matrix AQUEOUS Sampled: 07 AUG 97 Prepared: NA
Authorized: 12 AUG 97 Received: 12 AUG 97 Analyzed: 12 AUG 97

Parameter	Result	Units	Reporting Limit	
Benzene	ND	ug/L	0.50	T
Toluene	ND	ug/L	0.50	
Ethylbenzene	ND	ug/L	0.50	
Xylenes (total)	ND	ug/L	0.50	

Surrogate	Recovery		Limits
a,a,a-Trifluorotoluene	90	%	82-112

Dilution factor is 1.0. All results and limits are corrected for dilution.

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Reported By: Dan Appelhans Approved By: Lynn S. Calvin

Quanterra
Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 1/6.5
Lab ID: 056503-0001-SA
Matrix: SOIL — Sampled: 07 AUG 97 — Prepared: 13 AUG 97
Authorized: 12 AUG 97 — Received: 12 AUG 97 — Analyzed: 14 AUG 97

Parameter	Result	Units	Reporting Limit	
Diesel Range Organics	9.3	mg/kg	4.0	1q
Surrogate	Recovery		Limits	
o-Terphenyl	86	%	72-133	

Dilution factor is 1.0. All results and limits are corrected for dilution.

1 = Sample resembles a hydrocarbon product occurring within the n-alkane range of C14-C28.
q = This sample has GC/FID characteristics for which reliable identification of a product could not be achieved.

Reported By: Bret Collins — Approved By: Deborah Street

Quanterra
Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 1/25
Lab ID: 056503-0002-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 15 AUG 97

Parameter	Result	Units	Reporting Limit	
Diesel Range Organics	1600	mg/kg	80	t1q
Surrogate	Recovery		Limits	
o-Terphenyl	NC	%	72-133	

Dilution factor is 20. All results and limits are corrected for dilution.

1 = Sample resembles a hydrocarbon product occurring within the n-alkane range of C10-C26.
q = This sample has GC/FID characteristics for which reliable identification of a product could not be achieved.
t = Sample diluted due to the concentration of target compounds.
NC = Not Calculated, calculation not applicable.

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra
Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 1/50
Lab-ID: 056503-0003-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 15 AUG 97

Parameter	Result	Units	Reporting Limit	
Diesel Range Organics	2300	mg/kg	80	t1q
Surrogate	Recovery		Limits	
o-Terphenyl	NC	%	72-133	

Dilution factor is 20. All results and limits are corrected for dilution.

1 = Sample resembles a hydrocarbon product occurring within the n-alkane range of C10-C28.
q = This sample has GC/FID characteristics for which reliable identification of a product could not be achieved.
t = Sample diluted due to the concentration of target compounds.
NC = Not Calculated, calculation not applicable.

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 1/70
Lab-ID: 056503-0004-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 14 AUG 97

Parameter	Result	Units	Reporting Limit
Diesel Range Organics	ND	mg/kg	4.0
Surrogate	Recovery		Limits
o-Terphenyl	103	%	72-133

Dilution factor is 1.0. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 1/70
Lab-ID: 056503-0004-DU
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 14 AUG 97

Parameter	Result	Units	Reporting Limit
Diesel Range Organics	ND	mg/kg	4.0
Surrogate	Recovery		Limits
o-Terphenyl	98	%	72-133

Dilution factor is 1.0. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra
Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 1/110
Lab ID: 056503-0005-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 14 AUG 97

Parameter	Result	Units	Reporting Limit
Diesel Range Organics	ND	mg/kg	4.0
Surrogate	Recovery		Limits
o-Terphenyl	93	%	72-133

Dilution factor is 1.0. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra
Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 2/6
Lab ID: 056503-0006-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 14 AUG 97

Parameter	Result	Units	Reporting Limit
Diesel Range Organics	ND	mg/kg	4.0
Surrogate	Recovery		Limits
o-Terphenyl	105	%	72-133

Dilution factor is 1.0. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra
Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 2/25
Lab ID: 056503-0007-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 14 AUG 97

Parameter	Result	Units	Reporting Limit
Diesel Range Organics	ND	mg/kg	4.0
Surrogate	Recovery		Limits
o-Terphenyl	89	%	72-133

Dilution factor is 1.0. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra
Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 2/50
Lab ID: 056503-0008-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 14 AUG 97

Parameter	Result	Units	Reporting Limit
Diesel Range Organics	ND	mg/kg	4.0
Surrogate	Recovery		Limits
o-Terphenyl	84	%	72-133

Dilution factor is 1.0. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra
Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 2/70
Lab ID: 056503-0009-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 14 AUG 97

Parameter	Result	Units	Reporting Limit
Diesel Range Organics	ND	mg/kg	4.0
Surrogate	Recovery		Limits
o-Terphenyl	99	%	72-133

Dilution factor is 1.0. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra
Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: HOLE 2/110
Lab ID: 056503-0010-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 14 AUG 97

Parameter	Result	Units	Reporting Limit
Diesel Range Organics	ND	mg/kg	4.0
Surrogate	Recovery		Limits
o-Terphenyl	92	%	72-133

Dilution factor is 1.0. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra
Environmental Services

Extractable Petroleum Hydrocarbons
Method 8015 Modified

Client Name: U.S. Geological Survey
Client ID: EQUIPMENT BLANK
Lab ID: 056503-0011-EB
Matrix: AQUEOUS
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Received: 12 AUG 97

Prepared: 13 AUG 97
Analyzed: 18 AUG 97

Parameter	Result	Units	Reporting Limit
Diesel Range Organics	ND	mg/L	0.10
Surrogate	Recovery		Limits
o-Terphenyl	95	%	63-130

Dilution factor is 1.0. All results and limits are corrected for dilution.

ND = Not Detected

Reported By: Bret Collins

Approved By: Deborah Street

Quanterra
Environmental Services

General Inorganics

Client Name: U.S. Geological Survey
Client ID: HOLE 1/6.5
Lab ID: 056503-0001-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Prepared: See Below

Received: 12 AUG 97
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	10		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio

Approved By: Tammy Smith

Quanterra
Environmental Services

General Inorganics

Client Name: U.S. Geological Survey
Client ID: HOLE 1/25
Lab ID: 056503-0002-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Prepared: See Below

Received: 12 AUG 97
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	11		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio

Approved By: Tammy Smith

Quanterra
Environmental Services

General Inorganics

Client Name: U.S. Geological Survey
Client ID: HOLE 1/50
Lab ID: 056503-0003-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Prepared: See Below

Received: 12 AUG 97
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	8.1		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio

Approved By: Tammy Smith

Quanterra Environmental Services

General Inorganics

Client Name: U.S. Geological Survey
Client ID: HOLE 1/70
Lab ID: 056503-0004-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Prepared: See Below

Received: 12 AUG 97
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	3.2		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio

Approved By: Tammy Smith

Quanterra
Environmental Services

General Inorganics

Client Name: U.S. Geological Survey
Client ID: HOLE 1/70
Lab ID: 056503-0004-DU
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Prepared: See Below

Received: 12 AUG 97
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	3.3		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio

Approved By: Tammy Smith

Quanterra
Environmental Services

General Inorganics

Client Name: U.S. Geological Survey
Client ID: HOLE 1/110
Lab ID: 056503-0005-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 07 AUG 97
Prepared: See Below

Received: 12 AUG 97
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	5.1		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio

Approved By: Tammy Smith

Quanterra
Environmental Services

General Inorganics

Client Name: U.S. Geological Survey
Client ID: HOLE 2/6
Lab ID: 056503-0006-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Prepared: See Below

Received: 12 AUG 97
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	11		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio

Approved By: Tammy Smith

Quanterra
Environmental Services

General Inorganics

Client Name: U.S. Geological Survey
Client ID: HOLE 2/25
Lab ID: 056503-0007-SA
Matrix: SOIL — Sampled: 08 AUG 97 — Received: 12 AUG 97
Authorized: 12 AUG 97 — Prepared: See Below — Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	9.7		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio Approved By: Tammy Smith

Quanterra
Environmental Services

General Inorganics

Client Name: U.S. Geological Survey
Client ID: HOLE 2/50
Lab ID: 056503-0008-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Prepared: See Below

Received: 12 AUG 97
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	6.5		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio

Approved By: Tammy Smith

Quanterra
Environmental Services

General Inorganics

Client Name: U.S. Geological Survey
Client ID: HOLE 2/70
Lab ID: 056503-0009-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Prepared: See Below

Received: 12 AUG 97
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	3.3		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio

Approved By: Tammy Smith

Quanterra
Environmental Services

General Inorganics

ient Name: U.S. Geological Survey
ient ID: HOLE 2/110
Lab ID: 056503-0010-SA
Matrix: SOIL
Authorized: 12 AUG 97

Sampled: 08 AUG 97
Prepared: See Below

Received: 12 AUG 97
Analyzed: See Below

Parameter	Result	Qual	Dil	RL	Units	Test Method	Prepared Date	Analyzed Date
Water	4.4		1.0	0.10	%	D2216	NA	15 AUG 97

Reported By: Jeffrey W. Gillio

Approved By: Tammy Smith

APPENDIX II

Laboratory Quality Assurance / Quality Control Results

DODEC LABORATORY DATA REVIEW WORKSHEET

1.0 GENERAL INFORMATION

Data reviewer: BOB BRECK
Date of review: 11/17/97
Sample project number: 56353
Project name: MM CANNON (AIR TOXICS)
Sample collection date: 7/21/97
Sample matrix and number: 4 AIR

Type and number of samples in project:

Type	Number
Environmental	3
Trip blank	
Equipment blank	
Ambient blank	1
MS/MSD	
Other	

2.0 DATA REPORT

Date of Analytical Results Report: 8/11/97
Number of volumes in Raw Data Report: 1
Raw Data Report reviewed? Yes____ No X

Were all analyses requested on the COC form performed by the laboratory?
Yes X No____

If no, list canceled analyses and reason for non-performance:

Were the samples properly preserved upon receipt by the laboratory?
Yes X No____

If no, list laboratory ID for samples that were not properly preserved.

3.0 ANALYTICAL METHODS

Analytical methods used in this project

____	VOC by GC/MS (SW 8240, SW 8260, E524, E624)
____	Halogenated VOC by GC (SW 8010)
____	Aromatic VOC by GC (SW 8020)
____	SVOC by GC/MS (SW 8270)
____	PAH by HPLC (SW 8310)
____	Organochlorine pesticides and PCB (SW 8080)
____	Organophosphorous pesticides (SW 8140)
____	Chlorinated herbicides (SW 8150)
____	Dioxins and Furans (SW 8280)
____	Explosives (8330)
____	TOC (E415.1 or SW 9060)
____	TPH (E418.1)
____	Oil and Grease (E413.2)
____	TOX (SW9020)
____	ICP screen for metals (SW 6010)
____	ICP/MS screen for metals (SW 6020)
____	Trace ICP screen for metals (SW 6010 modified)
____	Antimony by GFAA (SW 7041)
____	Arsenic by GFAA (SW 7060)
____	Chromium (SW 7191 or 7196)
____	Lead by GFAA (SW 7421)
____	Mercury by CVAA (SW 7470 or 7471)
____	Selenium by GFAA (SW 7740)
____	Thallium by GFAA (SW 7841)
____	Inorganic anions (E300.0)
____	Alkalinity (310.1)
____	Cyanide, total and amenable (SW 9010/9012)
____	Nitrogen, ammonia (E350.1)
____	Nitrogen, TKN (E351.2)
____	Nitrogen, nitrate (E353.2)
____	Nitrogen, nitrate plus nitrite (E353.2)
____	Nitrogen, nitrite (E354.1)
____	Phosphorous, total or ortho (E365.3)
____	Sulfate (E375.4)
____	Sulfide (E376.2)
____	TDS (E160.1)
____	pH (SW 9040 or 9045)
____	Percent moisture (D2216)
____	Gross alpha and gross beta radioactivity (SW 9310)
____	Alpha-emitting radium isotopes (SW 9315)
____	Radium-228 (SW 9320)
____	Uranium (908.1)
X	Other analyses : TO-3 BTEX; TO-3 TVPH

Were analytical holding times met? Yes X No _____

If no, list analytical method and laboratory ID for samples that exceeded holding time:

_____

Did surrogate recoveries meet QC acceptance criteria? NA
Yes _____ No _____

If no, list analytical method, laboratory ID, and surrogates that did not meet acceptance criteria:

_____

Did actual reporting limits meet project detection limits?
Organic analyses : Yes _____ No X

If no, list analytical method, laboratory ID, and reason for non-conformance:

TC-3 BTEX SAMPLES -0001, -0002 | -0003 WERE ANALYZED AT A DILUTION
TC-3 TVPH

RLIS WERE RAISED ACCORDINGLY

Inorganic analyses: Yes _____ No _____ NA

Reporting limits for GFAA metals and inorganic anions may be raised when: (1) sample concentrations exceed the instrument linear range and (2) target analytes are subject to matrix interferences. Reporting limits for ICP metals and mercury by CVAA are typically only raised when the sample concentration exceeds the instrument linear range.

Did DCS meet QC acceptance criteria? Yes X No _____

If no, list analytical method, laboratory ID, and reason for non-conformance:

_____

Did SCS meet QC acceptance criteria? Yes____ No____ NA

If no, list analytical method, laboratory ID, and reason for non-conformance:

Were any target compounds found in the method, trip, equipment, or ambient blanks above the RL? Yes ____ No X

If yes, list the analytical method, laboratory ID, type of blank and compound:

Did the MS/MSD meet QC acceptance criteria? Yes___ No___ NA

MS/MSD data are used to evaluate the effect of the sample matrix on the analytical process and should only be used in conjunction with other available laboratory QC information to evaluate precision and accuracy.

If no, list the analytical method, laboratory ID, and reason for non-conformance :

Additional comments:

AMBIENT BLANKS ANALYZED AT A DIFFERENT

QC SUMMARY

The Quanterra laboratories operate under a vigorous QA/QC program designed to ensure the generation of scientifically valid, legally defensible data by monitoring every aspect of laboratory operations. Routine QA/QC procedures include the use of approved methodologies, independent verification of analytical standards, use of duplicate Laboratory Control Samples to assess the precision and accuracy of the methodology on a routine basis, and a rigorous system of data review.

The standard laboratory QC package is designed to:

1. establish a strong, cost-effective QC program that ensures the generation of scientifically valid, legally defensible data,

2. assess the laboratory's performance of the analytical method using control limits generated with a well-defined matrix,

3. establish clear-cut guidelines for acceptability of analytical data so that QC decisions can be made immediately at the bench, and

4. provide a standard set of reportables which assures the client of the quality of his data.

The Quanterra QC program is based upon monitoring the precision and accuracy of an analytical method by analyzing a set of Duplicate Control Samples (DCS) at frequent, well-defined intervals. Each DCS is a well-characterized matrix which is spiked with target compounds at 5-100 times the reporting limit, depending upon the methodology being monitored. The purpose of the DCS is not to duplicate the sample matrix, but rather to provide an interference-free, homogeneous matrix from which to gather data to establish control limits. These limits are used to determine whether data generated by the laboratory on any given day is in control.

Control limits for accuracy (percent recovery) are based on the average, historical percent recovery +/- 3 standard deviation units. Control limits for precision (relative percent difference) range from 0 (identical duplicate DCS results) to the average, historical relative percent difference + 3 standard deviation units. These control limits are fairly narrow based on the consistency of the matrix being monitored and are updated on a quarterly basis.

For each batch of samples analyzed, an additional control measure is taken in the form of a Single Control Sample (SCS). The SCS consists of a control matrix that is spiked with surrogate compounds appropriate to the method being used. In cases where no surrogate is available, (e.g., metals or conventional analyses) a single DCS serves as the control sample. An SCS is prepared for each sample lot for which the DCS pair are not analyzed. The recovery of the SCS is charted in exactly the same manner as described for the DCS, and provides a daily check on the performance of the method.

Accuracy for DCS and SCS is measured by Percent Recovery.

$$\% \text{ Recovery} = \frac{\text{Measured Concentration}}{\text{Actual Concentration}} \times 100$$

Precision for DCS is measured by Relative Percent Difference (RPD).

$$\text{RPD} = \frac{|\text{ Measured Concentration DCS1 - Measured Concentration DCS2 }|}{(\text{Measured Concentration DCS1 + Measured Concentration DCS2})/2} \times 100$$

All samples analyzed concurrently by the same test are assigned the same QC lot number. Projects which contain numerous samples, analyzed over several days, may have multiple QC lot numbers associated with each test. The QC information which follows includes a listing of the QC lot numbers associated with each of the samples reported, DCS and SCS (where applicable) recoveries from the QC lots associated with the samples, and control limits for these lots. The QC data is reported by test code, in the order that the tests are reported in the analytical results section of this report.

Quanterra
Environmental Services

QC LOT ASSIGNMENT REPORT - MS QC
Air Toxics

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA,MS,SD,DU)
056353-0001-SA	AIR	TO-3-BTEX	30 JUL 97-A5	30 JUL 97-A5	
056353-0001-SA	AIR	TO-3-GTJ-G	30 JUL 97-A5G	30 JUL 97-A5	
056353-0002-SA	AIR	TO-3-BTEX	30 JUL 97-A5	30 JUL 97-A5	
056353-0002-SA	AIR	TO-3-GTJ-G	30 JUL 97-A5G	30 JUL 97-A5	
056353-0003-SA	AIR	TO-3-BTEX	30 JUL 97-A5	30 JUL 97-A5	
056353-0003-SA	AIR	TO-3-GTJ-G	30 JUL 97-A5G	30 JUL 97-A5	
056353-0004-SA	AIR	TO-3-BTEX	30 JUL 97-A5	30 JUL 97-A5	
056353-0004-SA	AIR	TO-3-GTJ-G	30 JUL 97-A5G	30 JUL 97-A5	

Quanterra
Environmental Services

DUPLICATE CONTROL SAMPLE REPORT
Air Toxics
Project: 056353

Category: TO-3-BTEX Method TO-3 - BTEX
Matrix: AIR
QC Lot: 30 JUL 97-A5 Date Analyzed: 30 JUL 97
Concentration Units: ppmv

Analyte	Concentration Spiked	Measured DCS1	Qual	DCS2	Qual	AVG	Accuracy Average(%) DCS	Limits	Precision (RPD) DCS	Limit
Benzene	1.01	0.915		0.916		0.916	91	70-125	0.17	20
Toluene	1.02	0.964		0.981		0.972	95	70-125	1.8	20

Category: TO-3-GTJ-G Method TO-3 - TVPH by GC
Matrix: AIR
QC Lot: 30 JUL 97-A5G Date Analyzed: 30 JUL 97
Concentration Units: ppm (v/v)

Analyte	Concentration Spiked	Measured DCS1	Qual	DCS2	Qual	AVG	Accuracy Average(%) DCS	Limits	Precision (RPD) DCS	Limit
TVPH as Gasoline	9.19	9.25		9.30		9.27	101	70-125	0.52	20

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

METHOD BLANK REPORT
Air Toxics
Project: 056353

Test: TO-3-BTEX-G TO-3 - BTEX
Matrix: AIR
QC Lot: 30 JUL 97-A5 QC Run: 30 JUL 97-A5 Date Analyzed: 30 JUL 97

Analyte	Result	Units	Reporting Limit
Benzene	ND	ppmv	0.020
Toluene	ND	ppmv	0.020
Ethylbenzene	ND	ppmv	0.020
Xylenes (total)	ND	ppmv	0.020

Test: TO-3-TVPH-GTJ-G TO-3 - TVPH by GC
Matrix: AIR
QC Lot: 30 JUL 97-A5G QC Run: 30 JUL 97-A5 Date Analyzed: 30 JUL 97

Analyte	Result	Units	Reporting Limit
TVPH as Gasoline	ND	ppm (v/v)	1.0

ND = Not Detected

Quanterra
Environmental Services

CANISTER FIELD DATA RECORD

CLIENT: US GEOLOGICAL SURVEY
CANISTER SERIAL #: 9705B
DATE CLEANED: 7/14B
CLIENT SAMPLE # MPA5-0797
SITE LOCATION: Cannon AFB, SWMU70

VFR ID: _____
Duration of comp.: _____ hrs./min.
Flow setting: _____ ml/min
Initials: _____ LC/[illegible]

READING	TIME	VAC. (inches Hg) or PRESS. (psig)	DATE	INITIALS
INITIAL VACUUM CHECK	1254 MDT	~~5~~-30	7-21-97	[illegible]
INITIAL FIELD VACUUM	↓	↓	↓	↓
FINAL FIELD READING	1315	-~~5~~" Hg *	7-21-97	[illegible]
GAUGE READING UPON RECEIPT				

LABORATORY CANISTER PRESSURIZATION

INITIAL VACUUM (inches Hg and PSIA)			
FINAL PRESSURE (PSIA)			

Pressurization gas: _____

COMMENTS

* -5" Hg atmospheric pressure

Comp. Time (Hours)	Flow rate Range (ml/min)
0.5	158 - 166.7
1	79.2 - 83.3
2	39.6 - 41.7
4	19.8 - 20.8
6	13.2 - 13.9
8	9.9 - 10.4
10	7.92 - 8.3
12	6.6 - 6.9
24	3.3 - 3.5

Quanterra
Environmental Services

CANISTER FIELD DATA RECORD

CLIENT: US GEOLOGICAL SURVEY
CANISTER SERIAL #: ~~12888~~ 93167
DATE CLEANED: 7/14B
CLIENT SAMPLE #: MPCEO-0797
SITE LOCATION: Cannon AFB, SWMU70

VFR ID: _____
Duration of comp.: _____ hrs./min.
Flow setting: _____ ml/min
Initials: _____ LC/LO

READING	TIME	VAC. (inches Hg) or PRESS. (psig)	DATE	INITIALS
INITIAL VACUUM CHECK	1321	< -30" Hg	07-21-97	RWW
INITIAL FIELD VACUUM	✓	✓	✓	✓
FINAL FIELD READING	1332	-8" Hg *	07-21-97	RWW
GAUGE READING UPON RECEIPT				
LABORATORY CANISTER PRESSURIZATION				
INITIAL VACUUM (inches Hg and PSIA)				
FINAL PRESSURE (PSIA)				

Pressurization gas: _____

COMMENTS

* -8" Hg is atmospheric pressure

Comp. Time (Hours)	Flow rate Range (ml/min)
0.5	158 - 166.7
1	79.2 - 83.3
2	39.6 - 41.7
4	19.8 - 20.8
6	13.2 - 13.9
8	9.9 - 10.4
10	7.92 - 8.3
12	6.6 - 6.9
24	3.3 - 3.5

Quanterra
Environmental Services

CANISTER FIELD DATA RECORD

CLIENT: US GEOLOGICAL SURVEY
CANISTER SERIAL #: 9707B
DATE CLEANED: 7/14B
CLIENT SAMPLE # VW-0797
SITE LOCATION: Cannon AFB, SWMU70

VFR ID: _____
Duration of comp.: _____ hrs./min.
Flow setting: _____ ml/min
Initials: _____ LC/LG

READING	TIME	VAC. (inches Hg) or PRESS. (psig)	DATE	INITIALS
INITIAL VACUUM CHECK	1339	<-30" Hg	07-21-97	RWW
INITIAL FIELD VACUUM	✓	✓	✓	✓
FINAL FIELD READING	1350	-2" Hg*	07-21-97	RWW
GAUGE READING UPON RECEIPT				

LABORATORY CANISTER PRESSURIZATION

INITIAL VACUUM (inches Hg and PSIA)			
FINAL PRESSURE (PSIA)			

Pressurization gas: _____

COMMENTS

* -2" Hg atmospheric pressure

Comp. Time (Hours)	Flow rate Range (ml/min)
0.5	158 - 166.7
1	79.2 - 83.3
2	39.6 - 41.7
4	19.8 - 20.8
6	13.2 - 13.9
8	9.9 - 10.4
10	7.92 - 8.3
12	6.6 - 6.9
24	3.3 - 3.5

Quanterra
Environmental Services

CANISTER FIELD DATA RECORD

CLIENT: US GEOLOGICAL SURVEY
CANISTER SERIAL #: 12888
DATE CLEANED: 7/14 B
CLIENT SAMPLE #: Ambient Blank-0797
SITE LOCATION: Cannon AFB, SWMU70

VFR ID: _____
Duration of comp.: _____ hrs./min.
Flow setting: _____ ml/min
Initials: _____ LC/AG

READING	TIME	VAC. (inches Hg) or PRESS. (psig)	DATE	INITIALS
INITIAL VACUUM CHECK	1415	<-30" Hg	07-21-97	RWW
INITIAL FIELD VACUUM	↓	↓	↓	↓
FINAL FIELD READING	1430	-2" Hg*	07-21-97	RWW
GAUGE READING UPON RECEIPT				
LABORATORY CANISTER PRESSURIZATION				
INITIAL VACUUM (inches Hg and PSIA)				
FINAL PRESSURE (PSIA)				

Pressurization gas: _____

COMMENTS

* -2" Hg at [illegible]

Comp. Time (Hours)	Flow rate Range (ml/min)
0.5	158 - 166.7
1	79.2 - 83.3
2	39.6 - 41.7
4	19.8 - 20.8
6	13.2 - 13.9
8	9.9 - 10.4
10	7.92 - 8.3
12	6.6 - 6.9
24	3.3 - 3.5

[redacted]

Chain [redacted]ustody Record

Quanter[redacted] Environmen[redacted] Services

QUA-4124-1

Client: U.S. GEOLOGICAL SURVEY	Project Manager: FRED GEBHARDT	Date: 7-22-97	Chain Of Custody Number: 65469
Address: 4501 INDIAN SCHOOL RD SUITE 200	Telephone Number (Area Code)/Fax Number: 505 262 5399	Lab Number	Page ____ of ____
City: ALBUQUERQUE State: NM Zip Code: 87110	Site Contact	Lab Contact	
Project Name: SWMU-70	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.: LINDSEY BREYER - DENVER			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Aqueous	Sed.	Soil	GAS	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	SumMA	TPH	BTEX	METHOD TO-3	Special Instructions/ Conditions of Receipt
MPA5-0797	7-21-97	1315				✓							✓	✓	✓	✓	
MPC50-0797	7-21-97	1332				✓							✓	✓	✓	✓	

Analysis (Attach list if more space is needed)

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other ____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: Frederick S. Gebhardt	7-22-97	1200	1. Received By		
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

[redacted]

Chain [redacted]ustody Record

QUA-4124-1

Quanter Environmental Services

Client	Project Manager	Date	Chain Of Custody Number
U.S. GEOLOGICAL SURVEY	FRED GEBHARDT	7-22-97	65470
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page ___ of ___**
4501 INDIAN SCHOOL RD SUITE 200	505 262 5399		

City	State	Zip Code	Site Contact	Lab Contact
ALBUQUERQUE	NM	87110		

Project Name	Carrier/Waybill Number
SWMU-70	

Contract/Purchase Order/Quote No.: LINDSEY BREYER - DENVER

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Aqueous	Sed.	Soil	GAS	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	SUMMA			TPH	BTEX	METHOD TO-3							Special Instructions/ Conditions of Receipt
VW-0797	7-21-97	1350				✓							✓			✓	✓	✓							
AMBIENT BLANK-0797	7-21-97	1430				✓							✓			✓	✓	✓							

Analysis (Attach list if more space is needed)

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ___ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other ___

QC Requirements (Specify):

Relinquished By	Date	Time	Received By	Date	Time
1. Fredrick S. Gebhardt	7-22-97	1200	1.		
2.			2.		
3.			3.		

Comments:

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

DODEC LABORATORY DATA REVIEW WORKSHEET

1.0 GENERAL INFORMATION

Data reviewer: Bob Brack
Date of review: 9/25/97
Sample project number: 56503
Project name: NM-Cannon AFB
Sample collection date: 8/12/97
Sample matrix and number: 2 Aqueous; 13 Soil

Type and number of samples in project:

Type	Number
Environmental	10
Trip blank	1
Equipment blank	1
Ambient blank	
MS/MSD	2
Other	1 Duplicate

2.0 DATA REPORT

Date of Analytical Results Report: 9/9/97
Number of volumes in Raw Data Report: 1
Raw Data Report reviewed? Yes____ No X

Were all analyses requested on the COC form performed by the laboratory?
Yes X No____

If no, list canceled analyses and reason for non-performance:

_____

Were the samples properly preserved upon receipt by the laboratory?
Yes X No____

If no, list laboratory ID for samples that were not properly preserved.

_____

3.0 ANALYTICAL METHODS

Analytical methods used in this project

	VOC by GC/MS (SW 8240, SW 8260, E524, E624)
	Halogenated VOC by GC (SW 8010)
X	Aromatic VOC by GC (SW 8020) BTEX
	SVOC by GC/MS (SW 8270)
	PAH by HPLC (SW 8310)
	Organochlorine pesticides and PCB (SW 8080)
	Organophosphorous pesticides (SW 8140)
	Chlorinated herbicides (SW 8150)
	Dioxins and Furans (SW 8280)
	Explosives (8330)
	TOC (E415.1 or SW 9060)
	TPH (E418.1)
	Oil and Grease (E413.2)
	TOX (SW9020)
	ICP screen for metals (SW 6010)
	ICP/MS screen for metals (SW 6020)
	Trace ICP screen for metals (SW 6010 modified)
	Antimony by GFAA (SW 7041)
	Arsenic by GFAA (SW 7060)
	Chromium (SW 7191 or 7196)
	Lead by GFAA (SW 7421)
	Mercury by CVAA (SW 7470 or 7471)
	Selenium by GFAA (SW 7740)
	Thallium by GFAA (SW 7841)
	Inorganic anions (E300.0)
	Alkalinity (310.1)
	Cyanide, total and amenable (SW 9010/9012)
	Nitrogen, ammonia (E350.1)
	Nitrogen, TKN (E351.2)
	Nitrogen, nitrate (E353.2)
	Nitrogen, nitrate plus nitrite (E353.2)
	Nitrogen, nitrite (E354.1)
	Phosphorous, total or ortho (E365.3)
	Sulfate (E375.4)
	Sulfide (E376.2)
	TDS (E160.1)
	pH (SW 9040 or 9045)
X	Percent moisture (D2216)
	Gross alpha and gross beta radioactivity (SW 9310)
	Alpha-emitting radium isotopes (SW 9315)
	Radium-228 (SW 9320)
	Uranium (908.1)
X	Other analyses : DRO, 8015 MODIFIED

Were analytical holding times met? Yes X No _____

If no, list analytical method and laboratory ID for samples that exceeded holding time:

Did surrogate recoveries meet QC acceptance criteria?
Yes X No _____

If no, list analytical method, laboratory ID, and surrogates that did not meet acceptance criteria:

SC20 (DITA) AND SC15M (RE) SAMPLES -CC2 AND -CC3 WERE ANALYZED AT A DILUTION DUE TO HIGH CONCENTRATIONS OF TARGET COMPOUNDS - SURROGATES WERE DILUTED TO LESS THAN DETECTABLE CONCENTRATIONS

Did actual reporting limits meet project detection limits?
Organic analyses : Yes _____ No X

If no, list analytical method, laboratory ID, and reason for non-conformance:

SC20 AND SC15 SAMPLES -CC2 & -CC3 WERE ANALYZED AT A DILUTION - RL'S WERE RAISED ACCORDINGLY

Inorganic analyses: Yes _____ No _____ NA

Reporting limits for GFAA metals and inorganic anions may be raised when: (1) sample concentrations exceed the instrument linear range and (2) target analytes are subject to matrix interferences. Reporting limits for ICP metals and mercury by CVAA are typically only raised when the sample concentration exceeds the instrument linear range.

Did DCS meet QC acceptance criteria? Yes X No _____

If no, list analytical method, laboratory ID, and reason for non-conformance:

Did SCS meet QC acceptance criteria? Yes X No____

If no, list analytical method, laboratory ID, and reason for non-conformance:

Were any target compounds found in the method, trip, equipment, or ambient blanks above the RL? Yes ____ No X

If yes, list the analytical method, laboratory ID, type of blank and compound:

Did the MS/MSD meet QC acceptance criteria? Yes X No____

MS/MSD data are used to evaluate the effect of the sample matrix on the analytical process and should only be used in conjunction with other available laboratory QC information to evaluate precision and accuracy.

If no, list the analytical method, laboratory ID, and reason for non-conformance :

Additional comments:

QC SUMMARY

The Quanterra laboratories operate under a vigorous QA/QC program designed to ensure the generation of scientifically valid, legally defensible data by monitoring every aspect of laboratory operations. Routine QA/QC procedures include the use of approved methodologies, independent verification of analytical standards, use of duplicate Laboratory Control Samples to assess the precision and accuracy of the methodology on a routine basis, and a rigorous system of data review.

The standard laboratory QC package is designed to:

1. establish a strong, cost-effective QC program that ensures the generation of scientifically valid, legally defensible data,

2. assess the laboratory's performance of the analytical method using control limits generated with a well-defined matrix,

3. establish clear-cut guidelines for acceptability of analytical data so that QC decisions can be made immediately at the bench, and

4. provide a standard set of reportables which assures the client of the quality of his data.

The Quanterra QC program is based upon monitoring the precision and accuracy of an analytical method by analyzing a set of Duplicate Control Samples (DCS) at frequent, well-defined intervals. Each DCS is a well-characterized matrix which is spiked with target compounds at 5-100 times the reporting limit, depending upon the methodology being monitored. The purpose of the DCS is not to duplicate the sample matrix, but rather to provide an interference-free, homogeneous matrix from which to gather data to establish control limits. These limits are used to determine whether data generated by the laboratory on any given day is in control.

Control limits for accuracy (percent recovery) are based on the average, historical percent recovery +/- 3 standard deviation units. Control limits for precision (relative percent difference) range from 0 (identical duplicate DCS results) to the average, historical relative percent difference + 3 standard deviation units. These control limits are fairly narrow based on the consistency of the matrix being monitored and are updated on a quarterly basis.

For each batch of samples analyzed, an additional control measure is taken in the form of a Single Control Sample (SCS). The SCS consists of a control matrix that is spiked with surrogate compounds appropriate to the method being used. In cases where no surrogate is available, (e.g., metals or conventional analyses) a single DCS serves as the control sample. An SCS is prepared for each sample lot for which the DCS pair are not analyzed. The recovery of the SCS is charted in exactly the same manner as described for the DCS, and provides a daily check on the performance of the method.

Accuracy for DCS and SCS is measured by Percent Recovery.

$$\% \text{ Recovery} = \frac{\text{Measured Concentration}}{\text{Actual Concentration}} \times 100$$

Precision for DCS is measured by Relative Percent Difference (RPD).

$$\text{RPD} = \frac{|\text{ Measured Concentration DCS1 - Measured Concentration DCS2 }|}{(\text{Measured Concentration DCS1 + Measured Concentration DCS2})/2} \times 100$$

All samples analyzed concurrently by the same test are assigned the same QC lot number. Projects which contain numerous samples, analyzed over several days, may have multiple QC lot numbers associated with each test. The QC information which follows includes a listing of the QC lot numbers associated with each of the samples reported, DCS and SCS (where applicable) recoveries from the QC lots associated with the samples, and control limits for these lots. The QC data is reported by test code, in the order that the tests are reported in the analytical results section of this report.

Quanterra
Environmental Services

QC LOT ASSIGNMENT REPORT
Organics by Chromatography

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
056503-0001-SA	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0002-SA	SOIL	8020-S	12 AUG 97-01	12 AUG 97-01
056503-0003-SA	SOIL	8020-S	12 AUG 97-01	12 AUG 97-01
056503-0003-SA	SOIL	8020-S	12 AUG 97-01	12 AUG 97-01
056503-0004-SA	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0004-DU	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0005-SA	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0006-SA	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0007-SA	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0007-MS	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0007-SD	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0008-SA	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0009-SA	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0010-SA	SOIL	8020-SL	12 AUG 97-K	12 AUG 97-K
056503-0011-EB	AQUEOUS	8020-A	12 AUG 97-H	12 AUG 97-H
056503-0012-TB	AQUEOUS	8020-A	12 AUG 97-H	12 AUG 97-H

Quanterra
Environmental Services

DUPLICATE CONTROL SAMPLE REPORT
Organics by Chromatography

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	AVG	Accuracy Average(%) DCS	Accuracy Limits	Precision (RPD) DCS	Precision Limits
Category: 8020-SL								
Matrix: SOIL								
QC Lot: 12 AUG 97-K								
Concentration Units: ug/kg								
Benzene	50.0	48.7	50.5	49.6	99	79-116	3.6	15
Toluene	50.0	47.9	49.3	48.6	97	81-112	2.9	15
Chlorobenzene	50.0	48.8	50.4	49.6	99	87-112	3.2	15
Ethylbenzene	50.0	47.7	48.9	48.3	97	83-113	2.5	15
Xylenes (total)	150	150	154	152	101	85-112	2.4	15
1,3-Dichlorobenzene	50.0	51.1	51.6	51.4	103	81-117	0.97	15
1,4-Dichlorobenzene	50.0	51.2	51.7	51.4	103	86-114	0.97	15
1,2-Dichlorobenzene	50.0	49.8	50.5	50.2	100	83-113	1.4	15
Category: 8020-S								
Matrix: SOIL								
QC Lot: 12 AUG 97-01								
Concentration Units: ug/kg								
Benzene	1000	1030	1020	1020	103	75-119	0.98	15
Toluene	1000	1030	1020	1020	103	78-115	0.98	15
Chlorobenzene	1000	1040	1020	1030	103	81-114	1.9	15
Ethylbenzene	1000	1000	983	992	99	81-112	1.7	15
Xylenes (total)	3000	3090	3040	3060	102	80-115	1.7	15
1,3-Dichlorobenzene	1000	1010	997	1000	100	80-119	1.3	15
1,4-Dichlorobenzene	1000	1040	1030	1040	104	79-120	0.97	15
1,2-Dichlorobenzene	1000	1000	999	1000	100	78-117	0.10	15
Category: 8020-A								
Matrix: AQUEOUS								
QC Lot: 12 AUG 97-H								
Concentration Units: ug/L								
Benzene	20.0	19.6	19.8	19.7	99	75-113	1.0	15
Toluene	20.0	19.6	19.8	19.7	99	79-113	1.0	15
Chlorobenzene	20.0	19.8	20.0	19.9	100	83-115	1.0	15
Ethylbenzene	20.0	19.1	19.2	19.2	96	82-115	0.52	15
Xylenes (total)	60.0	58.9	59.6	59.2	99	82-115	1.2	15
1,3-Dichlorobenzene	20.0	19.3	19.6	19.4	97	80-120	1.5	15
1,4-Dichlorobenzene	20.0	19.3	19.5	19.4	97	80-122	1.0	15
1,2-Dichlorobenzene	20.0	19.4	19.7	19.6	98	81-118	1.5	15

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

SINGLE CONTROL SAMPLE REPORT
Organics by Chromatography

Analyte	Concentration Spiked	Concentration Measured	Accuracy(%) SCS	Accuracy(%) Limits
Category: 8020-SL				
Matrix: SOIL				
QC Lot: 12 AUG 97-K QC Run: 12 AUG 97-K				
Concentration Units: ug/kg				
a,a,a-Trifluorotoluene	75.0	68.8	92	84-111
Category: 8020-S				
Matrix: SOIL				
QC Lot: 12 AUG 97-01 QC Run: 12 AUG 97-01				
Concentration Units: ug/kg				
a,a,a-Trifluorotoluene	1500	1500	100	77-118
Category: 8020-A				
Matrix: AQUEOUS				
QC Lot: 12 AUG 97-H QC Run: 12 AUG 97-H				
Concentration Units: ug/L				
a,a,a-Trifluorotoluene	30.0	27.4	91	82-112

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

METHOD BLANK REPORT
Organics by Chromatography

Analyte	Result	Units	Reporting Limit
Test: 8020L-BTEX-S			
Matrix: SOIL			
QC Lot: 12 AUG 97-K QC Run: 12 AUG 97-K			
Benzene	ND	ug/kg	5.0
Toluene	ND	ug/kg	5.0
Ethylbenzene	ND	ug/kg	5.0
Xylenes (total)	ND	ug/kg	5.0
Test: 8020-BTEX-S			
Matrix: SOIL			
QC Lot: 12 AUG 97-01 QC Run: 12 AUG 97-01			
Benzene	ND	ug/kg	50
Toluene	ND	ug/kg	50
Ethylbenzene	ND	ug/kg	50
Xylenes (total)	ND	ug/kg	50
Test: 8020-BTEX-2-S			
Matrix: SOIL			
QC Lot: 12 AUG 97-01 QC Run: 12 AUG 97-01			
Benzene	ND	ug/kg	50
Toluene	ND	ug/kg	50
Ethylbenzene	ND	ug/kg	50
Xylenes (total)	ND	ug/kg	50
Test: 8020L-BTEX-S			
Matrix: SOIL			
QC Lot: 12 AUG 97-K QC Run: 12 AUG 97-K			
Benzene	ND	ug/kg	5.0
Toluene	ND	ug/kg	5.0
Ethylbenzene	ND	ug/kg	5.0
Xylenes (total)	ND	ug/kg	5.0

Quanterra
Environmental Services

METHOD BLANK REPORT
Organics by Chromatography (cont.)

Analyte	Result	Units	Reporting Limit
Test: 8020-BTEX-AP			
Matrix: AQUEOUS			
QC Lot: 12 AUG 97-H QC Run: 12 AUG 97-H			
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	ND	ug/L	0.50
Test: 8020-BTEX-AP			
Matrix: AQUEOUS			
QC Lot: 12 AUG 97-H QC Run: 12 AUG 97-H			
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	ND	ug/L	0.50

Quanterra
Environmental Services

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT
Organics by Chromatography
Project: 056503

Category: 8020-A Method 8020 Aromatic Volatile Organics
Matrix: AQUEOUS
Sample: 056509-0001
MS Run: 12 AUG 97-H
Units: ug/L

Analyte	Sample Result	Concentration MS Result	Concentration MSD Result	Amount Spiked MS/MSD	%Recovery MS	%Recovery MSD	%RPD	Acceptance Limit Recov.	Acceptance Limit RPD
Benzene	39	140	140	100	98	99	0.7	75-113	15
Toluene	160	250	260	100	95	98	1.2	79-113	15
Chlorobenzene	ND	100	100	100	101	101	0.0	83-115	15
Ethylbenzene	56	150	150	100	96	97	0.6	82-115	15
Xylenes (total)	470	760	760	300	96	97	0.3	82-115	15
1,3-Dichlorobenzene	ND	99	100	100	99	100	0.9	80-120	15
1,4-Dichlorobenzene	ND	100	100	100	101	102	0.9	80-122	15
1,2-Dichlorobenzene	ND	99	100	100	99	100	1.0	81-118	15

Category: 8020-S Aromatic Volatile Organics
Matrix: SOIL
Sample: 056503-0002
MS Run: 12 AUG 97-01
Units ug/kg Units Qualifier: Wet wt.

Analyte	Sample Result	Concentration MS Result	Concentration MSD Result	Amount Spiked MS/MSD	%Recovery MS	%Recovery MSD	%RPD	Acceptance Limit Recov.	Acceptance Limit RPD
Benzene	ND	NC	NC	1000	NC	NC	NC	75-119	15
Toluene	ND	NC	NC	1000	NC	NC	NC	78-115	15
Chlorobenzene	ND	NC	NC	1000	NC	NC	NC	81-114	15
Ethylbenzene	ND	NC	NC	1000	NC	NC	NC	81-112	15
Xylenes (total)	ND	NC	NC	3000	NC	NC	NC	80-115	15
1,3-Dichlorobenzene	ND	NC	NC	1000	NC	NC	NC	80-119	15
1,4-Dichlorobenzene	ND	NC	NC	1000	NC	NC	NC	79-120	15
1,2-Dichlorobenzene	ND	NC	NC	1000	NC	NC	NC	78-117	15

NC = Not Calculated, calculation not applicable.
ND = Not Detected

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT
Organics by Chromatography
Project: 056503 (cont.)

Category: 8020-SL Direct Purge Soils
Matrix: SOIL
Sample: 056503-0007
MS Run: 12 AUG 97-K
Units: ug/kg

Analyte	Sample Result	Concentration MS Result	Concentration MSD Result	Amount Spiked MS/MSD	%Recovery MS	%Recovery MSD	%RPD	Acceptance Limit Recov.	Acceptance Limit RPD
Benzene	ND T	50.7	49.2	50.0	101	98	3.0	79-116	15
Toluene	ND	49.1	47.8	50.0	98	96	2.7	81-112	15
Ethylbenzene	ND	48.6	47.3	50.0	97	95	2.7	83-113	15
Xylenes (total)	ND	149	146	150	99	97	2.0	85-112	15

T = Preferred values unless footnoted on secondary column test.
ND = Not Detected

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

QC LOT ASSIGNMENT REPORT
Semivolatile Organics by GC

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
056503-0001-SA	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0002-SA	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0003-SA	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0004-SA	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0004-DU	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0005-SA	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0006-SA	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0007-SA	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0007-MS	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0007-SD	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0008-SA	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0009-SA	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0010-SA	SOIL	8015M-D-S	13 AUG 97-01	13 AUG 97-01
056503-0011-EB	AQUEOUS	8015M-D-A	13 AUG 97-01	13 AUG 97-01

Quanterra
Environmental Services

DUPLICATE CONTROL SAMPLE REPORT
Semivolatile Organics by GC

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	Measured AVG	Accuracy Average(%) DCS	Accuracy Average(%) Limits	Precision (RPD) DCS	Precision (RPD) Limits
Category: 8015M-D-S Matrix: SOIL QC Lot: 13 AUG 97-01 Concentration Units: mg/kg								
Diesel Range Organics	20.0	22.8	22.4	22.6	113	70-132	1.8	21
Category: 8015M-D-A Matrix: AQUEOUS QC Lot: 13 AUG 97-01 Concentration Units: mg/L								
Diesel Range Organics	0.500	0.170	0.194	0.182	36	29-129	13	40

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

SINGLE CONTROL SAMPLE REPORT
Semivolatile Organics by GC

Analyte	Concentration Spiked	Concentration Measured	Accuracy(%) SCS	Accuracy(%) Limits
Category: 8015M-D-S Matrix: SOIL QC Lot: 13 AUG 97-01 QC Run: 13 AUG 97-01 Concentration Units: mg/kg				
o-Terphenyl	0.800	0.812	102	72-133
Category: 8015M-D-A Matrix: AQUEOUS QC Lot: 13 AUG 97-01 QC Run: 13 AUG 97-01 Concentration Units: mg/L				
o-Terphenyl	0.0200	0.0169	84	63-130

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

METHOD BLANK REPORT
Semivolatile Organics by GC

Analyte	Result	Units	Reporting Limit
Test: 8015M-DRO-FID-S			
Matrix: SOIL			
QC Lot: 13 AUG 97-01 QC Run: 13 AUG 97-01			
Diesel Range Organics	ND	mg/kg	4.0
Test: 8015M-DRO-FID-S			
Matrix: SOIL			
QC Lot: 13 AUG 97-01 QC Run: 13 AUG 97-01			
Diesel Range Organics	ND	mg/kg	4.0
Test: 8015M-DRO-FID-A			
Matrix: AQUEOUS			
QC Lot: 13 AUG 97-01 QC Run: 13 AUG 97-01			
Diesel Range Organics	ND	mg/L	0.10

Quanterra
Environmental Services

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT
Semivolatile Organics by GC
Project: 056503

Category: 8015M-D-S Diesel Range Organics in Solid Samples
Matrix: SOIL
Sample: 056503-0007
MS Run: 13 AUG 97-01
Units mg/kg Units Qualifier: Wet wt.

Analyte	Sample Result	Concentration MS Result	Concentration MSD Result	Amount Spiked MS/MSD	%Recovery MS	%Recovery MSD	%RPD	Acceptance Limit Recov.	Acceptance Limit RPD
Diesel Range Organics	ND	17.2	17.3	20.0	86	86	0.6	70-132	21

ND = Not Detected

Calculations are performed before rounding to avoid round-off errors in calculated results.

U.S. GEOLOGICAL SURVEY, WATER R[illegible]URCES DIVISION, NEW MEXICO DISTRICT
ANALYTICAL REQU[illegible]T/CHAIN OF CUSTODY

Project Name & Number: Cannon Air Force Base (463536006)	PACKING AND SHIPPING DETAILS
Sampling Location: SWMU-70	Packed and Sealed for Shipping by: Fred Gebhardt; Seal Number: 082895
Team Leader: Fred Gebhardt	Delivered to Shipper by: Fred Gebhardt; Airbill Number: 3436568542
	Sampling Status: ☒ Done ☐ Continuing

Sample Date	Sample Time	Field Sample Number	Sample Type	No. of Containers	Analytical Methods (Parameters)	Remarks
8/7/97	0840	HOLE1/6.5	SOIL	2 *	Diesel Range Organics by SW8015M, BTEX by SW8020, and Soil Moisture, by D2216	Environmental Sample
"	0930	HOLE1/25	"	" *	"	"
"	1110	HOLE1/50	"	" *	"	Contaminated; as indicated by Field screening
"	1235	HOLE1/70	"	" *	"	"
"	1236	HOLE1/70	"	" *	"	"

Additional Comments
* BTEX jars & vials are in a separate cooler w/ seal no. 082894.

CHAIN OF CUSTODY RECORD				LABORATORY LOG-IN OF SAMPLE SHIPPING CONTAINER	
Relinquished by (signed)	Received by (signed)	Date	Time	Analytical Laboratory	Seal Intact upon Receipt ☐ Yes ☐ No
Ralph Wilcox	to Federal Express	8/11/97	0800	Quanterra Environmental Lab 4955 Yarrow Street Arvada, CO 80002 ph: (303) 421-6611 Attention: Lindsay Breyer	Condition of Contents
	Eric [illegible]	8/12/97	0930		Contents Temperature
					Laboratory Project Number

U.S. GEOLOGICAL SURVEY, WATER RI IRCES DIVISION, NEW MEXICO DISTRICT
ANALYTICAL REQUE T/CHAIN OF CUSTODY

f 3

56503

Project Name & Number	PACKING AND SHIPPING DETAILS	
Cannon Air Force Base (463536006)	Packed and Sealed for Shipping by	Seal Number
Sampling Location: SWMU-70	Delivered to Shipper by	Airbill Number
Team Leader: Fred Gebhardt	Sampling Status ☐ Done ☐ Continuing	

Sample Date	Sample Time	Field Sample Number	Sample Type	No. of Containers	Analytical Methods (Parameters)	Remarks
8/7/97	1455	HOLE1/110	SOIL	2 *	Diesel Range Organics by SW8015M, BTEX by SW8020, and Soil Moisture, by D2216	Environmental Sample
8/8/97	0815	HOLE2/6	"	" *	"	"
"	0910	HOLE2/25	"	6 *	"	Environmental Sample plus MS & MSD
"	1015	HOLE2/50	"	2 *	"	Environmental Sample
"	1120	HOLE2/70	"	" *	"	"

Additional Comments

CHAIN OF CUSTODY RECORD				LABORATORY LOG-IN OF SAMPLE SHIPPING CONTAINER	
Relinquished by (signed)	Received by (signed)	Date	Time	Analytical Laboratory	Seal Intact upon Receipt ☐ Yes ☐ No
	Eric Fritz	8/12/97	0930	Quanterra Environmental Lab 4955 Yarrow Street Arvada, CO 80002 ph: (303) 421-6611 Attention: Lindsay Breyer	Condition of Contents
					Contents Temperature
					Laboratory Project Number

3 of 3

U.S. GEOLOGICAL SURVEY, WATER R JRCES DIVISION, NEW MEXICO DISTRICT
ANALYTICAL REQUEST/CHAIN OF CUSTODY

56503

Project Name & Number	PACKING AND SHIPPING DETAILS	
Cannon Air Force Base (463536006)	Packed and Sealed for Shipping by	Seal Number
Sampling Location: SWMU-70	Delivered to Shipper by	Airbill Number
Team Leader: Fred Gebhardt	Sampling Status ☐ Done ☐ Continuing	

Sample Date	Sample Time	Field Sample Number	Sample Type	No. of Containers	Analytical Methods (Parameters)	Remarks
8/8/97	1320	HOLE 2/110	SOIL	2 *	Diesel Range Organics by SW8015M, BTEX by SW8020, and Soil Moisture, by D2216	Environmental Sample
8/7/97	0820	Equipment Blank	Field QC Blank	5 *	DRO(SW8015) & BTEX(SW8020)	Field QC
"	"	Trip Blank	"	3 *	BTEX(SW8020)	Field QC

Additional Comments

CHAIN OF CUSTODY RECORD				LABORATORY LOG-IN OF SAMPLE SHIPPING CONTAINER	
Relinquished by (signed)	Received by (signed)	Date	Time	Analytical Laboratory	Seal Intact upon Receipt ☐ Yes ☐ No
	[signature]	8/12/97	0930	Quanterra Environmental Lab 4955 Yarrow Street Arvada, CO 80002 ph: (303) 421-6611 Attention: Lindsay Breyer	Condition of Contents
					Contents Temperature
					Laboratory Project Number

Quanterra

Sample Checklist

Project #: 56503 Date/Time Received: 8-12-97

Company Name & Sampling Site: USGS

*Cooler #(s): 1

Temperatures: 2.1°C

Unpacking & Labeling Check Points:

N/A	Yes	No		Initials
	☑	☐	1. Radiation checked, record if reading > 0.5 mR/hr. (_____mR/hr)	ES
	☑	☐	2. Cooler seals intact.	
	☑	☐	3. Chain of custody present.	
	☐	☑	4. Bottles broken and/or are leaking, comment if yes.	
			PHOTOGRAPH BROKEN BOTTLES	
	☑	☐	5. Containers labeled, comment if no.	
✓	☐	☐	6. pH of all samples checked and meet requirements, note exceptions.	
	☐	☑	7. Chain of custody includes "received by" and "relinquished" by signatures, dates, and times.	
	☑	☐	8. Receipt date(s) > 48 hours past the collection date(s)? If yes, notify PA/PM.	
	☑	☐	9. Chain of custody agrees with bottle count, comment if no.	
	☑	☐	10. Chain of custody agrees with labels, comment if no.	
☑	☐	☐	11. VOA samples filled completely, comment if no.	
☑	☐	☐	12. VOA bottles preserved, check for labels.	
	☐	☑	13. Did samples require preservation with sodium thiosulfate?	
☑	☐	☐	14. If yes to #12, did the samples contain residual chlorine?	
☑	☐	☐	15. Sediment present in "D," dissolved, bottles.	
	☐	☑	16. Are analyses with short holding times requested?	
☐	☑	☐	17. Is extra sample volume provided for MS, MSD or matrix duplicates?	
	☐	☑	18. Multiphase samples present? If yes, comment below.	
	☐	☑	19. Any subsampling for volatiles? If yes, list samples.	
			PHOTOGRAPH MULTIPHASE SAMPLES	
	☑	☐	20. Clear picture taken, labeled, and stapled to project folder.	
☑	☐	☐	21. Subout COC signed and sent with samples to bottle prep?	
	☑	☐	22. Was sample labeling double checked?	

Comments: Include action taken to resolve discrepancies/problems. Include a hard copy of e-mail or use extra paper if more space is needed. (5) 2 OF 3 CHAINS ARE MISSING RELINQUISHED SIGNATURES

Initials: _____

Revision 3.4 - July 11, 1997

APPENDIX III

Field Data

Sample container and preservation requirements

Parameters and methods	Bottle Size and Type	Preservatives
Soil-gas: Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), and Total Volatile Petroleum Hydrocarbon (TVPH) by TO-3	One-liter SUMMA® canister	None
Soil: Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by SW8020	125 ml wide-mouth glass jar	None, Chilled
Soil: Diesel Range Organics (DRO) by SW8015M; Soil moisture by D2216	250 ml wide-mouth glass jar	None, Chilled

07-21-97

1205 Arrive @ site. Field Crew:
Fred Gebhardt - Project Chief
Jim Bartolino - technical support
Jerry Larson -
Ralph Wilcox - notes

1230 Jim calibrated O_2 meter (MSA Passport)
Reading 20.8% → O_2, 0 ppm → CO,
0 ppm H_2S, and 0% LEL (Cal. gas is
58% LEL, 15% O_2, & 58% CO_2

1250 Check vacuum of Summa canisters w/
pressure gage provided by Quanterra.
Gage is reading -8 in. Hg w/o being attached
Cannister 9705B < -30 in. Hg (meter
pegs @ -30 in Hg) (atmospheric press

1303 Began pumping soil gas from MPA5
w/ parasthaltic pump (running wide open)

1315 Stopped purging soil gas, final stabilized O_2 19.7%.
Collected Summa cannister soil gas sample.
0% CO_2 w/ MSA glass packed detection tubes.
0 ppm on HNU

1321 Moved to MPC50. Checked vacuum
on Summa cannister 93167 < -30" Hg.

1324 Began purging MPC50; CO_2 → 2%;

1331 Stopped purging soil gas and sampled w/ Summa cannister; final stabilized O_2 17.4%

1342 Began purging soil gas @ the vent well (VW). Summa cannister 9707B <-30" Hg vacuum. 0 ppm on HNU

1348 Stopped purging and sampled VW w/ summa canister. O_2 dropped as low as 19.7% during purging and stabilized @ 20.6%. $CO_2 \rightarrow 0\%$

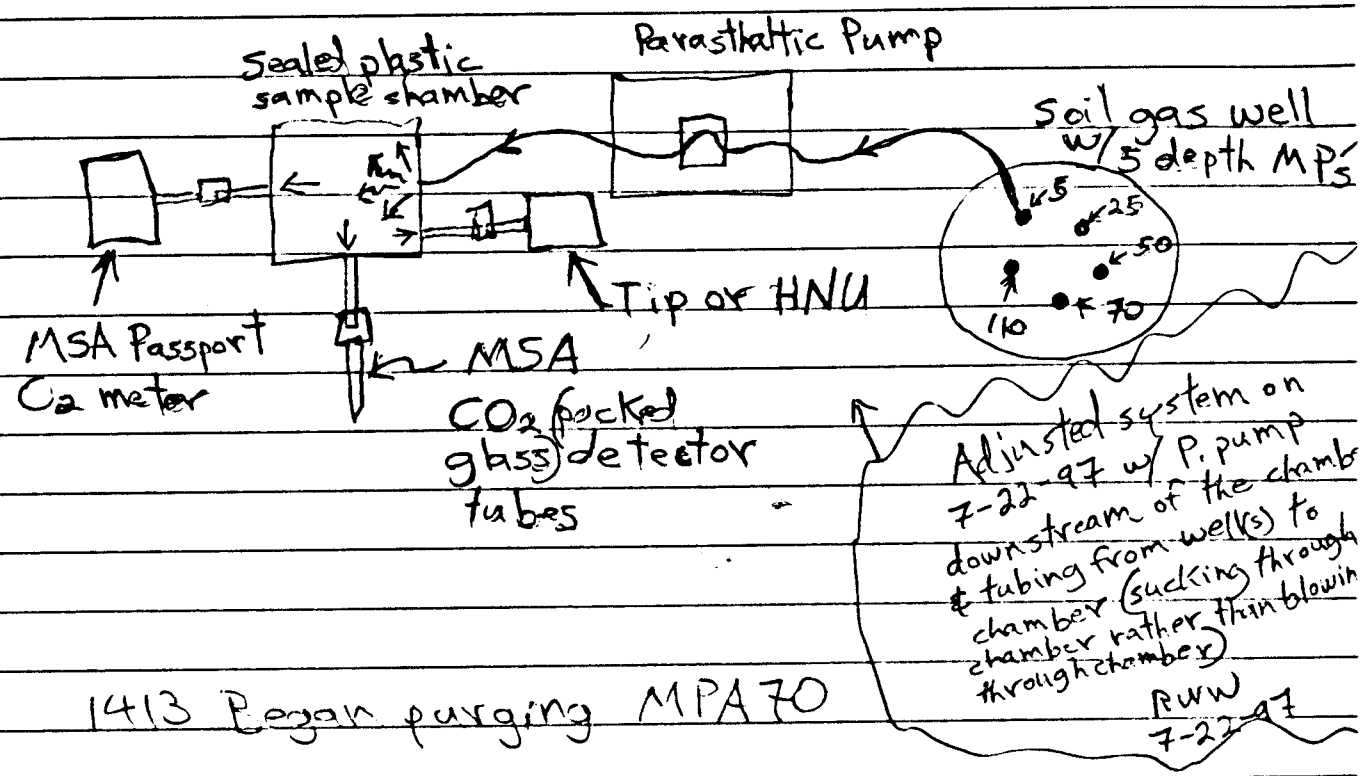
1400 Purging MPA 25 w/ para. pump. to determine if a respiration test is required for this MP.

1405 Stopped purging MPA 25; O_2 stabilized @ 19.3%, CO_2 @ 1%, & HNU @ 15 ppm. HNU dropped to 0 each time tip was placed in chamber after initially reading 15 ppm.

1407 Purging MPA 50.

1411 Stopped purging MPA 50. Stabilization @ 18.4% O_2, 1.5% CO_2, & 69 ppm on HNU.

Soil gas puging & field measurement system



1413 Began purging MPA70

1418 Stopped purging. Stabilization @ 19.8% O, 55ppm on photovac TIP, and 0% CO_2.

1418 Began purging MPA110

1420 Collected ambient air blank w/ Summa canister 12882. Initial vaccum check <-30" Hg.

1422 Stopped purging MPA 110. Stabilization @ 20.7% O_2, 0% CO_2, and 45 ppm on TIP.

1424 Began purging MPB 5.

1427 Stopped purging MPB 5. Stabilization @ 20.8% O_2, 0% CO_2, and 40 ppm TIP.

1429 Began purging MPB 25.

1436 Stopped purging MPB 25. Stabilization @ 11.4% O_2 (actually this was the lowest reading, the values rose slightly before purging stopped), 5% CO_2, and 63 ppm TIP.

1438 Began purging MPB 50.

1443 Stopped purging MPB 50. Stabilization @ 16.2% O_2, 2% CO_2, and 284 ppm TIP.

1448 Began purging MPB 70

1452 Stopped purging MPB 70. Stabilization @ 20.2% O_2, 1% CO_2, and 125 ppm TIP

1455 Began purging MPB 110

1500 Stopped purging MPB 110. Stabilization @ 19.7% O_2, 1% CO_2, and 102 ppm TIP.

1513 Jim recalibrated MSA Passport O_2 meter. It had held its original calibration

1515 Began purging MPC 5.

1521 Stop purging MPC 5. Stabilization @ 15.4% O_2, 2% CO_2, and 23 ppm HNU

1526 Began purging MPC 25.

1536 Stopped purging MPC 25. Stabilization @ 13.3% O_2, 4% CO_2, and 20 ppm HNU.

1537 Began purging MPC 50 for the second time today.

1540 Stopped purging MPC 50. Stabilization @ 15.9% O_2 (lowest reading), 2% CO_2, and 70 ppm HNU.

1541 Began purging MPC 70.

1547 Stopped purging MPC 70. Stabilization @ 20.1% O_2, <1% CO_2 (slight discoloratio in tube), 0 ppm HNU.

1548 Began purging MPC 110

18 1553 Stopped purging MPC 110. Stabilization @ 18.8% O_2, 1% CO_2, and 0 ppm HNC

07-22-97

0740 ARRIVE @ SITE. FIELD CREW:
FRED GEBHARDT - PROJECT CHIEF
RALPH WILCOX - G.C. OPERATOR
JIM BARTOLINO - TECHNICAL SUPPORT

0745 RALPH IS PREPARING THE GAS CHROMATOGRAPH ADJUSTING FLOW RATE, FILLING WITH HYDROCARBON FREE AIR, PREPARING "BTEX" STANDARD.
THE FIRST G.C. READING WILL BE AN INSTRUMENT BLANK THEN THE "BTEX" STANDARD WILL BE INJECTED.
A SYRINGE BLANK WILL ALSO BE INJECTED BEFORE THE "BTEX" STD.

BTEX STANDARD WAS PREPARED BY USGS LAB 07/09/97. BTEX - BENZENE, TOLUENE, ETHYL BENZENE, XYLENE.

G.C. - PHOTOVAC 10-S 50 SERIEL# 6180151.
* REFER TO GAS CHROMATOGRAMS FOR SAMPLING RESULTS.
0838 START PURGING MPA 5.
0900 SAMPLING MPA 5
0901 PURGING MPA 25, JERRY LARSON ARRIVES ON SITE.
0910 JERRY OFFSITE HEADED TO ENVIRONMENTAL OFFICE CAFB
0915 SAMPLED MPA 25, ~~PU~~ START PURGING MPA 50
0931 SAMPLED MPA 50, START PURGING MPA 70
0940 MPA 50 SAMPLE FLOODED G.C. WILL RE-RUN STANDARD AND COLLECTED MPA SAMPLE AGAIN AT A LOWER CONC. STARTED PURGING ON MPA 50 AGAIN.

1002 SAMPLED MPA 50, START PURGING MPA 70 AGAIN

1005 JERRY & JOHN PIKE FROM CAFB ARRIVE ON SITE. DISCUSSED THE RESULT FROM YESTERDAY'S SAMPLING AND WHAT FUTURE SAMPLING WILL BE REQUIRED.

1015 MPA 50 GC SAMPLE COMPLETE, WILL RUN ANOTHER STD THROUGH GC. JERRY + JOHN OFFSITE

1025 JERRY BACK ON SITE.

1028 SAMPLED MPA 70, START PURGING MPA 110.

1041 SAMPLED MPA 110, START PURGING MPB 5

1056 SAMPLED MPB 5, START PURGING MPB 25.

1110 SAMPLED MPB 25, START PURGING MPB 50.

1131 SAMPLED MPB 50, START PURGING MPB 70

1138 STOPPED GC RUN, FLOODED GC W/ SAMPLE FROM MPB 50. STARTED PURGING MPB 50 AGAIN. RAN STANDARD

1151 SAMPLED MPB 50,

1200 STARTED PURGING MPB 70

1203 SAMPLE MPB 70, START PURGING MPB 110

1217 SAMPLE MPB 110,

1221 STARTED PURGING MPC 5

1231 SAMPLE MPC 5, START PURGING MPC 25

1243 RAN STANDARD

1254 STARTED PURGING MPC 5

1256 SAMPLE MPC 5, START PURGING MPC 25

1311 SAMPLE MPC 25, PURGING MPC 50,

1323 SAMPLE MPC 50, PURGING MPC 70.

1337 SAMPLE MPC 70, PURGING MPC 110

1349 SAMPLE MPC 110, PURGING VW,

1403 SAMPLED VW.

1415 WILL NOW RUN A STANDARD THROUGH THE G.C.
THEN CALL QUITS FOR THE DAY.

08-7-97

0715 USGS PERSONELL ARRIVES AT SITE SWMU-70.

FRED GEBHARDT - PROJECT CHIEF
RALPH WILCOX - GAS CHROMATOGRAPH OPERATOR
DAVE REHDER > DRILLERS
STEVE GRANT

DRILL RIG - CME-85 AUGER RIG
AUGERS @ 5/8" HOLLOW STEM

SPLIT BARRELL SAMPLERS WILL BE USED TO COLLECT SAMPLES. BARRELLS ARE DECONED WITH HOT PRESSURE WASH SOLUTION OF LIQUINOX THEN RINSED WITH HOT ~~DT~~ PRESSURED DI WATER.

0804 STARTED AUGERING, HOLE #1, BETWEEN MPA + MPB.
0810 REACHED 3.5 FEET. PID READING = 0.5 ppm
READING COLLECTED AT TOP OF AUGER FLIGHT.

PID - PHOTOVAC TIP. G.C. - PHOTOVAC 10-S50
* ALL G.C. SAMPLES, STANDARDS + BLANKS WILL BE RAN AT THE SAME TEM
WEATHER CONDITIONS - MISTY + COOL.

0815 CONTINUED AUGERING.
0820 COLLECTED EQUIPMENT BLANK + TRIP BLANK.

** REFER TO CHROMATOGRAMS FOR DETAIL FIELD SCREENING OF SAMPLES

0830 REACHED 8.5 FEET, PID READING 1.1 ppm
0840 COLLECTED SAMPLE AT 6.5 FEET
SAMPLE # HOLE 1/6.5
RECOVERY OF CORE WAS 3.1 FEET.
0843 CONTINUED AUGERING
0849 REACHED 13.5 FEET, PID READING 0 ppm
0857 REACHED 18.5 FEET, PID READING 3.3 ppm.
CORE SAMPLES ARE COLLECTED AT 5, 25, 50, 70 + 110 FEET. OTHER CORE SAMPLES MAY BE COLLECTED IF DEAMED NECESSARY.
BETWEEN CORE SAMPLES A INNER BIT WILL BE USED.
0907 REACHED 23.5 FEET, PID READING 1.3 ppm.
IT APPEARS THAT PID READING FROM TOP OF AUGERS, IS NOT GIVING A GOOD REPRESENTIVE READING OF SOIL DOWN BELOW. WILL' CONTINUE READING FOR SAFETY.

** COLLECTING G.C. SAMPLES ALONG WITH SOIL SAMPLES HOWEVER DUE TO THE COOL WEATHER THE G.C. IS HAVING DIFFICULTIES WITH RETENTION TIMES.
G.C. SAMPLE IS MADE UP OF 8 cc OF SOIL + 20 ml of DI WATER
0920 REACHED 26.5 FEET, PID READING 3.5 ppm.
WILL MAKE TWO CORE RUNS. TRYING TO COLLECT A FULL 5 FOOT CORE AT THIS INTERVAL.
0930 COLLECTED SAMPLE AT 25 FEET, PID READING OF CORE 57 ppm. RECOVERY WAS 3 FEET.
SAMPLE # HOLE 1/25

0937 REACHED 28.5 FEET PID READING 88 ppm.
0945 COLLECTED SAMPLE AT 28 FEET, PID READING OF CORE 101 ppm. RECOVERY 2 FEET
SAMPLE # HOLE 1/28
0954 REACHED 33.5 FEET PID READING 12.7 ppm.
1003 REACHED 38.5 FEET PID READING 0 ppm

1011 Reached 43.5 feet, PID reading 2.6ppm.

1021 Reached 48.5 feet, PID reading 0 ppm.

1055 Reached 51.5 feet, PID reading 5.8ppm, cored 48.5-51.5 feet.

1110 Collected sample at 50 feet, PID reading inside core barrel 962ppm, recovered 3.5 feet of core; Reached 53.5 feet, PID reading 67ppm. Sample # @ 50 feet → HOLE 1/50.

1138 Reached 58.5 feet, PID reading 35.2ppm.

1148 Reached 63.5 feet, PID reading 156ppm.

1200 REACHED 68.5 FEET, PID READING 1105 ppm.

1223 REACHED 73.5 FEET, PID READING 1367 ppm.

1235 COLLECTED SAMPLE AT 70 FEET, CORE BARRELL. PID READING 69.7. ALSO COLLECTED DUPLICATE SAMPLE WHICH WILL HAVE THE TIME OF 1236. RECOVERY OF CORE 4 FEET. SAMPLE # HOLE 1/70.

1253 REACHED 78.5 FEET, PID READING 1332 ppm

1305 REACHED 83.5 FEET, PID READING 1063 ppm

1319 REACHED 88.5 FEET, PID READING 1072 ppm

1335 REACHED 93.5 FEET, PID READING 802 ppm

1351 REACHED 98.5 FEET, PID READING 430 ppm

1405 REACHED 103.5 FEET, PID READING 1001 ppm

1406 REACHED 108.5 FEET, PID READING 801 ppm

1445 REACHED 111 FEET, PID READING 627 ppm

1455 COLLECTED SAMPLE AT 110 FEET, CORE BARRELL PID READING 8.1. RECOVERY OF CORE 3.4 FEET SAMPLE # HOLE 1/110.

1530 RAN G.C. SAMPLE FOR SAMPLE # HOLE 1/110. IT CAME UP CLEAN ON G.C. WILL NOT GO ANY DEEPER.

*** PID READINGS COLLECTED AT THE TOP OF AUGER FLIGHTS DID NOT REFLEC BREATHING ZONE READINGS. BREATHING ZONE READINGS WERE ALWAYS 0 PPM.

DRILLERS WILL BREAK DOWN THEIR DRILL ROD, VOLCLAY THE AUGER HOLE AND THEN DECON THE AUGER FLIGHTS

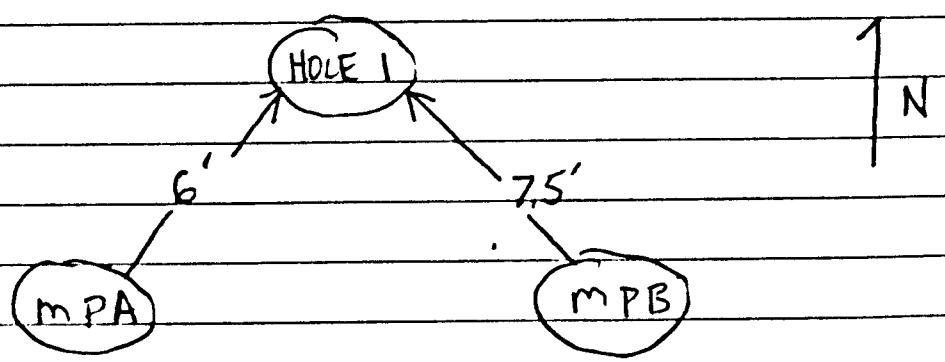
LITHOLOGY DESCRIPTION OF THE SAMPLE DEPTHS:

6.5 SANDY-SILT W/CLAY
MODERATE BROWN 5 YR 4/4
WELL SORTED

25
28 } SILTY-SAND FINE GRAIN
50 LIGHT BROWN 5 YR 5/6 WELL SORTED

70 SAND FINE → V. FINE GRAIN
LIGHT BROWN 5 YR 5/6 VERY WELL SORTED

110 SAND FINE GRAIN W/ SMALL AMOUNT OF SILT
LIGHT BROWN 5 YR 5/6 WELL SORTED.



08-08-97

0700 USGS PERSONNEL ARRIVE ON SWMU-20 SITE
SAME CREW AS YESTERDAY.

DRILLERS WILL MOVE RIG TO HOLE #2 BETWEEN MPB + MPC.
WEATHER CONDITIONS - FOG
0745 AUGERING BEGINS.
0750 REACHED 3.5 FEET, PID READING 1.7 ppm
0805 REACHED 6.5 FEET, PID READING 0.4 ppm
0815 COLLECTED SAMPLE AT 6 FEET, PID READING FROM CORE BARREL 10.3 ppm. 3 FEET RECOVERY. SAMPLE # HOLE 2/6.
0817 REACHED 8.5 FEET, PID READING 18.4 ppm.

0824 REACHED 13.5 FEET, PID READING 22.1 ppm

0832 REACHED 18.5 FEET, PID READING 5.0 ppm

0842 REACHED 23.5 FEET, PID READING 3.7 ppm.

0857 REACHED 26.5 FEET, PID READING 0.2 ppm

0910 COLLECTED SAMPLE HOLE 2/25 FEET. CORE BARREL PID READING 2.1. RECOVERY 2.7 FEET
ALSO COLLECTED MATRIX SPIKE + MSD.

0911 REACHED 28.5 FEET, PID READING 7.3 ppm.

0919 REACHED 33.5 FEET, PID READING 1.0 ppm.

0925 REACHED 38.5 FEET, PID READING 0.6 ppm.

0933 REACHED 43.5 FEET, PID READING 5.0 ppm

0942 REACHED 48.5 FEET, PID READING 1.7 ppm

1004 REACHED 51.5 FEET, PID READING 3.3 ppm

1015 COLLECTED SAMPLE HOLE 2/50, CORE BARRELL
PID READING 34.3. RECOVERY 3.3 FEET.

1022 REACHED 53.5 FEET, PID READING 126 ppm

1030 REACHED 58.5 FEET, PID READING 38.1 ppm

1042 REACHED 63.5 FEET, PID READING 124 ppm

1051 REACHED 68.5 FEET, PID READING 647 ppm

1109 REACHED 71.5 FEET, PID READING 252 ppm

1120 COLLECTED SAMPLE HOLE 2/70, CORE BARRELL
READING 1.8 ppm, RECOVERY 3.1 FEET.

1136 REACHED 73.5 FEET, PID READING 81.0 ppm

1148 REACHED 78.5 FEET, PID READING 82.2 ppm

1203 REACHED 83.5 FEET, PID READING 54.1 ppm

1211 REACHED 88.5 FEET, PID READING 78.7 ppm

1220 REACHED 93.5 FEET, PID READING 26.2 ppm

1227 REACHED 98.5 FEET, PID READING 41.1 ppm

1233 REACHED 103.5 FEET, PID READING 31.3 ppm

1241 REACHED 108.5 FEET, PID READING 25.5 ppm

1310 Reached 111.5 ft, PID reading 28.0 ppm

1320 COLLECTED SAMPLE HOLE 2/110, CORE BARREL PID READING 2.2 ppm, RECOVERY 3.4'.

DRILLERS WILL ~~XX~~ ~~[illegible]~~ BREAKDOWN DRILL ROD, VOLCLAY THE AUGER HOLE THEN DECON AUGER FLIGHTS.

LITHOLOGY DESCRIPTIONS OF THE SAMPLE DEPTHS

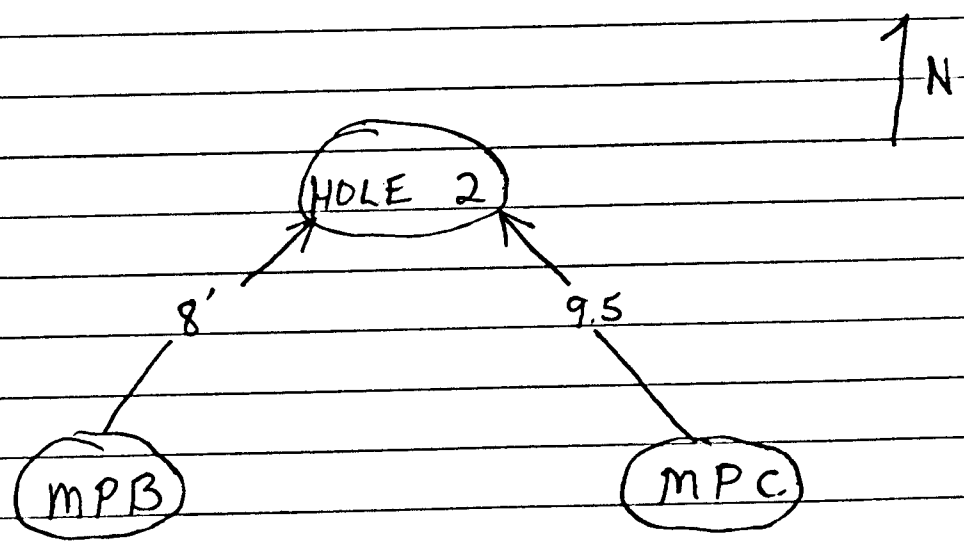
6 SILT - MODERATE BROWN 5 YR 4/4

25 SANDY-SILT FINE GRAIN
L. BROWN 5 YR 5/6, WELL SORTED

50 SILTY-SAND FINE GRAIN
LIGHT BROWN 5 YR 5/6, WELL SORTED

70 SAND FINE → V. FINE GRAIN
LIGHT BROWN 5 YR 5/6 V. WELL SORTED

110 SAND FINE GRAIN W/ SMALL AMOUNT OF SILT
LIGHT BROWN 5 YR 5/6 WELL SORTED



10-8-97

1100 ARRIVE AT SITE ~~SWMU #~~, LANDFILL #5 ON CANNON AFB.

CREW: FRED GEBHARDT (PROJECT CHIEF)
RALPH WILCOX (G.C OPERATOR)
JERRY LARSON (TECHNICAL SUPPORT)

PURPOSE OF VISIT IS TO ANALYIZE SOIL CONTAINED IN BARRELLS. SOIL WAS COLLECTED FROM SOIL BORINGS AT SWMU#70.

THE LAB ANALYSIS FROM SOIL BORINGS INDICATES CONTAMINATION IN SAMPLES COLLECTED AT 6.5 FT., 25 FT., AND AT 50 FT. THESE THREE SOIL INTERVALS ARE FROM HOLE #1.

BEFORE SOIL IN BARRELLS CAN BE DISPOSED OF, BARRELLS WITH CONTAMINATION NEED TO BE IDENTIFIED.

SIX BARRELLS ARE FROM HOLE #1 G.C. SAMPLES WILL BE COLLECTED. IF THE G.C. INDICATES CONTAMINATION THEN A SOIL SAMPLE WILL BE COLLECTED, IN A BRASS SLEEVE. THE SOIL WILL BE TESTED FOR DIESEL RANGE ORGANICS (DRO).

1208 BARRELL #1, G.C. SAMPLE COLLECTED.
PID READING - 225 PPM
(PID-HNU)
1223 COLLECTED SOIL SAMPLE FROM BARRELL #1
(DRUM-1)
1227 BARRELL (DRUM-2) #2, G.C. SAMPLE COLLECTED.
PID READING - 260 PPM
1234 DRUM-2 SAMPLE COLLECTED, SOIL

* SOIL SAMPLES ARE ~~[illegible]~~ COLLECTED FROM MID - BOTTOM OF EACH BARRELL.

1252 DRUM-3 COLLECTED G.C. SAMPLE.
PID READING - 140 PPM
1256 DRUM-3 SOIL SAMPLE COLLETED
1323 COLLECTED G.C. SAMPLE FROM DRUM-4
PID READING - 200 ppm
1327 COLLECTED SOIL SAMPLE DRUM-4
1332 COLLECTED SOIL SAMPLE DRUM-8, PID - 180 PPM.
1342 COLLECTED G.C. SAMPLE DRUM-5
PID READING - 0
1348 COLLECTED SOIL SAMPLE DRUM-5
1355 COLLECTED SOIL SAMPLE DRUM #9.
1400 COLLECTED G.C. SAMPLE DRUM-6
PID READING - 210 PPM.
COLLECTED SOIL SAMPLE DRUM-7
1410 COLLECTED SOIL SAMPLE DRUM-6

10-9-97

0900 ARRIVED AT LANDFILL SITE. DECIDED TO RE-SAMPLE DRUM-4, AND ANALYZE SAMPLE FOR VOC RATHER THAN DRO.

ALSO DUMPPED THE SOIL FROM 4-OF THE BARRELL'S THAT WERE SCREENED FOR CONTAMINATION YESTERDAY. THESE BARRELLS WERE FILLED WITH SOIL FROM SWMU #70 SITE HOLE #2.
THE LAB ~~ANALYSIS~~ ANAYLSIS INDICATED THAT THERE IS NO CONTAMINATION IN THE SOIL.

JOHN PIKE FROM CAFB ENVIRONMENTAL CONSULTED WITH BEFORE BARRELLS WERE DUMPED.