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REMEDIAL INVESTIGATION FOR NORTH BURN PIT, OIL SATURATED AREA, HAZARDOUS WASTE DRUM STORAGE AREA AND PETROLEUM, OIL AND LUBRICANTS STORAGE AREA KANSAS CITY MO

10/1/1991

O'BRIEN & GERE

Remedial Investigation 37 1

for

ADMINISTRATIVE RECORD COPY

North Burn Pit, site FT002
Oil Saturated Area, site SS003
Hazardous Waste Drum Storage, site SS004
POL Storage Yard, site ST005

Richards-Gebaur Air Force Base
Belton, Missouri
Contract DACW41-87-D-0153

U.S. Army Corps of Engineers
Kansas City District

October 1991

O'BRIEN & GERE

File:
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REMEDIAL INVESTIGATION (RI)

AT

RICHARDS-GEBAUR AIR FORCE BASE
BELTON, MISSOURI

FOR

FT002 - NORTH BURN PIT
SS003 - OIL SATURATED AREA
SS004 - HAZARDOUS WASTE DRUM STORAGE
ST005 - POL STORAGE YARD

CONTRACT DACW41-87-D-0153

PREPARED FOR:

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE RESERVE
ROBINS AIR FORCE BASE, GEORGIA

UNDER CONTRACT WITH:
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
KANSAS CITY DISTRICT
KANSAS CITY, MISSOURI

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OCTOBER 1991

REMEDIAL INVESTIGATION AT
RICHARDS-GEBAUR AIR FORCE BASE
BELTON MISSOURI

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Appendix A - O'Brien & Gere Engineers Analytical Data
Appendix B - Boring Logs/Well Construction Diagrams
Appendix C - Grain Size Distribution Curves, Atterberg Limits
Appendix D - Well Development Data, In-Situ Permeability Forms
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Exhibit A - Previous Analytical Data
Exhibit B - Previous Boring Logs
Exhibit C - Water Well Location Map
Exhibit D - Analysis of Base Water Supply

EXECUTIVE SUMMARY

O'Brien & Gere Engineers, Inc. (O'Brien & Gere) was contracted to conduct a Remedial Investigation at the following four sites at Richards-Gebaur Air Force Base (AFB) in Belton, Missouri. The results of this investigation are summarized below, while detailed information regarding the work performed can be found in later sections of this report.

A. FT002 - North Burn Pit

Low concentrations of lead and Total Petroleum Hydrocarbons (TPH) exist in the surface soil. Under current conditions, this site poses negligible risk to human health and the environment. Maximum lifetime cancer risk of 1.7E-09 was calculated for FT002.

B. SS003 - Oil Saturated Area

Concentrations of lead and TPH exist in the soil at this site. A maximum lifetime cancer risk of 2.1E-06 was calculated for this site. Under current conditions, the contaminated soils at this site do not pose a significant public health risk. Removal of oil-stained areas should be considered to minimize exposure during any future earth moving activities. Approximately 275 cubic feet of contaminated soils have been estimated for removal from the site to arrive at cleanup levels of 100 parts per million (ppm) or less TPH concentration. This is based on a contamination depth of three feet at the site.

C. SS004 - Hazardous Waste Drum Storage

The surface soils at this site contain concentrations of TPH; however, a maximum lifetime cancer risk of 1.0E-06 was calculated. Based on the current assessment, there is no significant risk to human health or the environment. Removal of surface soils along the fenceline may be considered if site conditions change in the future. The amount of contaminated soils to be removed was estimated to be approximately 210 cubic feet. This is based on the assumption that contamination is in the top eight inches of soil.

D. ST005 - POL Storage Yard

Concentrations of TPH exist in surface and subsurface soils at this site. A maximum lifetime cancer risk of 4.3E-07 was calculated based on existing site conditions. While no significant migration of contaminants to groundwater exist, there is a potential for migration due to the relatively shallow groundwater table. The potential for migration of contaminants via surface water run off also exists at this site. The impact to and quality of surface water should be addressed during any construction at this site.

SECTION ONE - INTRODUCTION

1.01 PURPOSE

The purpose of the Remedial Investigation (RI) at four sites located on Richards-Gebaur AFB is to collect site data and to characterize the vertical and horizontal extent of waste present at the sites.

1.02 SITE BACKGROUND INFORMATION

O'Brien & Gere was contracted to perform a Remedial Investigation at four sites for Richards-Gebaur AFB. The four sites contained in this RI have previously been investigated. The four sites are: FT002 - North Burn Pit; SS003 - Oil Saturated Area; SS004 - Hazardous Waste Drum Storage and ST005 - POL Storage Yard.

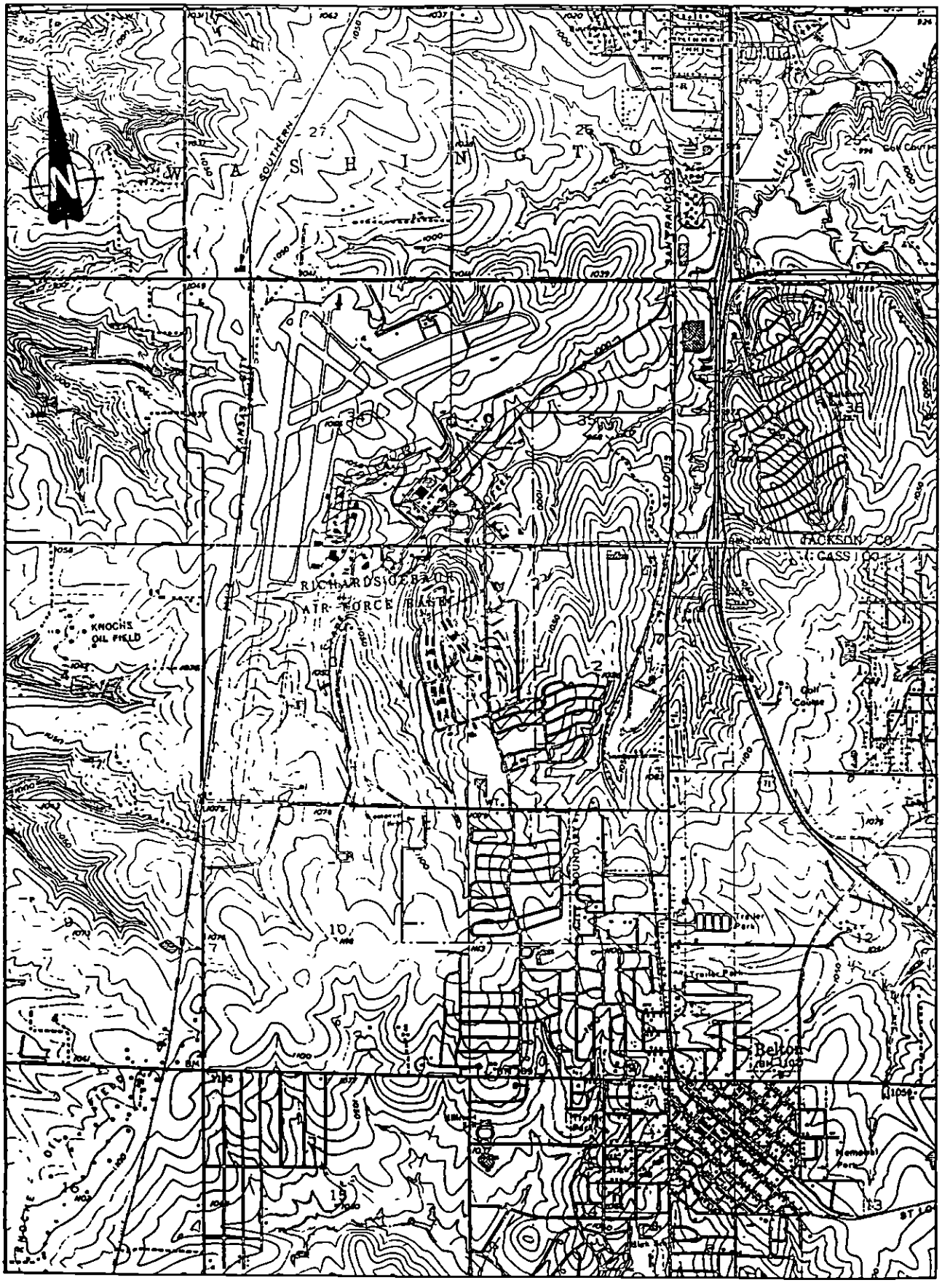
1.03 FT002 - NORTH BURN PIT

Since 1965, fire training activities have been conducted at the North Burn Pit, which is just north of a closed runway and north of the hangars. Until about 1969, waste oils, hydraulic fluid, some solvents, and contaminated fuels (referred to as POL waste), were stored and burned at the North Burn Pit. Storage of POL waste was accomplished in 55-gallon drums and used for subsequent fire training exercises. After 1969, waste oils and solvents were no longer burned and only off-spec JP-4 fuel was used for the training exercises.

In 1969 the site was improved with a concrete slab lining and retaining curb around the burn pit area to contain off-spec jet fuel, an oil separator to skim runoff prior to storm water discharge and a 5,000-gallon aboveground tank for receiving and storing waste fuels prior to burning. The Installation Restoration Program (IRP) Phase II Stage 2 report published by Ecology and the Environment, Inc. (E&E) in July, 1988 noted at least one failure of the separator and spillage of small quantities of fuel during fuel transfer to the aboveground tank had occurred during the operational life of the fire training area.

In February of 1988, training exercises were discontinued at the site when it was discovered effluent form the oil-water separator required a NPDES permit. The 5,000-gallon tank was removed during the summer of 1988.

Previous investigations were undertaken during the IRP Phase II Stage 2 (equivalent to a SI) which were to determine: 1) the indication of contamination from the site using a soil gas survey; 2) the occurrence of subsurface soil contamination; and, 3) evaluate whether groundwater contamination has occurred. As a



SCALE

0 ½ 1 1½ 2 MILES

0 .5 1 1.5 2 KILOMETERS

FIGURE 1-1, SITE LOCATION

result of these investigations, it was determined that there is very little groundwater movement and no deep aquifers being threatened. Installation of an additional well and additional monitoring were recommended (IRP Phase II Stage 2 report by E&E, 1988) to monitor groundwater quality and to confirm concentrations of volatile organics.

1.04 SS003 - OIL SATURATED AREA

The Oil Saturated Area is located west of Building 704. The area was previously used for storage of waste oil products by the Motor Pool. According to the Records Search (CH2M Hill, March 1983) in 1980, the ground was reportedly soft as a result of oil saturation and gravel was spread over the ground surface to stabilize it. During the Records Search field work at the Base, a small patch of oil-contaminated ground was noted at the edge of the gravel. There appears to be a moderate potential for surface water migration. Storm water runoff is channeled through a ditch across the southwest corner of the compound.

An IRP Phase II Stage 2 investigation (E&E, July 1988) was conducted at this site to evaluate the type and extent of surface and subsurface soil contamination, and to determine if contaminants are migrating via the surface drainage pathway. It was reported that lead was detected in some soil samples. Considering the depth of the samples (0-1 foot), it was determined that workers could be subject to direct contact with lead in the soil, and recommended removal be considered. Total petroleum hydrocarbons were also detected in the soil and removal of surface soils was recommended as well.

1.05 SS004 - HAZARDOUS WASTE DRUM STORAGE

The Hazardous Waste Drum Storage is located at the southwest corner of Building 923. This area, which is fenced and paved, was used for an undetermined number of years for storage of hazardous and non-hazardous drummed waste prior to disposal. The site is located in the watershed for Scope Creek. In a previous investigation by E&E, a single soil boring was drilled to 15 feet without encountering water. Surface water runoff flows directly into a grassy swale to the west of the area.

It was noted in the IRP Phase II Stage 2 report that, during the pre-survey meeting, as a result of a Notice of Violation issued by the USEPA at the storage area, remedial efforts such as the overpacking of seeping drums, removal of stained soils, and scraping the asphalt surface were performed. This site was not part of the Phase I or Phase II Stage 1 investigations. Hazardous materials are no longer stored in this area.

Investigations conducted in conjunction with the IRP Phase II Stage 2 report evaluated the type and extent of surface and subsurface soil contamination and evaluated potential migration of contaminants via surface drainage pathway. Contaminants found in the soils from this area were limited only to petroleum hydrocarbons. Concentrations were detected anywhere from 670 to 3,000 mg/kg from samples obtained at the 0-1 foot interval. The report recommended that the soil containing petroleum hydrocarbons be quantified in preparation for removal actions.

1.06 ST005 - POL STORAGE YARD

The POL Storage Yard is an aboveground tank farm which contains three pump houses and four aboveground fuel storage tanks ranging in size from 190,000 gallons to 260,000 gallons. The area is located in a semi-remote eastern portion of the base. Seepage from a storm water retention pond feeds a marshy area west of the site and drains into a system of culverts.

The POL storage tanks are situated on the flank of a gently sloping hill, and are connected by underground transfer lines to the three dispensing pump houses.

During the IRP Phase II Stage 2 pre-survey site visit in 1985, an iridescent sheen was noted on water in the marshy area. According to the IRP Phase II Stage 2 report, one major and several minor fuel spills were reported to have occurred near this area. The tanks are surrounded by asphalt covered earthen berms, but the berms and asphalt paved containment are weathered and cracking. During the site survey investigation in November of 1988, it was observed that the tanks' containment areas had been recently sealed. At that time, an iridescent sheen was noticed on the water standing within the containment sump.

Investigative efforts in conjunction with the IRP Phase II Stage 2 report were to: 1) determine the extent of any subsurface soil contamination; 2) evaluate the extent of migration of contaminants via underground buried utilities and surface drainage pathways; and, 3) determine whether groundwater contamination had occurred and evaluate the extent of contamination. Results from the IRP Phase II Stage 2 investigation indicated that groundwater south of this facility is free from contamination; but, soils inside the tank berms just beneath the liner indicate petroleum hydrocarbon accumulations. Based on this and the limited investigations from previous reports, long term monitoring and/or additional subsurface soil sampling were recommended for the POL Storage Yard.

1.07 PREVIOUS STUDIES

Former studies have resulted in generation of analytical data regarding soil and/or groundwater quality on all four sites. The data generated by previous studies is included in Exhibit A.

SECTION TWO - SITE FEATURES INVESTIGATION

2.01 DEMOGRAPHY, LAND USE, AND NATURAL RESOURCES

Richards-Gebaur AFB is located in west-central Missouri, about 2.6 miles east of the Kansas State line, as shown on Figure 2-1. The AFB is primarily located in Jackson County with a smaller portion in Cass County. Downtown Kansas City is approximately 18 miles to the north; Grandview is approximately three miles to the northeast; and, Belton is approximately three miles to the southeast. The main access to the AFB is off U. S. Highway 71. The AFB underwent a significant downsizing in 1985 from about 3500 acres to 428 acres with ownership transferred to the surrounding cities. This includes the runways and taxiways and the south portion of the airfield operations area.

2.02 CLIMATOLOGY

Richards-Gebaur AFB and the surrounding area exhibit a modified continental climate, in which conditions normally expected to prevail at that latitude are often distorted by air currents freely entering from the southeast, the Gulf of Mexico, or other distant areas. Average monthly temperatures range from 26°F in January to 78°F in July, with an average annual temperature of 54°F (Table 2-1). Most precipitation falls in the late spring and early summer and again in the early fall. Average monthly precipitation ranges from 1.15 inches in February to 5.05 inches in June. Average annual precipitation is 36.8 inches. Maximum and minimum annual precipitation is 63.6 and 28.8 inches, respectively. Pan evaporation and evapotranspiration rates are approximately 60 inches and 42 inches per year, respectively.

Prevailing winds for the Base are from the south all year and the mean annual wind speed is nine knots. Due to the Base's location and the generally flat topography in surrounding areas, weather changes can be rapid. Tornados and severe thunderstorms are most likely to occur in spring and summer months.

2.03 GEOLOGY

Richards-Gebaur AFB is located near the Kansas-Missouri border in an area of gently to steeply rolling upland that forms part of the Scarped Plain, a province of the Interior Lowland Region of the United States (Hinds and Green 1915, R. Gentile - 1982).

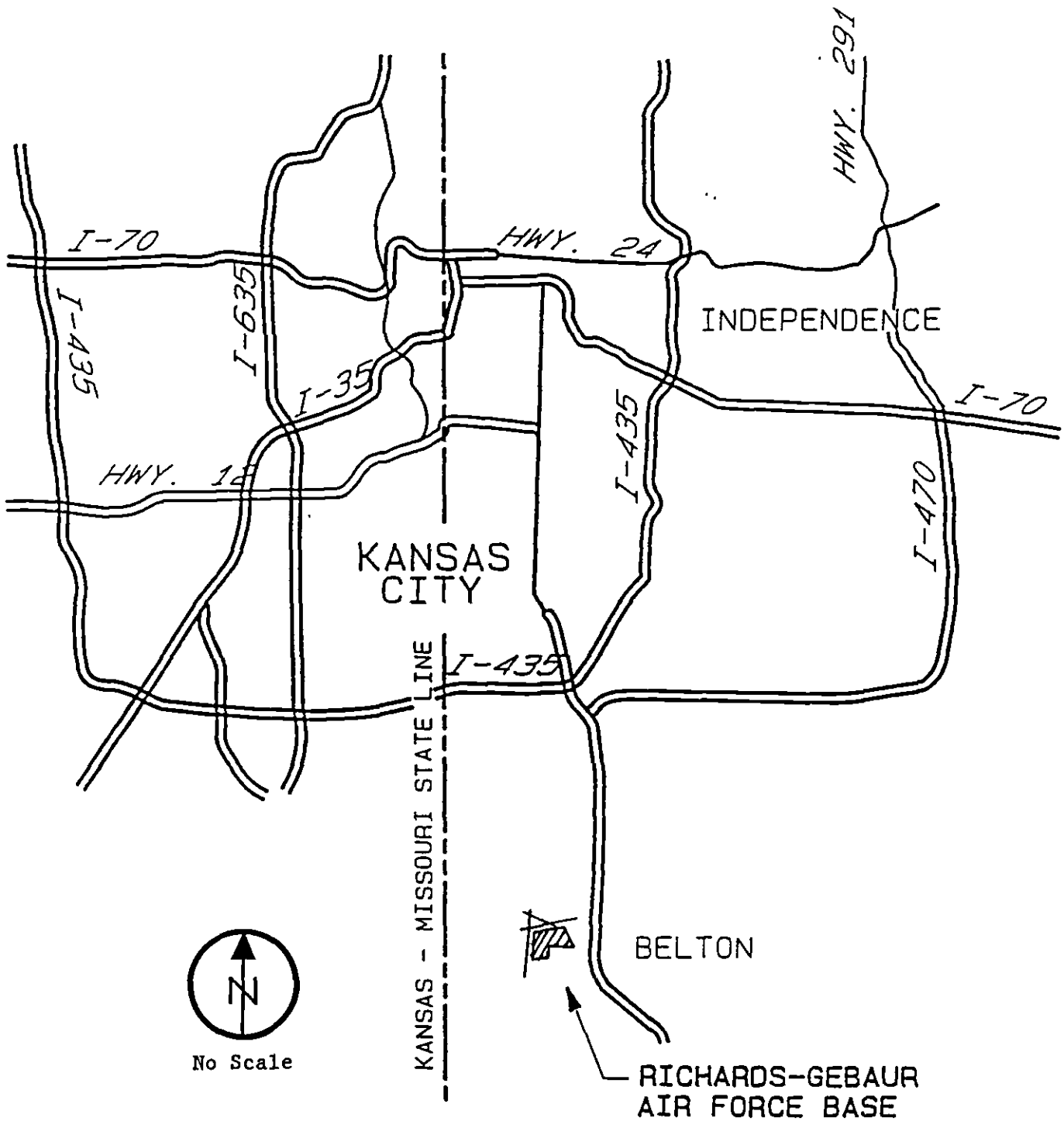


FIGURE 2-1, LOCATION OF RICHARDS-GEBAUR AFB

TABLE 2-1

METEOROLOGICAL DATA SUMMARY FOR
RICHARDS-GEBAUR AIR FORCE BASE[a]

Parameter	Jan.	Feb	Mar	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec	Annual
Temperature (°F)													
Highest	71	82	84	90	95	104	111	107	102	93	84	71	97 9[b]
Average Maximum	34.5	40 3	51.3	65 1	73 8	81 6	87.0	85 9	77.9	67 5	52.3	40.3	63.1
Average	26 2	31 9	42 1	55 3	64 7	72 8	77 9	76 3	68 5	57 6	43 6	32 6	54 1
Average Minimum	17 5	22 9	32 3	45 0	55 1	63 5	68 3	66 3	58.5	47 2	34 2	24 3	44 6
Lowest	-17	-12	-3	16	30	44	46	48	34	22	4	-8	-5 9[b]
Monthly Precipitation (inches)													
Maximum	3.51	3.15	11 48	8.74	7.65	12 57	12.40	7.76	13.54	9.24	5 68	2.79	63.64
Mean	1.50	1.15	2.58	3.40	4.25	5.05	3.78	3.19	4.65	3.62	1.78	1.57	36.83
Minimum	0.13	0.23	0 45	0.72	1.21	1.67	0 20	0.18	0 09	0.18	0.03	0.01	20.82

[a] - Period of Record 1954 - 1982

[b] - Average Annual Extremes

Source: Department of the Air Force, Richards-Gebaur AFB

Unconsolidated late Pleistocene-Holocene surficial deposits consist of residual clay mixed with chert and a trace of sand on the uplands and slope areas, and thin alluvial deposits adjacent to the larger streams. A thin blanket of loess overlies the bedrock in much of the upland area.

Richards-Gebaur AFB is located in the Osage Plains region of the Kansas Central Lowlands physiographic province. This region is characterized by low overall relief; broad, maturely dissected uplands yield to somewhat steeper valley slopes. Prominent escarpments have resulted from the presence of thick erosion-resistant limestone (Merriam 1963).

The exposed bedrock, Pennsylvanian in age, averages about 250 feet in thickness. It consists of relatively thin cyclothymic deposits, predominantly limestone and shale with isolated lenticular bodies of sandstone belonging to the Douglas Group, the Lansing Group, and the upper part of the Kansas City Group, Missourian Series. (See Figure 2-2). The subsurface Pennsylvanian rocks, averaging about 675 feet thick, include, in descending order, the Missourian, Desmoinesian, and Atokan series. The Missourian Series includes the Kansas City and Pleasanton groups. The lower part of the Kansas City Group, consisting of approximately 75 feet of relatively thick beds of limestone interbedded with shale, is present in the subsurface but does not crop out on the Base. Lithologically, the Kansas City Group contrasts with the underlying, predominantly clastic, 90- to 150-foot-thick sequence of beds forming the Pleasanton Group. The Desmoinesian Series includes the Marmaton and Cherokee groups. The Marmaton is 125 feet to 200 feet thick, consisting predominantly of limestone and shale and including thick bodies of channel fill, cross-bedded sandstone, and conglomerate. The Cherokee Group is a clastic sequence of beds with numerous thin coal beds; contains fine-grained micaceous sandstone and argillaceous limestone; and, its average thickness is 325 feet. Rocks tentatively assigned to the Atokan Series are lithologically similar to those of the Cherokee Group but are limited in areal extent and are up to 75 feet thick. Below the Pennsylvanian rocks and above the Precambrian igneous and metamorphic complex are about 1,500 feet of Mississippian, Devonian, Ordovician, and Cambrian sedimentary rocks.

FT002 is underlain by the Kansas City Group Wyandotte Formation and Sites SS003, SS004 and ST005 are underlain by the Kansas City Group Lane Formation according to Geologic Map of Belton Quadrangle (Gentile 1982). The Wyandotte Formation is composed of limestone with thin shale units near the middle and in the lower part, and attains a maximum thickness of almost 80 feet. The Lane Formation is medium-gray to bluish-gray shale 20 to 60 feet thick, that is commonly silty to sandy in the upper part (Gentile-1982). At the AFB this thickness range is 25 to 40 feet thick (Gentile-1992).

2.04 SOILS

The surface soils at Richards-Gebaur AFB consist primarily of very thin loess deposits over residual soil derived from the in-situ weathering of the underlying limestone and shale bedrock (see Figure 2-3). Soil cover normally varies from two feet to 15 feet in thickness. The soils on the upland surfaces belong to the Sharpsburg and Macksburg series. The Macksburg series consists of poorly drained silty clay loams, and the Sharpsburg series consists of moderately well-drained, silty clay loams (SCS, Jackson County, Missouri 1984).

Where shale is exposed along creeks, soils consist of residual clays and silty clays belonging to the Snead and Sampsel series. Moderately well-drained alluvium has filled stream valleys to a depth of about 50 feet. Alluvial soils belonging to the Verdigris (Kennebec) series are present in the level bottomland area along Scope Creek just east of the base. These alluvial soils have a high groundwater table and are subject to occasional flooding.

Permeabilities of the surficial soils are generally low, less than 10^{-6} centimeters per second (cm/s). Permeability of the Verdigris (Kennebec) alluvial soils are moderate, approximately 10^{-4} to 10^{-6} cm/s (Groundwater, Freeze and Cherry, 1979, Table 2.2).

2.05 SURFACE WATER

At the Base, all surface runoff is eventually channeled into Scope Creek or other smaller tributaries of the Little Blue River. Scope Creek flows north-north-east through the center of the Base. One man-made pond is found on the Base above the POL Storage Yard; however, the pond fenced and not used for recreation. Scope Creek is largely intermittent in its headlands, but becomes perennial in the northeast part of the Base, where it becomes the Little Blue River. Scope Creek is used by assorted wildlife as well as farm animals. Surface water drainage pathways are shown in Figure 2-4.

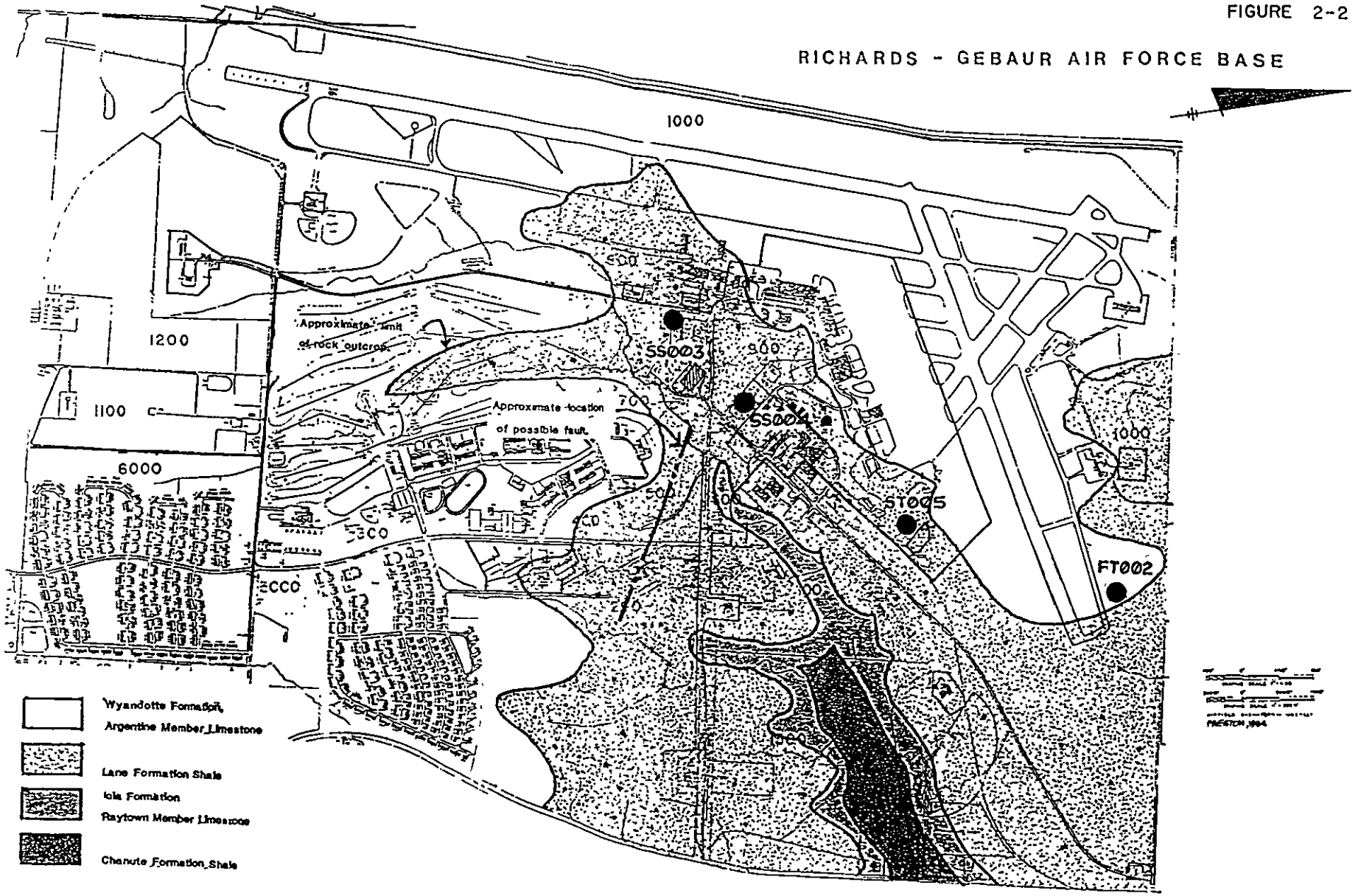
SECTION THREE - SOIL AND GROUNDWATER INVESTIGATION

3.01 REGIONAL HYDROGEOLOGY

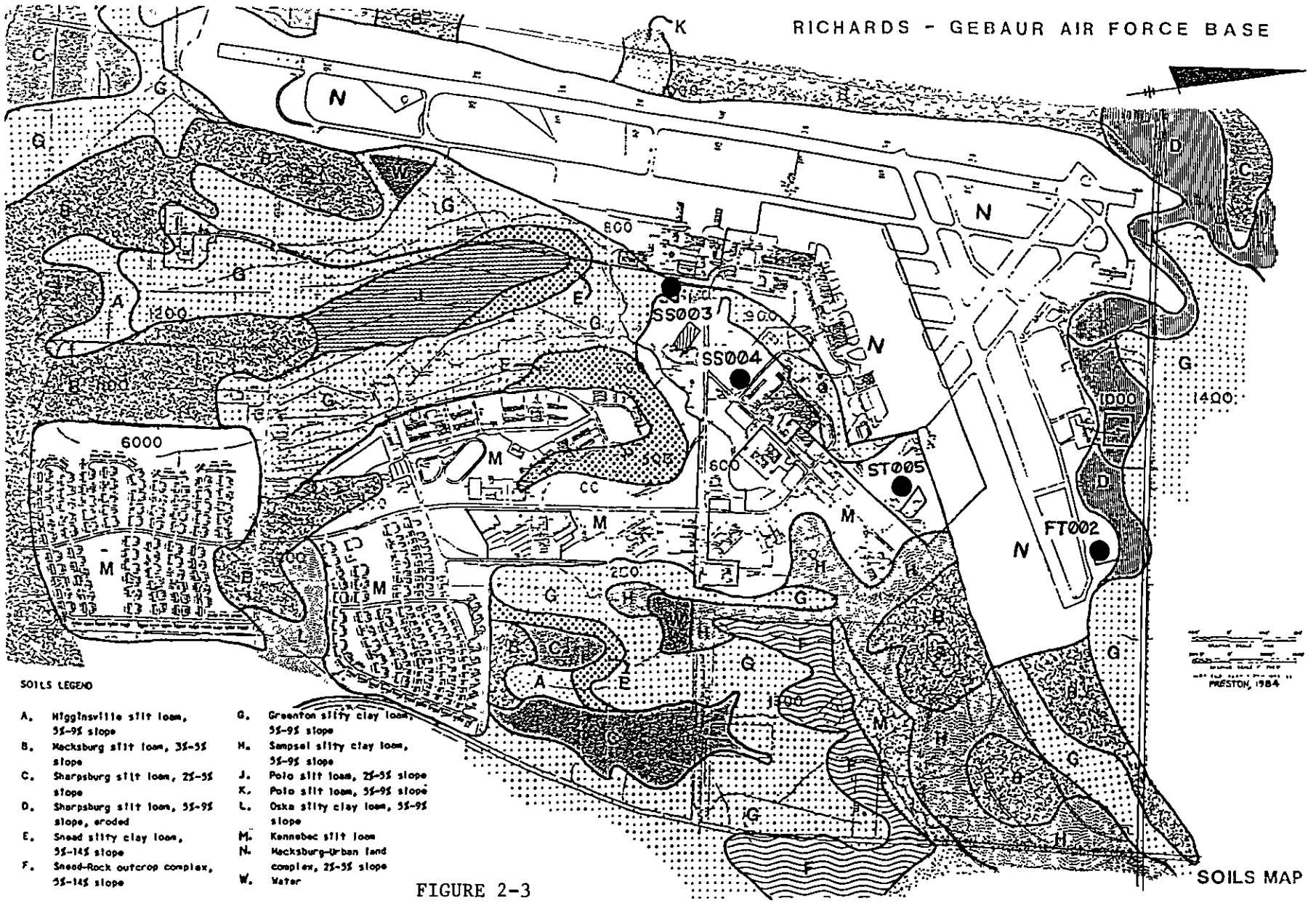
Groundwater resources in the Belton area are limited. Water is supplied to the AFB and the City of Belton via pipelines from the Missouri River. Several older water wells are located within three miles of the AFB (see Exhibit B). These wells are reported to have yields ranging from one to 20 gallons per minute (gpm). These wells are typically less than 250 feet deep and draw mineralized waters from Pennsylvanian shales and lenticular sandstone bodies contained therein. The Pennsylvanian rocks are

FIGURE 2-2

RICHARDS - GEBAUR AIR FORCE BASE



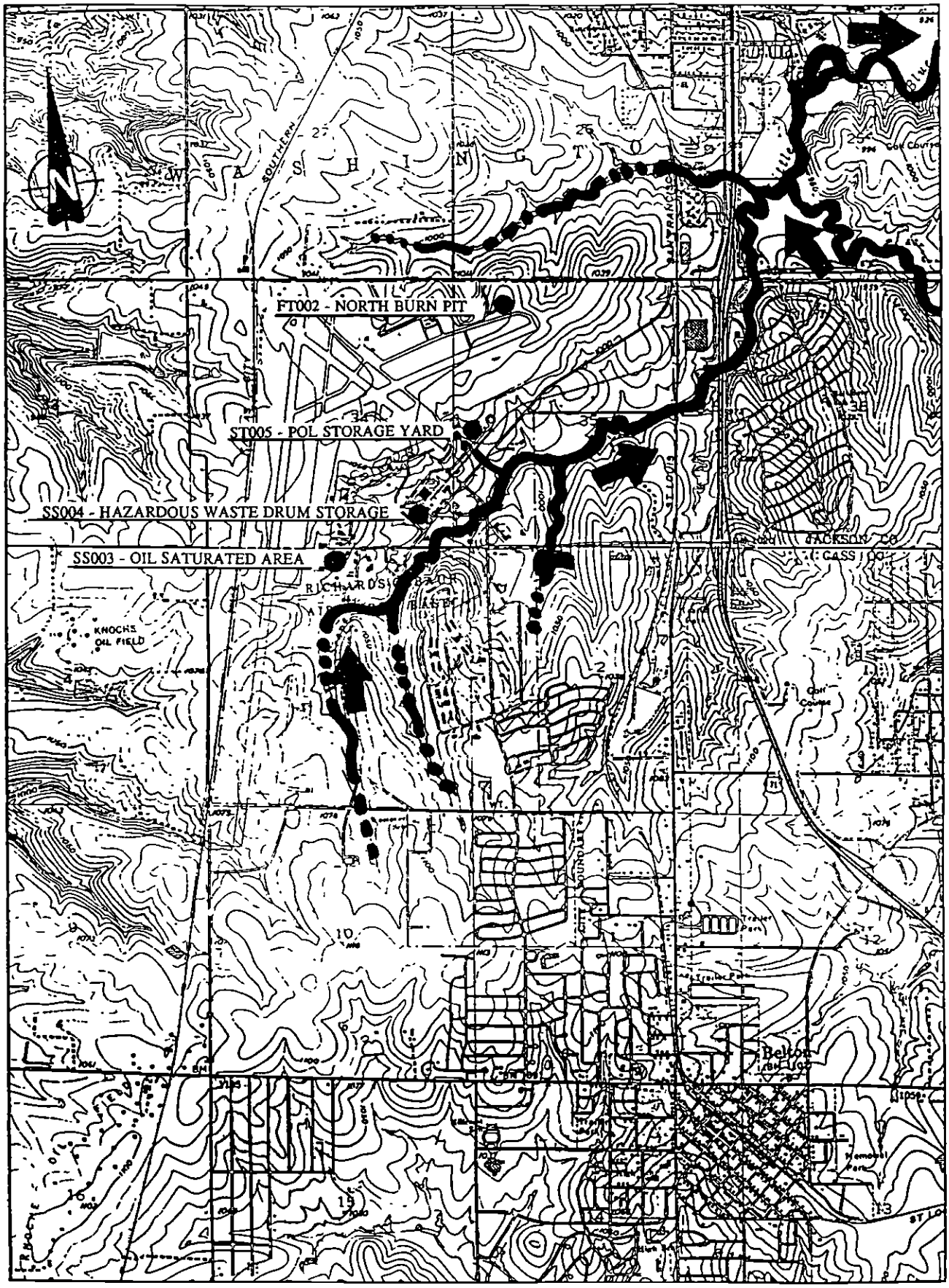
Geologic Map



SOILS LEGEND

A. Higginsville silt loam, 5%-9% slope
B. Macksburg silt loam, 3%-5% slope
C. Sharpsburg silt loam, 2%-5% slope
D. Sharpsburg silt loam, 5%-9% slope, eroded
E. Snead silty clay loam, 5%-14% slope
F. Snead-Rock outcrop complex, 5%-14% slope
G. Greenton silty clay loam, 5%-9% slope
H. Sampsel silty clay loam, 5%-9% slope
J. Polo silt loam, 2%-5% slope
K. Polo silt loam, 5%-9% slope
L. Oska silty clay loam, 5%-9% slope
M. Kennebec silt loam
N. Macksburg-Urban land complex, 2%-5% slope
W. Water

FIGURE 2-3



SCALE

0 ½ 1 1½ 2 MILES

0 .5 1 1.5 2 KILOMETERS

Figure 2-4, Surface Water Flow Map Richards-Gebaur AFB

generally too thick and are cost prohibitive to drill through for single-family homes, particularly given the accessibility of inexpensive hook-ups to the Missouri River water system. Two wells are still in use in a City of Belton mobile home park a mile southeast of the AFB. One of the wells produces 17 gpm and the other eight gpm. Production is from a system of vertical joints in a black fissile shale caused by a structural uplift of the Hushpuckney Shale member at a depth of approximately 275 feet.

3.02 SITE SOIL SAMPLING INVESTIGATIONS

3.02.1 FT002 - North Burn Pit

Two surface soil samples and a duplicate sample (0-2 feet) were collected from the site (see Figure 3-1). Samples S6S1, S6S2 and sample S6S3 (duplicate of sample S6S1), detected no significant amounts of volatile and semi-volatile organics. Levels of lead were detected at 440 mg/kg, 17 mg/kg and 580 mg/kg in samples S6S1, S6S2 and S6S3, respectively (see Table 3-1). Laboratory data for this site can be found in Appendix A, while previous analytical data summaries and other data from previous investigations can be found in Exhibit A.

3.02.2 SS003 - Oil Saturated Area

Two surface soil samples, a duplicate sample, and a background sample (0-2 feet) were collected from this site; S9S1, S9S2, S9S3 and S9S4. Sample S9S4 is the duplicate of sample S9S3. Only sample S9S3 contained detectable amounts of volatile organics (6 ppb xylenes, see Table 3-2). None of the remaining soil samples from SS003 contained measurable semi-volatile organic compounds. Soil sample S9S3 contained 170 mg/kg of lead while sample S9S2, the AFB background soil sample, contained the expected 20 mg/kg of lead (see Table 3-2). Laboratory data can be found in Appendix A, while previous laboratory data can be found in Exhibit A for this site.

3.02.3 SS004 - Hazardous Waste Drum Storage

Three surface soil samples and a duplicate sample (0-2 feet) were collected from SS004 (see Figure 3-3). Volatile and semi-volatile organic compounds were detected; however, these compounds were also found in the laboratory method blanks (see Table 3-3 or Appendix A for laboratory data). Total metal concentrations of all samples were comparable with concentrations found in background samples on the Base.

3.02.4 ST005 - POL Storage Yard

Three soil borings, ten feet in depth, were completed at the POL Storage Yard (see Figure 3-4). Measurable concentrations of

3068 016 04Fb

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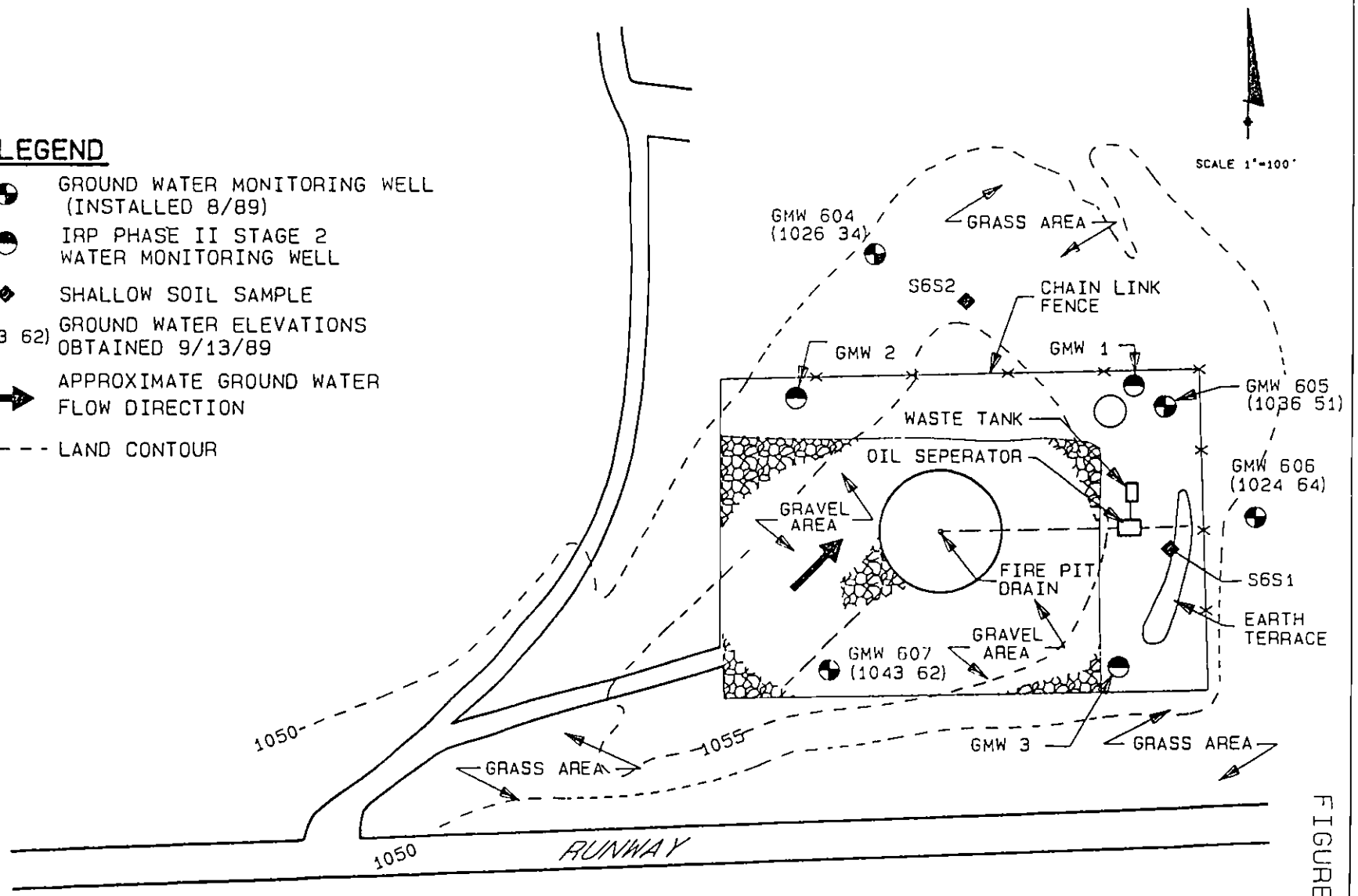


FT002 - NORTH BURN PIT

FIGURE 3-1

OBREN & GERE ENGINEERS INC

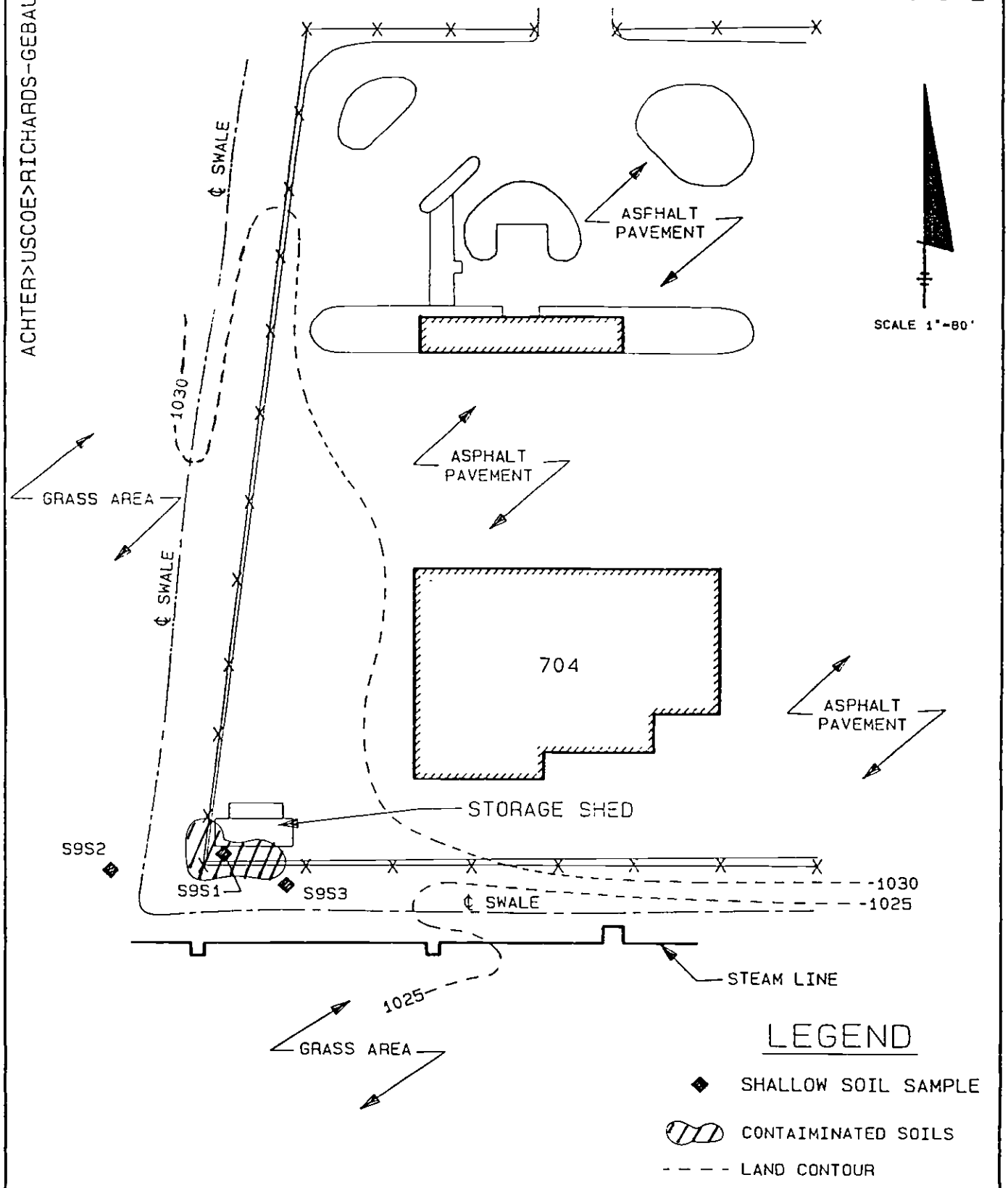
TABLE 3-1

RICHARDS-GEBAUR AFB
BELTON, MO
FT002 - NORTH BURN PIT
SOIL SAMPLE RESULTS
UNITS-mg/kg

	S6S1	S6S2	* S6S3	** S6S4	*** S6S5	# S9S2
VOLATILES						
Methylene Chloride	-	-	0.009	-	-	-
BASE NEUTRAL EXT.	-	-	-	-		-
ACID EXT.	-	-	-	-		-
TOTAL METALS						
Arsenic	6.8	6.6	6.1	<0.005		6.2
Barium	270	230	270	<0.2		220
Cadmium	2.3	<1.2	3.4	<0.01		<1.1
Chromium	46	22	56	<0.05		23
Lead	440	17	580	<0.05		20
Mercury	<0.5	<0.5	<0.5	<0.0005		<0.5
Selenium	<2.5	<2.5	<2.5	<0.005		<2.5
Silver	<1.3	<1.2	<1.3	<0.01		<1.1

- background soil sample
* - duplicate sample S6S1
** - rinsate sample
*** - travel blank
(Sample depth 0-2 feet)

FIGURE 3-2



SS003 - OIL SATURATED AREA

3068 016 03F

CH2M HILL & GERE ENGINEERS INC

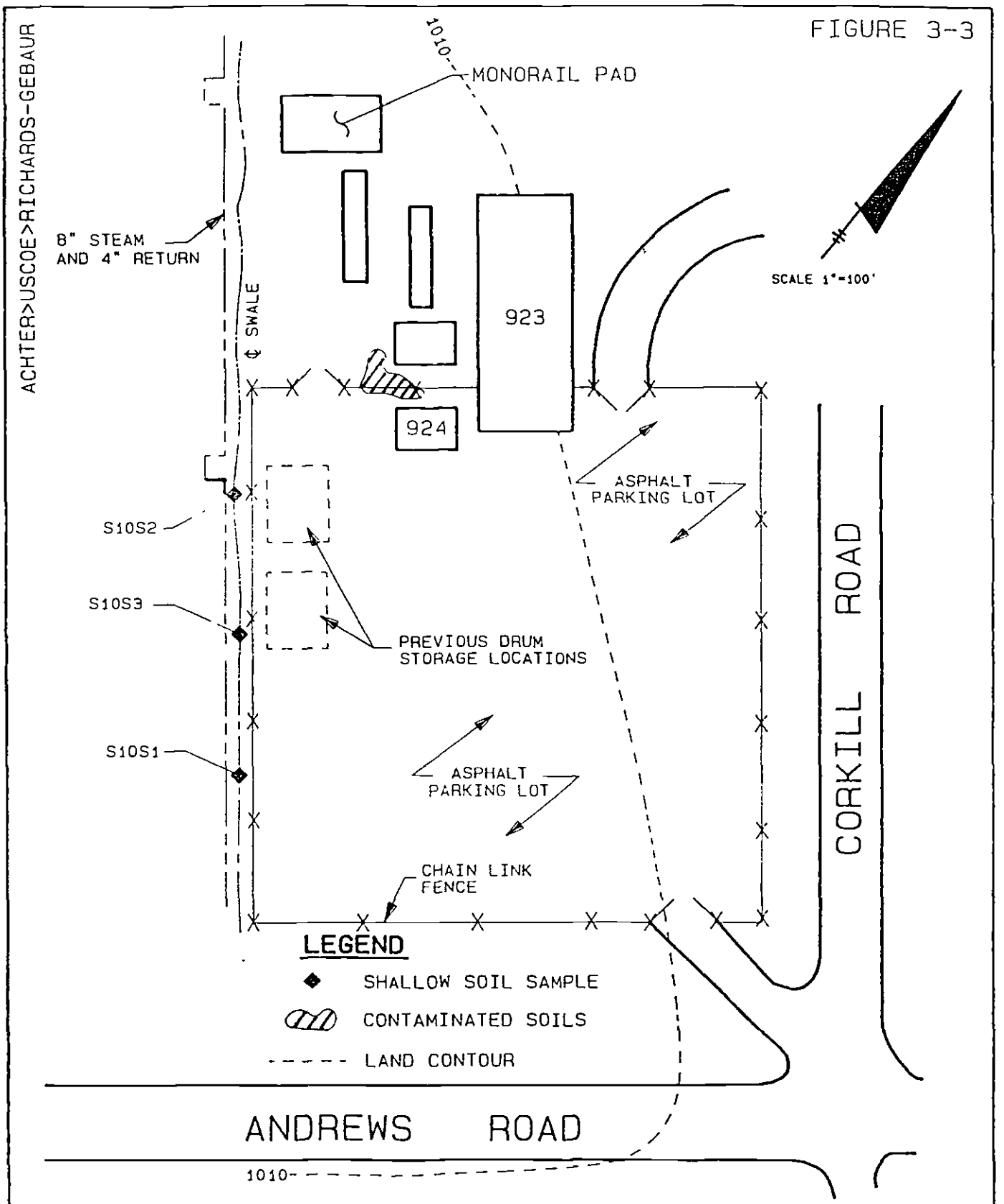
TABLE 3-2

RICHARDS-GEBAUR AFB
BELTON, MO
SS003 - OIL SATURATED AREA
SOIL SAMPLE RESULTS
UNITS-mg/lg

	S9S1	# S9S2	S9S3	* S9S4	** S9S5	*** S9S6
VOLATILES						
Xylenes	-	-	0.006	-	-	-
BASE/NEUTRAL EXT.	-	-	-	-	-	
ACID EXT.	-	-	-	-	-	
TOTAL METALS						
Arsenic	5.1	6.2	7.6	5.8	<0.005	
Barium	160	220	400	260	<0.2	
Cadmium	<2.4	<1.1	<1.1	<1.2	<0.01	
Chromium	18	23	27	29	<0.05	
Lead	94	20	170	44	<0.05	
Mercury	<0.5	<0.5	<0.5	<0.5	<0.0005	
Selenium	<0.6	<2.5	<2.5	<2.5	<0.005	
Silver	<2.4	<1.1	<1.1	<1.2	<0.01	

* - duplicate sample of S9S3
** - rinsate sample
*** - travel blank
\# - background soil sample

FIGURE 3-3



SS004 - HAZARDOUS WASTE DRUM STORAGE

3068 016 01F

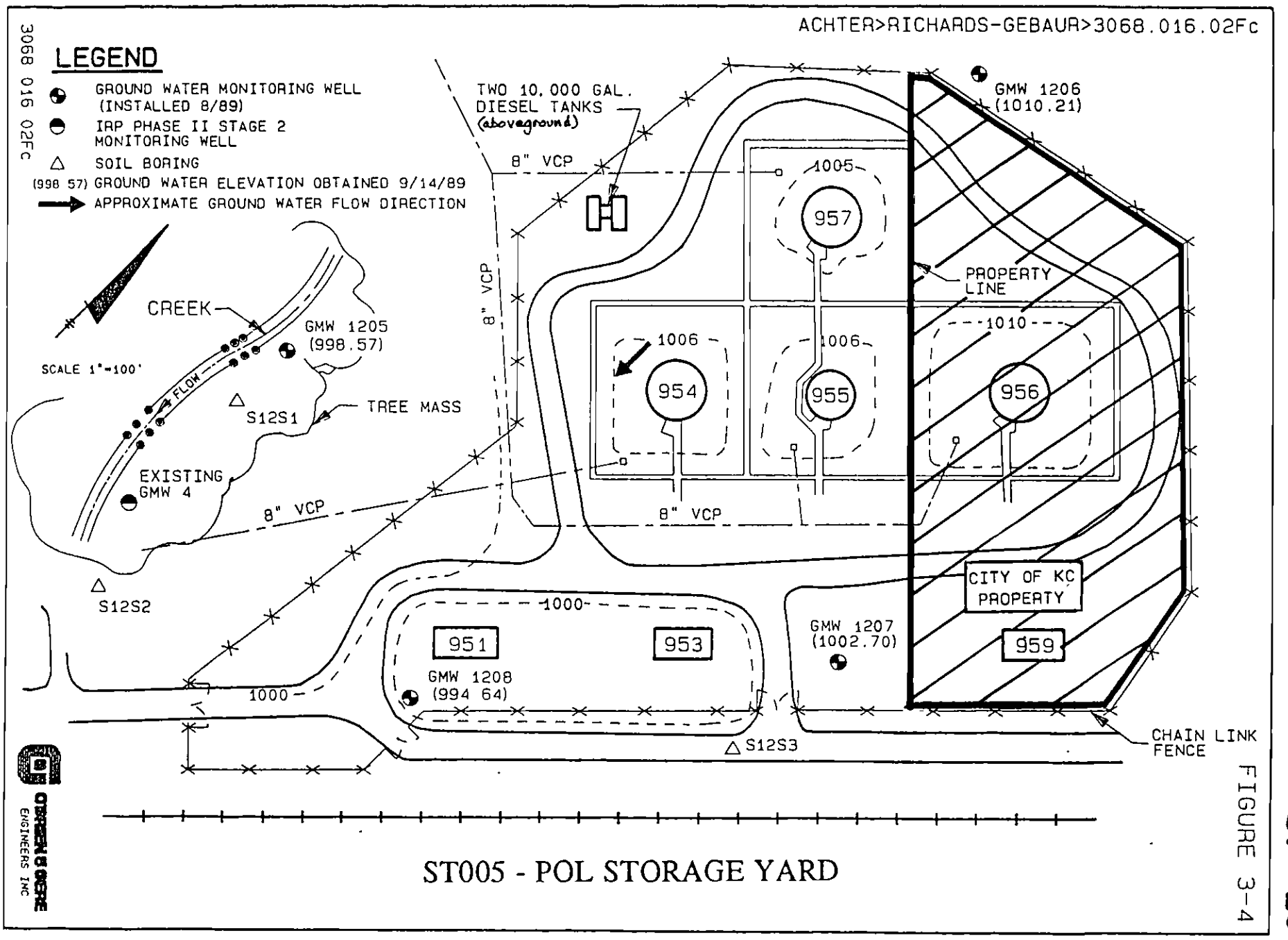
O'BRIEN & GERE ENGINEERS INC

TABLE 3-3

RICHARDS-GEBAUR AFB
BELTON, MO
SS004 - HAZARDOUS WASTE DRUM STORAGE
SOIL SAMPLE RESULTS
UNITS-mg/kg

	S10S1	S10S2	S10S3	* S10S4	** S10S5	*** S10S6	# S9S2
VOLATILES							
Acetone	-	-	0.090 B	.087 B	-	-	-
Methylene chloride	-	-	0.026	-	-		-
BASE/NEUTRAL EXT.	-	-	-	-	-		-
ACID EXT.	-	-	-	-	-		-
TOTAL METALS							
Arsenic	8.7	4.7	3.2	3.6	<0.005		6.2
Barium	120	190	83	81	<0.2		22
Cadmium	<1.3	<2.4	<1.0	<2.2	<0.01		<1.1
Chromium	23	20	40	55	<0.05		23
Lead	50	41	44	99	<0.05		20
Mercury	<0.5	<0.5	<0.5	<0.5	<0.0005		<0.5
Selenium	<5.0	<2.5	<0.5	<0.5	<0.005		<2.5
Silver	<1.3	<2.4	<1.0	<2.2	<0.01		<1.1

B - analyte was detected in the blank as well as the sample.
* - duplicate of S10S3
** - rinsate sample
*** - travel blank
- - (soil sample interval 0-2 in depth)
- background soil sample



ST005 - POL STORAGE YARD

FIGURE 3-4

TABLE 3-4

RICHARDS-GEBAUR AFB
BELTON, MO
ST005 - POL STORAGE YARD
SOIL SAMPLE RESULTS
UNITS-mg/kg

	S12S1	S12S2	S12S3	* S12S4	** S12S5	*** S12S6	# S9S2
VOLATILES							
Acetone	.018	.012	.033 B	.014 B	-	-	-
BASE/NEUTRAL EXT.	-	-	-	-	-		-
Bis(2-ethylhexyl)phthalate	1.6 B	1.7 B	0.47 B	-	-		-
ACID EXT.	-	-	-	-	-		-
TOTAL METALS							
Arsenic	13	5.1	9	6.8	<0.005		6.2
Barium	240	180	300	320	<0.2		220
Cadmium	<1.2	<1.2	<1.2	<1.2	<0.01		<1.1
Chromium	24	23	40	30	<0.05		23
Lead	19	13	28	12	<0.05		20
Mercury	<0.5	<0.5	<0.5	<0.5	<0.0005		<0.5
Selenium	<2.5	<2.5	<2.5	<2.5	<0.005		<2.5
Silver	<1.2	<1.2	<1.2	<1.2	<0.01		<1.1

B - analyte was detected in the blank as well as the sample.
* - duplicate of sample S12S3
** - rinsate sample
*** - travel blank
# - Background Soil Samples
(sample depth 0-10 feet)

acetone and Bis (2-ethylhexl) phthalate were detected in the soil samples, which were collected at depths ranging from three feet to eight feet, at ST005. However, these compounds were detected in the laboratory method blank, and are considered a product of the laboratory (see Table 3-4). No acid extractable compounds were found above detection limits. Total metal concentrations of lead ranged from 13 to 28 mg/kg, while chromium concentrations ranged from 23 to 40 mg/kg, which is comparable with concentrations found in background samples on the Base.

3.03 GROUNDWATER INVESTIGATION

The locations of groundwater monitoring wells installed at FT002 and ST005 are shown in Figures 3-1 and 3-4, respectively.

3.03.1 FT002 - North Burn Pit

Groundwater results (see Table 3-5) show that no volatile compounds were detected, while a base/neutral compound, bis(2-ethylhexl)phthalate was detected in three of the samples. However, this compound was determined to be a laboratory contaminant. Total lead and chromium concentrations from turbid unfiltered groundwater samples were found to exceed the National Drinking Water Standard (40 CFR 141.11) 0.005 mg/l. Total lead concentrations were 0.12 mg/l, 0.20 mg/l, and 0.11 mg/l while chromium levels of 0.18 mg/l, 0.29 mg/l, and 0.11 mg/l were found in samples 604, 606, and 607, respectively.

3.03.2 ST005 - POL Storage Yard

A single upgradient unfiltered groundwater sample (1206) yielded a benzene concentration of .007 mg/l which is above the .005 mg/l MCL set by the National Drinking Water Standards (see Table 3-6). Base/neutral extractable compound, bis(2-ethylhexl) phthalate, was detected at concentrations of .023 mg/l and 1.6 mg/l. However, this compound was found to be a common laboratory contaminant. No acid extractables were detected in the analyses of the soil samples at the site. Total metal concentrations of barium, chromium and lead were found above the MCL as set by the National Drinking Water Standards (40 CFR 141.11). Barium levels ranged from 0.8 to 1.9 mg/l. Chromium levels ranged from 0.07 to 0.37 mg/l and lead levels ranged from 0.07 to 0.29 mg/l.

3.04 MONITORING WELL INSTALLATION

A total of eight shallow groundwater monitoring wells were installed to investigate specific subsurface areas at FT002 and at ST005. Soil and rock samples were collected during the installation of each monitoring well for geotechnical analyses. The wells were installed and completed in accordance with the MDNR/USEPA/USAF approved Work Plan for this project.

TABLE 3-5

RICHARDS-GEBAUR AFB
BELTON, MO
FT002 - NORTH BURN PIT
GROUND WATER SAMPLE RESULTS
UNITS-mg/l

	604	605	606	607	* 608	** 609	*** 610	*** 616	N.D.W.S.
VOLATILES	-	-	-	-	-	-	-	-	
BASE/NEUTRAL EXT.									
Bis(2-ethylhexyl) phthalate	0.021	-	0.1	0.011	-	-	-	-	
ACID EXT.	-	-	-	-	-	-	-	-	
TOTAL METALS									
Arsenic	<0.026	<0.005	<0.023	<0.007	<0.005	<0.005	-	-	0.05
Barium	0.7	0.5	0.8	0.4	0.6	<0.2	-	-	1.0
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.01
Chromium	0.18	<0.05	0.29	0.11	<0.05	<0.05	-	-	0.05
Lead	0.12	<0.05	0.20	0.11	<0.07	<0.05	-	-	0.05
Mercury	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	0.002
Selenium	<0.005	<0.05	<0.005	<0.05	<0.05	<0.05	-	-	0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.05

N.D.W.S. - National Drinking Water Standards
* - duplicate sample of 605
** - rinsate sample
*** - travel blank

TABLE 3-6

RICHARDS-GEBAUR AFB
BELTON, MO
ST005 - POL STORAGE YARD
GROUND WATER SAMPLE RESULTS
UNITS-mg/l

	1205	1206	1207	1208	1209 *	1210 **	1211 ***	1212 ***	1213A ***	GMW4	N.D.W.S.
VOLATILES											
Benzene	-	0.007	-	-	-	-	-	-	-	-	.005
BASE/NEUTRAL EXT.	-	-	-	-		-	-	-	-	-	
Bis(2-ethylhexyl)phthalate	-	-	-	-	0.023	-	-	-	-	1.6	
ACID EXT.	-	-	-	-	-	-	-	-	-	-	
TOTAL METALS											
Arsenic	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	-	-	-	<0.005	0.05
Barium	1.3	0.8	1.3	1.9	1.7	<0.2	-	-	-	0.3	1.0
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	<0.01	0.01
Chromium	0.09	0.07	0.24	0.37	0.36	<0.05	-	-	-	<0.05	0.05
Lead	0.13	0.07	0.26	0.29	0.28	<0.05	-	-	-	<0.05	0.05
Mercury	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	<0.0005	0.002
Selenium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.005	0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	<0.01	0.05

* - duplicate sample of 1207
** - rinsate sample
*** - travel blank
N.D.W.S. - National Drinking Water Standards

Table 3-7
Well Construction Data
North Burn Pit, FT002
Richards-Gebaur AFB
Belton, MO

Well No.	(1) Boring Depth	(1) Screened Interval	(2) Sand Pack	(2) Bentonite Seal	(2) Grout Interval	Date Installed
GMW #604	33	15-30	20	2	11	08/23/89
GMW #605	37.9	20-30	22.4	2.25	13.25	08/18/89
GMW #606	33	14-29	21	2.25	9.75	08/23/89
GMW #607	42	17-32	27.5	2	12.5	08/23/89

NOTES:

(1) Depth below ground surface.

(2) Length of material in well column

All values in feet

3.04.1 FT002 - North Burn Pit

All of the monitoring well borings at FT002 were terminated in the Lane shale. All of the screened intake areas of GMW #604 through GMW #607 were positioned at the upper portion of the shallow aquifer to aid in the detection of any free-phased floating contaminants. GMW #604 and #606, as can be seen from Table 3-8, yielded very small volumes of water during development. During sample collection only minor amounts of water were purged prior to collection; therefore, it is possible that groundwater samples taken from these wells could have contained some drill water. However, these samples were taken from the limestone interval above the lower permeability member, and if any petroleum based contaminants were present in this interval, they would have been detected in these samples even if some drill water had mixed with the small amount of groundwater present in these wells. The water used in drilling the wells was Belton tap water. The analysis of this water by the City of Kansas City can be found in Exhibit D.

3.04.2 ST005 - POL Storage Yard

Four groundwater monitoring wells, GMW #1205, GMW #1206, GMW #1207, and GMW #1208, were installed at ST005 to sample shallow groundwater. One of the existing well, GMW #4, was also sampled.

GMW #1205 was installed in an assumed downgradient location to monitor groundwater movement from the site toward the creek (see Figure 3-4). GMW #1207 and GMW #1209 were installed near one of the fuel unloading stations adjacent to the railroad tracks. GMW #1206 was installed at a location upgradient of the storage tanks to provide background groundwater quality data for comparison purposes. Test boring logs and well construction diagrams for monitoring wells installed at ST005 are located in Appendix B. Well construction data for this site can be found in Table 3-9. The groundwater flow directions presented on Figure 3-4 are based on groundwater elevation data obtained on at the time of sampling.

The groundwater monitoring well test boring logs for ST005 reveal that three different subsurface units are distinguishable. The surface soils/fill consist of generally six inches of topsoil in the vicinity of GMW #1205 and GMW #1206. The boring for GMW #1207 encountered three inches of asphalt fragments mixed with crushed rock and the boring for GMW #1208 encountered three inches of crushed rock (limestone). The surface soils are underlain by silty clay and residual clay. An upper fill material zone was identified up to 5 feet thick in the vicinity of the boring for GMW #1208. The naturally occurring silty clay and residual clay range in thickness from approximately ten feet at GMW #1208 to 17.5 feet in the area of GMW #1206. The clay contains weathered limestone and chert fragments and the rock fragment content was observed increasing with depth in all four borings. Limestone, clay stone, and shale underlie the residual clay formation. These competent

Table 3-8
Well Development Data
North Burn Pit, FT002
Richards-Gebaur AFB
Belton, MO

Well No.	(1) Development Process	(2) Quantity of Water in Well (gals.)	Quantity of Water Removed (gals.)	Development Turbidity	Dates
GMW #604	Surging, bailing	3.61	8.5	Trace	09/12/89
GMW #605	Surging, bailing	10	46	Trace	08/23/89
GMW #606	Surging, bailing	4.66	8.3	Trace	09/12/89
GMW #607	Surging, bailing	5	24	Trace	08/24/89

NOTES:

(1) All of the monitoring wells are developed using two techniques: surging with a surge block; and, bailing with a 1.50 inch diameter stainless steel bailer.

(2) Quantity of water in well casing and saturated annulus.

Table 3-9
Well Construction Data
POL Storage Yard, ST005
Richards-Gebaur AFB
Belton, MO

Well No.	(1) Boring Depth	(1) Screened Interval	(2) Sand Pack	(2) Bentonite Seal	(2) Grout Interval	Date Installed
GMW #1205	18.5	4.5-14.5	15	2	1.5	08/14/89
GMW #1206	23	11.8-21.8	13.2	2	7.8	08/11/89
GMW #1207	23	5-15	19	2	2	08/14/89
GMW #1208	16	5-15	12	2.5	1.5	08/15/89

NOTES:

(1) Depth below ground surface.

(2) Length of material in well column

All values in feet

bedrock units occur at depths of between 11.5 feet and 14.9 feet below ground level. Limestone was encountered in the borings for GMW #1205 and GMW #1208. Claystone was encountered in GMW #1206 and shale in GMW #1207. Detailed lithologic descriptions of the overburden and bedrock formations encountered are presented on the respective test boring logs included in Appendix B.

The residual clay and underlying bedrock are the formations under ST005 in which shallow groundwater was encountered and the four on-site shallow monitoring wells were screened.

3.04.3 Monitoring Well Construction

The Monitoring Well Installation Plan for Richards-Gebaur AFB FT002 and ST005 stated that the test boring should penetrate a minimum of ten feet into the phreatic zone of the shallowest aquifer encountered. A monitoring well was then constructed after drilling the borehole to the depth specified by the site geologist. The monitoring well was assembled in each borehole with the following materials: two-inch inner diameter (I.D.), Polyvinyl Chloride (PVC), threaded, flush-joint, No. 10 machine slot (0.010 inch) pre-manufactured screen; two-inch PVC, threaded, flush-joint, solid riser pipe; non-carbonate silica sand; bentonite pellets; a lock; and, protective steel guard posts. A concrete pad (four inches x three feet x three feet) was constructed around each well with a brass monument cap set in the surface of each pad.

A Central Mine Equipment (CME-55) drilling rig was used to install the monitoring wells at FT002 and ST005. The rig was equipped with 3.75-inch inner diameter (I.D.), eight-inch outer diameter (O.D.) hollow stem augers.

The monitoring wells were installed between 9 Aug 89 and 23 Aug 89. Each well was installed as follows: 1.) The hole was drilled with hollow stem augers; 2.) Soil sampling was conducted with either a CME five-foot split-tube sampler or a two-foot long two-inch O.D. split-spoon; 3.) Rock coring, when required, was completed with a ten-foot NX size core barrel with a diamond bit; 4.) Boreholes penetrating competent rock were then reamed with a six-inch rock bit to the depth specified on the boring log; 5.) The two-inch PVC screen and risers were assembled and lowered into the borehole; 6.) The sand pack and bentonite seal were added through the annular space; 7.) The bentonite pellets were wet down every ten minutes for 30 minutes and hydration was allowed for a minimum of eight hours; 8.) Cement-bentonite grout was mixed, and allowed to cure for a minimum of 48 hours; and 9.) The surface protection system (pad, steel box cover, and protective posts) was constructed. Tables 3-7 and 3-9 show pertinent information on well construction details. Monitoring well construction diagrams are included as Appendix B. Soil grain size distribution curves and Atterberg limits of select soil samples are included in Appendix C.

3.04.4 Monitoring Well Development

The purpose of well development is two-fold: to remove fine particles (silt and clay) that were introduced into the well during the drilling process and to improve the hydraulic connection between the surrounding aquifer and the well. After allowing the grout seal and pad to cure, each well at FT002 and ST005 was developed using a stainless steel bailer and by surging with a surge block. Well development data are summarized in Tables 3-8 and 3-10. Forms completed in the field during well development are presented in Appendix D. Data recorded in the field included: date, static water level, quantity of water standing in the well (including the sand pack), water quality data details, physical characteristics of water, development equipment, surge techniques, and water quantity removed. The wells were allowed to stabilize for two weeks prior to collecting water quality samples. The Monitoring Well Development Data sheets (Appendix D) show measurements for specific parameters used to monitor the development water (pH, specific conductance, temperature) during different stages of well development. No major variations in these parameters were noted during well development. The final readings for these parameters are summarized and presented in Tables 3-11 and 3-12.

3.04.5 In-Situ Permeability Testing

A type of in-situ permeability (hydraulic conductivity) test known as a "slug test" or "instantaneous withdrawal test" was performed on each well after proper well development and prior to sampling. The test consists of removing a slug of water from the water column (a decontaminated bailer was used at this site) to lower the water level. The recovery to static or near static water level is recorded over time. Water levels were measured using a Brainard-Kilman 100-foot Water Rule electronic water level indicator. Data was evaluated using the Hvorslev Method (1951) to calculate the hydraulic conductivity for each well. This method has been chosen for this study since it is generally the most accepted method for determining hydraulic conductivity where the monitoring well does not fully penetrate the aquifer. Data and hydraulic conductivity calculations for each well test are presented in Appendix D.

3.05 SITE SURVEY

Well-head casing elevations at FT002 and ST005 were surveyed during September, 1989, by Sterling Engineers, Surveyors, and Planners Company. The surveying firm is located in Bridgeton, Missouri. Field notes and the completed site survey are contained in Appendix E.

Table 3-10
Well Development Data
POL Storage Yard, ST005
Richards-Gebaur AFB
Belton, MO

Well No.	Development Process (1)	Quantity of Water in Well (gals.) (2)	Quantity of Water Removed (gals.)	Development Turbidity	Dates
GMW #1205	Surging, bailing	2.5	40	Trace	08/20/89
GMW #1206	Surging, bailing	10	49	Trace	08/20/89
GMW #1207	Surging, bailing	6	16	Trace	08/21/89
GMW #1208	Surging, bailing	6.5	24	Trace	08/24/89

NOTES:

(1) All of the monitoring wells are developed using two techniques: surging with a surge block; and, bailing with a 1.50 inch diameter stainless steel bailer.

(2) Quantity of water in well casing and saturated annulus.

3.06 FT002 AND ST005 HYDROGEOLOGY

Groundwater elevations for monitoring wells at FT002 and ST005 can be found on Table 3-13 and Table 3-14, respectively. Data recorded during the September 13, 1989 sampling event at FT002 and the September 14, 1989 sampling event at ST005 have been summarized in Tables 3-11 and Table 3-12, respectively.

As indicated by the groundwater elevations presented on Figure 3-1, the general horizontal groundwater flow direction in the vicinity of FT002 is primarily towards the northeast. In the vicinity of GMW #605, however, an anomaly to the apparent flow pattern exists, relative to the groundwater elevations observed at GMW #604 and GMW #606. Although the higher groundwater level at GMW #605, as compared to adjacent monitoring wells GMW #604 and GMW #606 which have water levels consistently ten to 12 feet lower, cannot specifically be accounted for, it is possible that the monitoring well bentonite seal may leak or the screened interval may intercept perched groundwater due to the heterogeneous nature of the area formations, such as an irregular weathered surface of the Argentine limestone.

As indicated by the groundwater elevations presented on Figure 3-4, the general horizontal groundwater flow direction in the vicinity of ST005 is primarily towards the south. This predominant southerly flow direction is consistent with local surface drainage and physiographic condition with particular regard to the position of Scope Creek approximately 1,500 feet to the southeast.

SECTION FOUR - NATURE AND EXTENT OF CONTAMINATION

4.01 GENERAL

In this Section, the presently available data related to the nature and extent of contamination at each of the following sites at Richards-Gebaur AFB is presented for all sites, FT002 - North Burn Pit, SS003 - Oil Saturated Area, SS004 - Hazardous Waste Drum Storage and ST005 - POL Storage Yard.

Information relating to the nature and extent of contamination at each of these sites is presented and discussed in subsections 4.01, 4.02, 4.03, and 4.04, respectively. The information presented here is taken from the following reports: "*Installation Restoration Program Phase II Confirmation/ Quantification Stage 2 Final Report for Richards-Gebaur Air Force Base, Missouri*" (E&E 1988); analytical data from soil and water samples collected by O'Brien & Gere on September 14, 1989 and analyzed by O'Brien & Gere Laboratories, Inc. (O'Brien & Gere 1989); analytical results from soil samples collected by the United States Army Corps of Engineers (USACE 1989).

Table 3-11
Groundwater Quality Measurements
North Burn Pit, FT002
Richards-Gebaur AFB
Belton, MO

Well No.	pH	Specific Conductance (umhos/cm)	Temperature (C)	Date
GMW #604	*	*	16	09/12/89
GMW #605	7.6	521	17	08/23/89
GMW #606	*	*	18	09/12/89
GMW #607	7.8	595	18	08/24/89

NOTES:

All measurements reflect final readings at the end of well development

* Readings not recorded due to instrument failure.

Table 3-12
Groundwater Quality Measurements
POL Storage Yard, ST005
Richards-Gebaur AFB
Belton, MO

Well No.	pH	Specific Conductance (umhos/cm)	Temperature (C)	Date
GMW #1205	7.13	930	20	08/20/89
GMW #1206	6.35	635	17	08/20/89
GMW #1207	7.75	786	23	08/21/89
GMW #1208	6.88	1122	21	08/24/89

NOTES:

All measurements reflect final readings at the end of well development

Table 3-13
Groundwater Elevation Summary
North Burn Pit, FT002
Richards-Gebaur AFB
Belton, MO

Well No.	(1) TOC (feet)	Depth to Ground Water Surface (feet below TOC)	Date	Water Level (feet)	(2) Coordinates Northing	Easting
GMW #604	1055.65	29.31	09/13/89	1026.34	979853	487706
GMW #605	1053.53	20.02	09/13/89	1033.51	979779	487908
GMW #606	1051.58	26.94	09/13/89	1024.64	979679	488040
GMW #607	1061.17	17.55	09/13/89	1043.62	979522	487707

NOTES:

(1) TOC - Top of well casing elevations are based on a local benchmark near the site and referenced on the site survey in Appendix E.

(2) Coordinates are based on an arbitrary grid system established on site and referenced in the site survey in Appendix E.

Table 3-14
Groundwater Elevation Summary
POL Storage Area, ST005
Richards-Gebaur AFB
Belton, MO

Well No.	(1) TOC (feet)	Depth to Ground Water Surface (feet below TOC)	Date	Water Level (feet)	(2) Coordinates Northing	Easting
GMW #1205	1002.85	4.28	09/14/89	998.57	977143	486904
GMW #1206	1020.92	10.71	09/14/89	1010.21	977528	486984
GMW #1207	1009.00	6.30	09/14/89	1002.7	977224	487227
GMW #1208	1003.04	8.40	09/14/89	994.64	976991	487016
GMW #4	999.85	5.48	9/14/90	994.37	976946	486876

NOTES:

(1) TOC - Top of well casing elevations are based on a local benchmark near the site and referenced on the site survey in Appendix E.

(2) Coordinates are based on an arbitrary grid system established on site and referenced in the site survey in Appendix E.

4.02 FT002 - NORTH BURN PIT

In 1988, a soil gas survey was performed by E&E to assess the scope of impact that past fire training exercises had at this site. Based on soil gas results, E&E drilled three boreholes outside the perimeter of the concrete burn pit and collected three subsurface soil samples from each borehole. They also collected six surface soil samples outside the burn pit. The sampling locations of the samples collected by E&E are shown in Figure 3-5 in Exhibit A. The 15 soil samples were analyzed for halogenated and aromatic organics and TPH. The analytical results from soil samples collected by E&E are given in Table 4-7 in Appendix A. Low concentrations of petroleum hydrocarbons were detected in surface soils throughout the site (2.8 to 34 milligrams per kilogram [mg/kg]).

E&E also installed three groundwater monitoring wells within the fenced area (and property line), and collected one groundwater sample from each well, as well as a surface water sample from standing water behind the raised terrace at the eastern perimeter of the site (Figure 4-7 in Exhibit A). The surface water and groundwater sample from MW1 were analyzed for halogenated and aromatic volatile organics (VOC's). The surface water sample was also analyzed for petroleum hydrocarbons. The groundwater samples from MW2 and MW3 were only analyzed for volatile organic compounds. E&E reported that groundwater samples from wells MW2 and MW3 had low concentrations of chloroform (0.50 and 0.61 ug/l, respectively), and tetrachloroethylene (0.71 and 0.41 ug/l, respectively). The deeper well, MW1, reportedly had detectable methylene chloride concentrations (37 ug/l).

In September 1989, O'Brien & Gere installed four groundwater monitoring wells - GMW #604, #605, #606, and #607, and sampled them approximately two weeks later. In addition, four surface soil samples, S6S1, S6S2, S6S3, and S6S1-M, were collected at two locations in the North Burn Pit. Samples S6S1, S6S3, and S6S1-M were collected in front of a small earth terrace east of the concrete burn pit. Sample S6S2 was collected from a stained area north of the burn pit, approximately 30 feet outside the fenced area. The sampling locations are shown on Figure 3-1. The data from soil analyses conducted by O'Brien & Gere are given in Table 3-2. Lead concentrations in the sediments behind an erosion control terrace were significantly higher than the background lead sample for the Base (20 mg/kg). USGS reported that average lead concentrations in Missouri soils are 2-200 mg/kg. Lead was detected in the sediments at the site from a vertically split duplicate sample which yielded 440 mg/kg and 580 mg/kg. All other metal concentrations were within the range normally found in the soils of the region. Unfiltered groundwater samples from wells GMW #605 and GMW #607 had lead and chromium concentrations that exceeded the respective USEPA MCL for each of these total metals. No base/neutral extractables or volatile organic compounds were detected in any of the on-site samples.

The data provided by E&E and O'Brien & Gere suggest that low concentrations of petroleum hydrocarbons are present in surface soils throughout the site. Lead was detected at one sampling location (S6S1, terrace retention sediments) near the site. The unfiltered groundwater samples collected from the site by O'Brien & Gere indicated lead and chromium concentrations that were higher than the corresponding USEPA MCL's in three out of four groundwater wells sampled. However, since the metal concentrations were similar in wells that are estimated to be upgradient (GMW #604) and downgradient (GMW #607) of the site, it is evident that the North Burn Pit is not the source of metals in the groundwater. The clay soils in Missouri have naturally high background concentrations of these metals, and the groundwater concentrations may reflect the naturally occurring groundwater concentrations for these metals. Unfiltered samples tend to be turbid and carry fines through the analytical processes. It can therefore be expected that analyses on unfiltered groundwater samples can reflect parent formation characteristics to a degree. Low concentrations of chloroform, methylene chloride, and tetrachloroethylene were detected in groundwater collected from wells at the site; but, the concentrations detected were well below the USEPA MCL for chloroform (100 ug/l) and the USEPA Health Advisory for non-carcinogenic effects for tetrachloroethylene (Table 4-1). The concentration of methylene chloride detected exceeded the USEPA Ambient Water Quality Criteria for methylene chloride.

4.03 SS003 - OIL SATURATED AREA

E&E collected three surface soil samples from an oil-stained area, three subsurface soil samples, three sediment soil samples and one surface water sample from a drainage ditch that runs along the west edge of the site. The sample locations are shown in Figure 3-7 in Exhibit A. The surface soils at the site (samples 4007, 4008 and 4009) were reported to show unnatural concentrations of total petroleum hydrocarbons (670 to 3,800 mg/kg) and higher than background concentrations of lead (169-343 mg/kg). The surface soil samples in the drainage ditch downgradient from the Oil Saturated Area (sampling locations 4010, 4011, and 4012) were reported to have background concentrations of petroleum hydrocarbons (non-detect to 3 mg/kg), and lead concentrations were also within background concentrations for the region (E&E 1988). The subsurface soil samples (4039, 4040, and 4041) detected only background levels of petroleum hydrocarbons and lead at depths of 3.5, 8.5 and 16 feet. (Table 4-2, Tidball 1984).

O'Brien & Gere collected and analyzed three surface soil samples and a duplicate sample from SS003. Sample S9S1 was collected from within the fenceline, next to the storage shed. S9S2 was collected approximately 20 feet east of the fenceline, and S9S3 was collected outside and adjacent to the southern fenceline, approximately 20 feet from the eastern corner (Figure 3-2). Although detectable concentrations of arsenic barium, chromium, and

TABLE 4-1

U.S. EPA DRINKING WATER STANDARDS, CRITERIA, AND GUIDELINES FOR PROTECTION OF PUBLIC HEALTH (ug/l)

Chemical	MCL[a]	MCLG[b]	HA[c]
Barium	1000	-	-
Benzene	5	0	-
Chloroform	100[d]	-	-
Chromium	50	120	120
Ethylbenzene	-	680	680
Lead	50	20	0
Methylene chloride	0	0	0.19[e]
Tetrachloroethylene	-	0	12[f]
Xylenes	-	440	-

[a] - USEPA Maximum Contaminant Limit in Drinking Water

[b] - USEPA Maximum Contaminant Limit Goal for Drinking Water

[c] - USEPA Lifetime Health Advisory for non-carcinogenic effects - drinking water concentrations

[d] - MCL for total trihalomethanes

[e] - Methylene chloride has been classified as a Probably Human Carcinogen by USEPA. As such, no Lifetime Health Advisory has been published. Ambient Water Quality Criteria for protection of human health related to ingestion of water and fish for methylene chloride is 0.19 ug/l.

[f] - The USEPA is currently reviewing the carcinogenic status of tetrachloroethylene. If it is determined that tetrachloroethylene is a Probable Human Carcinogen, then no Lifetime Health Advisory is recommended. The compound would then be regulated according to the Ambient Water Quality Criteria of 0.8 ug/l.

TABLE 4-2

CONCENTRATION RANGES FOR METALS IN SURFACE SOILS IN WESTERN-CENTRAL MISSOURI[a]

SOIL CONCENTRATION (mg/kg)

Metal	Medium[b]	Range[c]
Lead	20	10-80
Chromium	54	10-80
Nickel	14	5-70
Selenium	0.3	0.1-2.5
Zinc	49	20-560
Arsenic	8.7	2.8-30
Barium	580	100-1500
Calcium	0 3(%)	0.07-2.7(%)
Mercury	0.039	0.010-0.50

[a] - From Tidball, R. "Geography of Soil Geochemistry of Missouri Agricultural Soils", USGS Professional Paper 954-H, 1984.

[b] - Median concentration for the State of Missouri

[c] - Range of concentrations in soil samples collected from Western-Central Missouri

lead were reported in samples S9S2, S9S3, and S9S4, the concentrations were within the normal range for background concentrations in Missouri soils (Tidball 1984, Table 4-2). Sample S9S3 contained 0.006 mg/kg xylenes and 170 mg/kg lead. No other volatile organic compounds or acid/base/neutral extractable compounds (BNA's) were detected in the samples collected.

Data presented by E&E and O'Brien & Gere indicate that the surface soils at SS003 contain lead and TPH residues, and imply that the contamination is confined to the immediate vicinity of the oil stained soils on either side of the fenceline. Since the sediment samples adjacent to the Oil Saturated Area, and downgradient in the surface runoff path, reportedly had low TPH and lead levels, it would appear that there has not been migration of contaminants from the Oil Saturated Area via surface runoff. In addition, since the surface water sample taken by E&E from the ditch to the east of the fenceline, and the surface soil sample collected by O'Brien & Gere to the east of the fenceline were free from lead or petroleum hydrocarbon contamination, it appears that contaminants from the oil-stained area have not migrated toward the eastern ditch in surface runoff.

4.04 SS004 - HAZARDOUS WASTE DRUM STORAGE

E&E drilled a single borehole adjacent to the site and collected three subsurface soil samples from this borehole. According to E&E, this borehole was located in the direct path of runoff from the site. They also collected four surface soil samples at the site. Three of the surface soil samples, 4021, 4022, and 4023, were located adjacent to and within the eastern fenceline of the site. One surface soil sample was collected from outside the fenceline at the northern corner of the site, where the drums had been stored (Figure 3-8 in Exhibit A). One surface soil and surface water sample were collected from a location approximately 200-300 feet from the site in the natural drainage path of surface water runoff from the site. Unnatural concentrations of petroleum hydrocarbons (1,900 mg/kg) were reported in soils from the area directly outside the northern fenceline (4020). According to E&E, this is the area where drums had been previously stored. Low concentrations of petroleum hydrocarbons (55 to 140 mg/kg) were in the samples collected from within the eastern fenceline (Table 4-11 in Exhibit A).

O'Brien & Gere collected four surface soil samples, S10S2, S10S3, S10S1, and S10S4, from the grassy swale adjacent to the previous drum storage area, which is in the direct line of surface runoff from the site (Figure 3-3). Detectable concentrations of arsenic, barium, chromium, and lead were found at the site. However, these concentrations did not exceed the range for background concentrations of these metals in Missouri soils (Table 4-2, Tidball 1984). No VOC's or BNA's were detected in soil samples collected at the site.

Based on the data presented by E&E, and recent analytical results from samples collected by O'Brien & Gere, it appears that there is minimal contamination of surface soils by petroleum hydrocarbons in the Hazardous Waste Drum Storage, with a hot spot in the area directly adjacent to and north of the fenceline. Since the surface and subsurface soil samples and surface water samples from the drainage ditch adjacent to the site did not have detectable concentrations of petroleum hydrocarbons, it appears that significant amounts of the contaminants are not migrating from the site via surface runoff.

4.05 ST005 - POL STORAGE YARD

E&E installed and sampled a single downgradient monitoring well outside the perimeter of the yard (GMW #4, Figure 3-9 in Exhibit A). In addition, they collected two surface water samples from the drainage ditch west of the site - one from an upstream location (DF 4045), and one from a downstream location (DF 4046). None of the parameters analyzed for (petroleum hydrocarbons, total metals, and volatile organic compounds) were detected in the water samples collected. In addition, six boreholes were drilled by E&E inside all three bermed areas; three subsurface soil samples were taken from each boring; one surface soil sample was collected outside Building 951; and, a subsurface soil sample was collected at a depth of three feet near Building 953. The subsurface soil samples in the bermed areas had total petroleum hydrocarbon concentrations ranging from 9.9 to 1,500 mg/kg. The surface soil sample collected outside Building 951 had a TPH concentration of 2,800 mg/kg, and the subsurface soil sample collected from outside Building 953 had detectable concentrations of benzene (1.25 mg/kg), total xylenes (2.25 mg/kg), and ethylbenzene (6.25 mg/kg).

Four groundwater monitoring wells, #1205, #1206, #1207, and #1208, were installed and sampled by O'Brien & Gere (Figure 3-4). GMW #1205 was installed in a location that was assessed to be hydraulically downgradient of the site, and GMW #1206 was installed in a location that was assessed to be hydraulically upgradient. In addition, one existing well, GMW #4, that had been installed by E&E was also sampled. The upgradient well, GMW #1206 had detectable concentrations of benzene (0.007 ppm), which exceeded the USEPA MCL for benzene. In addition, barium, chromium, and lead were detected in the unfiltered samples at concentrations exceeding their respective USEPA MCLs in monitoring wells #1205, #1206, #1207, #1208, and #1209. Three ten-foot soil borings were installed at the site from which five soil samples were collected. The locations of the soil borings are indicated on Figure 3-4. No BNA's or VOC's were found above the detection limits in any of the soil samples analyzed. Detectable concentrations of arsenic, barium, chromium, and lead were found in the total metals analysis, and these concentrations were within the normal range for the background concentrations in Missouri soils.

The USACE collected five surface soil samples within all three bermed areas; three surface soil samples near Building 953; one surface soil sample at the fuel off-loading station; and three surface soil samples at each of the eight railcar tanker off-loading stations. Concentrations of TPH ranged from Not Detected to 8,568 mg/kg. The results of the investigation by USACE are presented in Table 4-3 and Figure 2 located in Exhibit A. No quality assurance, quality control, sampling plans or analytical data hard copy is available for this data. One should note that many of the soil samples collected, including all the soil samples collected from beneath the northernmost bermed area, were not analyzed "due to the strong odor of jet fuel" from the samples (Table 4-3, Exhibit A). It is likely that the fuel concentrations in these soil samples contained higher relative concentrations of volatile hydrocarbons which exhibit fuel-like odors. No hypothesis should be offered for relative concentrations of TPH's in these odorous samples since two different fuels (JP-4 & fuel oil) were stored, in addition to the fact that younger spills tend to have a higher percentage of volatile components than older spills.

The data provided by O'Brien & Gere, E&E, and USACE indicate that there is surface and subsurface contamination of site soils by petroleum hydrocarbons. In addition, surface soils around the fuel transfer tanks and around Building 953 also contain high concentrations of TPH's. Benzene was detected in groundwater samples from GMW #1206; but, since this well is hydraulically upgradient from the site, it is likely that the contaminated soils at the POL Storage Yard are not the source of the benzene. According to the reports, none of the other groundwater monitoring wells had detectable concentrations of TPH, VOC's, or BNA's at the time they were sampled, which suggests that soil contaminants had not migrated to the groundwater at the time the wells were sampled. However, the potential remains for soil contaminants to leach into groundwater at the site.

SECTION FIVE - BASELINE RISK ASSESSMENT

5.01 GENERAL

The following section presents the results of a Baseline Risk Assessment of possible adverse impacts to public health and the environment related to the presence of waste residues at four IRP sites located on Richards-Gebaur AFB. The assessment is conducted based on methodology presented in *Risk Assessment Guidance for Superfund - Volume I - Human Health Evaluation (USEPA 1989)*. Consistent with the requisition for a "baseline" assessment, the assessments are conducted assuming that current conditions will prevail at each of the sites. The assessments are based on data presented in the following reports; 1) "*Installation Restoration Program Phase II Confirmation/Quantification Stage 2 Final Report for Richards-Gebaur Air Force Base, Missouri* (E&E 1988);

2) Analytical summary data from soil samples collected at ST005 by the USACE; and 3) this Remedial Investigation report conducted by O'Brien & Gere. The data presented in the report prepared by E&E and the data provided by the USACE are assumed to reflect both current and accurate site conditions.

5.02 INTRODUCTION

There are many different chemicals that are currently used or have been used in society. Many of these chemicals may potentially have adverse effects on human health or the environment, depending on the frequency and magnitude of exposures experienced by receptors. In a site-specific risk assessment, the potential adverse effects on human health or the environment that may result from the presence of chemicals at a site are evaluated based on what is known about the site and its uses.

A chemical may pose a risk to human health or the environment only if sensitive receptor populations (humans, animals, wildlife, or sensitive ecosystems) have the potential to be exposed to the chemical in sufficient quantities to affect either the health of individuals or the general ecological balance. As such, a site-specific risk assessment involves the identification of potentially hazardous chemicals at the site, the estimation of the concentrations of the chemicals that may be present at locations where receptors may come into contact with them (exposure point concentrations), and the evaluation of potential adverse effects that may result from the estimated dose of the chemicals absorbed by receptors. There are three basic stages in a site specific risk assessment:

1) Hazard Assessment - In the hazard assessment, the chemicals at the site that may pose a potential public health or environmental hazard (indicator parameters) are identified based on the concentrations of the chemicals detected and the number of samples in which the chemical was detected.

2) Exposure Assessment - In the exposure assessment, the pathways by which receptors may be exposed to on-site chemicals are identified, and exposure point concentrations of the chemicals are estimated for each viable exposure pathway identified. Exposure point concentrations may be determined directly from analytical data from environmental samples or may be estimated based on the results of mathematical simulations of contaminant fate and transport processes.

3) Risk Characterization - In the risk characterization step, the potential adverse effects to human health or the environment that may result from the chemical exposures are evaluated. Based on exposure point concentrations, potential uptake routes, and activity patterns of potential receptors, the Chronic Daily Intake (CDI) of indicator compounds received by receptors is calculated.

The potential adverse effects on human health or the environment resulting from the CDI are then evaluated using methods outlined by USEPA (USEPA 1989). The results of the risk characterization procedure are presented in two separate sections: the Public Health Evaluation, and the Environmental Assessment.

The results of the hazard assessment, exposure assessment, and risk characterization are presented and discussed in Sections 5.02, 5.03, and 5.04, respectively, for each of the sites, North Burn Pit, Oil Saturated Area, Hazardous Waste Drum Storage and the POL Storage Yard.

5.03 HAZARD ASSESSMENT

The purpose of the hazard assessment is to focus the subsequent steps of the analysis on the on-site chemicals that may potentially represent a human health or environmental hazard. The chemicals that are present at the site in relatively high concentrations and/or are frequently detected are selected as indicator parameters. The exposure assessment and risk characterization procedures are conducted for each indicator parameter selected.

In this Section, the indicator parameters at each of the sites are identified and the human toxicology, environmental toxicology, and environmental fate and transport of each indicator compound is discussed. This information is used in subsequent sections to develop the exposure assessment and risk characterization steps for each site. Summaries of the indicator parameters selected for each site are given in Tables 5-1A, 5-1B, 5-1C, and 5-1D.

5.03.1 Selection of Indicator Parameters

a) FT002 - North Burn Pit - A discussion on the nature and extent of contamination at the North Burn Pit has been presented in Section 4.01 of this document. Lead, TPH, chromium, and methylene chloride have been selected as indicator compounds for soils at the North Burn Pit based on the presence of these parameters in surface soil samples from the raised trench area in concentrations exceeding background concentrations. In addition, lead, chromium, chloroform, tetrachloroethylene, and methylene chloride were included as indicator compounds for groundwater.

b) SS003 - Oil Saturated Area - A discussion on the nature and extent of contamination at the Oil Saturated Area has been presented in Section 4.02 of this document. Lead, TPH, and xylenes were selected as indicator parameters for this site based on the presence of TPH and xylene residues in surface soils and lead concentrations that exceed background levels for lead compounds in regional soils.

TABLE 5-1 A

SUMMARY OF EXPOSURE ASSESSMENTS AT
NORTH BURN PIT

Exposure Pathway	Pathway Status	Potential Receptors	Indicator Parameters	Mean Exposure Point Conc	Maximum Exposure Point Conc.
Air	Incomplete				
Surface Water	Incomplete				
Ground-water	Incomplete		Lead Chromium Chloroform Tetrachloroethylene	(b)	(b)
Direct Contact	Complete	Groundsman	Lead TPH CaPAH's Methylene Chloride	510 mg/kg 8 7 mg/kg (0.0014) mg/kg (a) 0 009 mg/kg	580 mg/kg 34 mg/kg (0.0053) mg/kg (a) 0.009 mg/kg

(a) - Estimated concentration of CaPAH in TPH's based on the average concentration of CaPAH in motor oil and lubricating oil of 155 ppm CaPAH (Stokeman and Dime 1986)(Table 5-9). These are conservative estimates of potential CaPAH concentrations at the site. It is expected that the actual soil concs. for CaPAH's would be lower than the calculated estimates. See Sect 5 02 2 for the basis for the selection of indicator parameters and Sect. 5.05 for analysis of uncertainties

(b) - Exposure point concentrations for these parameters are not presented because the pathway is incomplete

TABLE 5-1 B

SUMMARY OF EXPOSURE ASSESSMENTS AT
OIL SATURATED AREA

Exposure Pathway	Pathway Status	Potential Receptors	Indicator Parameters	Mean Exposure Point Conc	Maximum Exposure Point Conc.
Air	Incomplete				
Surface Water	Incomplete				
Ground-water	Incomplete				
Direct Contact	Complete	Personnel gaining access to storage	TPH CaPAH Lead Xylenes	2160 mg/kg 0.33 mg/kg (a) 210 mg/kg 0.006 mg/kg	3800 mg/kg 0 60 mg/kg (a) 343 mg/kg 0.006 mg/kg

(a) – Estimated concentration of CaPAH in TPH's based on the average concentration of CaPAH in motor oil and lubricating oil of 155 ppm CaPAH (Stokeman and Dime 1986)(Table 5-9). These are conservative estimates of potential CaPAH concentrations at the site. It is expected that the actual soil concs. for CaPAH's would be lower than the calculated estimates. See Sect. 5.02.2 for the basis for the selection of indicator parameters and Sect. 5.05 for analysis of uncertainties.

TABLE 5-1 C

SUMMARY OF EXPOSURE ASSESSMENTS AT
HAZARDOUS WASTE DRUM STORAGE

Exposure Pathway	Pathway Status	Potential Receptors	Indicator Parameters	Mean Exposure Point Conc.	Maximum Exposure Point Conc.
Air	Incomplete				
Surface Water	Incomplete				
Ground-water	Incomplete				
Direct Contact	Complete	Personnel gaining access to lawn tools storage shed	TPH CaPAH Methylene Chloride	535 mg/kg 0.08 mg/kg (a) 0 026 mg/kg	1900 mg/kg 0 30 mg/kg (a) 0.026 mg/kg

(a) - Estimated concentration of CaPAH in TPH's based on the average concentration of CaPAH in motor oil and lubricating oil of 155 ppm CaPAH (Stokeman and Dime 1986)(Table 5-9). These are conservative estimates of potential CaPAH concentrations at the site. It is expected that the actual soil concs. for CaPAH's would be lower than the calculated estimates See Sect. 5.02 2 for the basis for the selection of indicator parameters and Sect 5.05 for analysis of uncertainties.

TABLE 5-1D

SUMMARY OF EXPOSURE ASSESSMENTS AT
POL STORAGE YARD

Exposure Pathway	Pathway Status	Potential Receptors	Indicator Parameters	Mean Exposure Point Conc	Maximum Exposure Point Conc.
Air	Complete	Workers at site	TPH	-	
			Benzene	-	
			Ethylbenzene	-	
			Xylenes	-	
Surface Water	Complete	Biota in Creek	TPH	-	
Ground-water	Incomplete		Benzene	(c)	(c)
			Lead		
			Barium		
			Chromium		
			bis(2-ethylhexyl)phthalate		
Direct Contact	Complete	Workers at site	TPH		8568 mg/kg
			Benzene		(43) mg/kg (a)
			Ethylbenzene		(32) mg/kg (a)
			Toluene		(111) mg/kg (a)
			Xylenes		(197) mg/kg (a)
			CaPAH		(0.005) mg/kg (b)
			Acetone		0.018 mg/kg

- unable to estimate due to insufficient data

(a) - estimated soil concentrations based on concentrations for benzene, ethylbenzene, toluene, and xylene in JP-4 of 0.5%, 0.37%, 1.3%, and 2.3% respectively (Air Force Engineering and Services Lab, 1981)

(b) - estimated soil concentration based on CaPAH concentration in Jet Fuel of 0.55 ppm (Stokman and Dime 1986)

(c) - Exposure point concs. for these parameters were not estimated because this pathway is incomplete

c) SS004 - Hazardous Waste Drum Storage - A discussion on the nature and extent of contamination at the Hazardous Waste Drum Storage has been presented in Section 4.03 of this document. TPH's and methylene chloride have been selected as indicator parameters for this site since TPH's and methylene chloride were detected in surface soil samples collected at the site. Metal concentrations detected at the site did not exceed the range for background concentrations of these metals in Missouri soils.

d) ST005 - POL Storage Yard - A discussion on the nature and extent of contamination at the POL Storage Yard has been presented in Section 4.04 of this document. TPH's, benzene, xylenes, ethylbenzene, barium, chromium, and lead were selected as indicator parameters at this site. TPH's were detected in surface and subsurface soils outside Building 951, at the fuel transfer stations, and beneath the bermed areas; and, benzene, xylenes, and ethylbenzene were detected in the subsurface soils outside Building 953. Concentrations of barium, chromium, and lead greater than the respective USEPA MCL's for these compounds were detected in groundwater samples collected at the site, and were therefore included as groundwater indicator parameters for the POL Storage Yard.

5.03.2 Toxicological Profiles of Indicator Compounds

5.03.2.1 Introduction

The analytical method specified by the USEPA for determination of TPH in soil (USEPA 418.1) provides an estimate of the total concentration of aliphatic and aromatic petroleum hydrocarbons in the soil. The precise concentrations of the different TPH components varies widely depending on the nature of the petroleum products discharged at the site and other site-specific characteristics. In order to characterize the potential risks related to exposure to TPH's, the concentrations of the individual components of the TPH's present at the site need to be estimated. The constituents of greatest toxicologic concern in TPH mixtures have been identified as the carcinogenic polynuclear aromatic hydrocarbons (CaPAH's) and benzene (Stokman and Dime 1986). CaPAH's and benzene were therefore selected as surrogate indicators for TPH in order to assess the TPH concentrations in soils at the sites. The TPH components present in soils at the sites at Richards-Gebaur AFB have not been identified by chemical analysis. The relative concentrations of the TPH constituents would vary depending on the source of the TPH's that had been discharged at a particular site. Therefore, the concentrations of TPH-related CaPAH's in soils were estimated based on published estimates of the concentrations of these chemicals in various petroleum products (Stokman and Dime 1986, Air Force Engineering and Services Laboratory 1981) and consideration of the nature of petroleum products that may have been discharged at the particular site being evaluated.

In this Section, the human toxicology, environmental toxicology, and environmental fate of the indicator parameters selected in Section 5.02.1, as well as the TPH components identified above, are briefly discussed.

5.03.2.2 Polynuclear Aromatic Hydrocarbons

Polynuclear aromatic hydrocarbons (PAH's) are formed in the incomplete combustion of coal, oil and gas, garbage, and other organic substances. They may also be found in substances such as coal tar, creosote, crude oil, road and roofing tar, used motor oils, and in refined petroleum products including gasoline, kerosene, diesel fuel, and some home heating oils.

Due to their formation in combustion processes, PAH's are ubiquitous in soils. Background concentration for PAH's in soils have been compiled by the Agency of Toxic Substances and Disease Registry (ATSDR 1989). ATSDR reported a wide range of soil concentrations for PAH's depending on the location and type of environment (0.002 to 147 mg/kg). In general, the highest soil concentrations were in urban environments, followed by agricultural and then rural environments. In addition, a previous risk assessment of soil contamination with petroleum hydrocarbons (Stokman and Dime 1986) has cited data published by the American Petroleum Institute which indicates that 0.05 ppm may be considered to be a "normal" background value for total PAH's in soil.

a) Human Toxicology - Several of the PAH's, including benzo(a)pyrene (BaP), benzo(b)fluoranthene (BbF), indeno(1,2,3-cd)pyrene (IP), chrysene, dibenzo(a,h)anthracene (DBA), and benzo(a)anthracene (BaA), have been shown to be carcinogenic in rats and mice following dermal contact. Based on the Weight of Evidence criteria, the USEPA has classified BaP, BaA, BbF, DBA, and chrysene as probable human carcinogens, and IP has been classified as a possible human carcinogen. Of these, BaP is generally considered by the USEPA to be the most potent carcinogen.

The relative potencies of different CaPAH's have been evaluated by the Environmental Criteria and Assessment Office (ECAO) for the Office of Water Regulations to facilitate the development of ambient water quality criteria for the protection of public health (USEPA 1982). ECAO reviewed available data on the induction of tumors in test animals following various routes of administration. Two skin painting experiments which employed common or similar experimental protocols were identified as being suitable for the comparison of the carcinogenic potencies of CaPAH's. The carcinogenic potencies of DBA, BbF, chrysene, IP, and BaA were compared to the carcinogenic potency of BaP based on the relative ED10 (dose at which it is expected that 10% of the treated animals will develop tumors). The observed order of potency was DBA $\geq$ BaP > BbF > BaA $\geq$ IP $\geq$ chrysene. Based on the data analysis, the relative potencies for DBA, BbF, and the group consisting of

BaA, IP, and chrysene were stated to be approximately 1.0, 0.3, and 0.01, respectively, on a scale where the potency of BaP was 1.0. ECAO also reviewed data regarding the carcinogenic potencies of DBA and BaA following oral and intravenous administration. However, due to methodological differences between experiments, it was determined that the data were unsuitable for a legitimate comparison of carcinogenic potencies and the derivation of water quality criteria.

The evaluation of the carcinogenic potency of CaPAH mixtures causes additional uncertainties beyond the uncertainties involved in estimating the relative potencies of individual CaPAH's. This is because other PAH's may modify the potency (potentiate or attenuate) of specific CaPAH's when they are co-administered with them. For example, fluoranthene, pyrene, and benzo(e)pyrene were shown to be co-carcinogens (potentiate carcinogenic potency) when administered with BaP in skin painting experiments, and other PAH's such as BaA have been suggested to serve as anti-carcinogens (attenuate carcinogenic potency) when co-administered with BaP. The postulated mechanism of the co-carcinogenic and anti-carcinogenic activity of different PAH's vary, and would probably be related to factors such as the relative doses of the compounds, the methods of administration, and the affected organ. According to ATSDR (ATSDR 1989), however, several experiments have shown that most PAH mixtures are considerably less potent than individual CaPAH's. Since CaPAH's require metabolic activation by enzymes to induce their carcinogenicity, this effect may be due to the competition of non-carcinogenic PAH's in the mixture for the activating enzymes, and thereby a reduction in the generation of the activated CaPAH metabolites.

Since PAH's are usually found in the environment together, and due to the possible synergistic effects of different PAH's with respect to the carcinogenic potency of PAH mixtures, the USEPA has adopted a conservative policy of regulating exposures to all PAH mixtures containing CaPAH's according to the cancer potency factor of benzo(a)pyrene (11.53 mg/kg/day). It is believed that use of the cancer potency factor for benzo(a)pyrene in risk characterization ensures that the carcinogenic risk from PAH mixtures will not be underestimated. However, the actual risk to human health related to exposure to a specific PAH mixtures may be lower than the risk calculated by using this potency factor.

b) <u>Environmental Toxicology</u> - According to the USEPA (USEPA 1985), there is little information available regarding the adverse effects of PAH's on aquatic and terrestrial wildlife. The USEPA has stated, however, that PAH's are probably not very toxic to aquatic organisms. PAH's may bioconcentrate in plants, aquatic organisms, and terrestrial organisms. Bioconcentration factors ranging from 900 to 4,900 have been reported (ATSDR 1989).

c) Environmental Fate and Transport - In general, PAH's are of low water solubility, medium to low volatility, and have a moderate to high tendency to adsorb to organic carbon. The exact physical and chemical properties depends on the molecular weight of the PAH being considered. The lower molecular weight PAH's (such as acenapthene, anthracene, and phenanthrene) tend to adsorb less strongly to the organic matter in soil and thus tend to have greater vertical mobility in soils and a somewhat higher leaching potential. Low molecular weight PAH's also volatilize more extensively from soils, and significant amounts of these compounds may be lost from surface soils due to volatilization. Low molecular weight PAH's, in particular naphthalene, has been shown to be transported to groundwater from contaminated soils, as well as being transported laterally within aquifers.

PAH's undergo photo-oxidation and chemical oxidation in the atmosphere and water. The most important transformation mechanism for PAH's in soils is considered to be microbial degradation. The rate and extent of PAH biodegradation in the soil is affected by environmental factors, characteristics of the microbial population, and the physical and chemical properties of the PAH being considered. The rate of biodegradation may also be affected by other contaminants that may have been present in the soils. Half-lives of 220 to 530 days, 240 to 680 days, and 750 to 940 days have been reported for BaP, BaA, and DBA, respectively, and a biodegradation loss rate of 16% in 16 months for chrysene has been reported for biodegradation based on soil incubation studies (Dragun 1988).

5.03.2.3 Benzene

a) Human Toxicology - Benzene is a recognized human carcinogen. Several epidemiologic studies have provided sufficient evidence of a causal relationship between benzene exposure and leukemia in humans. Benzene is also a known inducer of aplastic anemia in humans, with a latent period of up to ten years. It also produces leukopenia and thrombocytopenia, which may progress to pancytopenia. In both humans and animals, benzene exposure is associated with chromosomal damage, although it is not mutagenic in microorganisms.

The USEPA has classified benzene as a class A carcinogen (known human carcinogen), and has published a cancer potency factor of 2.9E-02 (mg/kg/day) for the quantitative estimation of the cancer risk from low level oral and inhalation exposure to benzene (IRIS 1991).

b) Environmental Toxicology - The EC50 values for benzene in a variety of invertebrate and vertebrate freshwater aquatic species range from 5,300 ug/liter to 386,000 ug/liter. However, only values for the rainbow trout (5,300 ug/liter) were obtained from flow through tests and were based on measured concentrations.

Results based on unmeasured concentrations in static tests are likely to underestimate the toxicity of relatively volatile compounds like benzene. A chronic test with Daphnia magna indicated no adverse effects observed at test concentrations as high 98,000 ug/liter. Freshwater and saltwater plant species that have been studied exhibit toxic effects at benzene concentrations ranging from 20,000 ug/liter to 525,000 ug/liter (USEPA 1985).

c) Environmental Fate and Transport - The properties of benzene that exert the greatest influence on its environmental fate are its high solubility (1,000 mg/l at 25 C°) and high volatility (95 mm Hg at 25 C°, Henry's law constant 5.5 E-3 atmosphere - cubic meter/mole). As such, when benzene is released to surface water, volatilization will result in a substantial loss of benzene to the atmosphere. Based on volatility, a half-life of 4.81 hours for benzene in a one meter deep body of water has been calculated. Benzene released to the surface soil can be transported to the air through volatilization, to surface water through runoff, and to groundwater as a result of leaching. For benzene in subsurface soil, the most likely transport mechanism will be leaching to groundwater. Generally, based on its the relatively low organic carbon partition coefficient (Koc = 60 to 83), benzene is considered to be moderately to highly mobile in soils and groundwater. Other parameters that determine the leaching potential for benzene in the soil include the soil type, amount of rainfall, depth of groundwater, and potential for biological degradation.

The most significant atmospheric degradation reaction for benzene is photo-oxidation by the hydroxyl radical. It appears, however, that the photo-oxidation reaction occurs at a much slower rate in water than in air. As stated earlier, the most important loss mechanism for benzene is volatilization. In addition, benzene may be biodegraded by micro-organisms in soils. Generally, benzene biodegradation will occur most rapidly in aerobic conditions, though benzene has been shown to biodegrade at a slower rates under anaerobic conditions. Half-lives of 68 to 110 days have been reported for the aerobic degradation of benzene in naturally occurring soil-groundwater systems (Dragun 1988).

5.03.2.4 Ethylbenzene

a) Human Toxicology - Animal and human studies indicate that ethylbenzene can be rapidly and efficiently absorbed via inhalation, oral ingestion, and dermal uptake. Following absorption, ethylbenzene is rapidly and extensively metabolized in the liver and adrenal cortex, and eliminated from the body, primarily in the urine. Generally, ethylbenzene metabolites are considered to be only slightly toxic.

According to ATSDR (ATSDR 1989), there are no reports on the hematological, hepatotoxic, developmental, or reproductive effects of ethylbenzene in humans. Animal studies suggest that dose-

dependant systemic toxicity, fetotoxicity, and adverse reproductive effects may be induced by ethylbenzene, though the relevance of these studies to public health remains inconclusive. In addition, it appears that ethylbenzene or ethylbenzene metabolites are not mutagenic in bacteria or yeast.

No association between increased cancer incidence in humans and exposure to ethylbenzene was located in the literature by ATSDR. The only animal data indicating a significant increase in tumors in rats orally exposed to ethylbenzene was regarded by ATSDR to be inconclusive due to methodological deficiencies in the study design. Therefore, the relevance of ethylbenzene-induced carcinogenicity to public health cannot be determined. The USEPA has classified ethylbenzene as a group D agent, which means that there is inadequate evidence of carcinogenicity of ethylbenzene in animals. No potency factor or other quantitative estimate of carcinogenicity has been developed by the USEPA for ethylbenzene. A reference dose (RfD) of 0.1 mg/kg/day for ethylbenzene has been published by the USEPA (IRIS 1991).

b) Environmental Toxicology - According to the USEPA (USEPA 1985), ethylbenzene has been reported to be acutely toxic to freshwater species at concentrations exceeding 32 mg/liter. No chronic toxicity was reported, but the highest test dose was only one hundredth of the 96-hour test dose for the particular species being tested. No studies on the bioaccumulation of ethylbenzene were reported in the literature reviewed. However, a bioconcentration factor of 95 was calculated based on the octanol/water partition coefficient. The USEPA has not established final Ambient Water Quality Criteria for ethylbenzene due to insufficient data. However, the lowest concentration of ethylbenzene known to have toxic effects in aquatic organisms has been reported as 32,000 ug/liter.

c) Environmental Fate and Transport - The properties of ethylbenzene that exert the greatest influence on its environmental fate are its water solubility (208 mg/l at 25 C°) and high volatility (9.5 mm Hg at 25 C°, Henry's law constant 7.9 E-3 atm. cubic meter/mole). As such, when ethylbenzene is released to surface water, volatilization will result in a substantial loss of ethylbenzene to the atmosphere. Ethylbenzene released to the surface soil can be transported to the air through volatilization, to surface water through runoff, and to groundwater as a result of leaching. For ethylbenzene in subsurface soil, the most likely transport mechanism will be leaching to groundwater. Generally, based on its relatively low organic carbon partition coefficient (Koc = 165 - 254), ethylbenzene is considered to be moderately mobile in soils and groundwater. Other parameters that determine the leaching potential for ethylbenzene in the soil include the soil type, amount of rainfall, depth of groundwater, and potential for biological degradation.

The most significant degradation reaction for ethylbenzene in air and water is photo-oxidation by the hydroxyl radical. However, as stated earlier, the most important loss mechanism for ethylbenzene from water is volatilization. The most important loss mechanism for ethylbenzene from surface soils is volatilization and surface runoff. In addition, ethylbenzene may be biodegraded by microorganisms in water and soils. Generally, ethylbenzene biodegradation will occur most rapidly in aerobic conditions (USEPA 1979).

5.03.2.5 Total Xylenes

a) Human Toxicology - According to ATSDR (ATSDR 1990), there is no evidence of adverse cardiovascular, gastrointestinal, hematological, musculoskeletal, hepatic, or renal effects in humans following xylene exposure. This is in part due to the fact that occupational exposures to xylenes is usually accompanied by exposure to other industrial solvents, which confounds the potential association between xylene exposure and adverse health outcomes. High level acute and chronic xylene exposures in humans may be associated with respiratory effects following inhalation, and neurological effects including impaired reaction times, impaired short term memory, and alterations in equilibrium and body balance. Acute and/or chronic xylene exposures in animals have been related to cardiovascular, hepatic, renal, neurological, and developmental effects. The USEPA has published a RfD for oral ingestion of xylene of 2 mg/kg/day (IRIS 1991).

According to ATSDR, there are limited data to assess the genotoxic effects of xylenes. No data were located by ATSDR regarding the development of cancer in humans following xylene exposure. Results of chronic carcinogenicity bioassays in animals have been negative or equivocal. As such, the USEPA has classified xylene as a group D agent (insufficient evidence to assess carcinogenicity). No cancer potency factors or other quantitative estimates of potential xylene carcinogenicity have been published.

b) Environmental Toxicology - According to USEPA (USEPA 1985), xylene adversely affected adult trout at concentrations as low as 3.6 mg/liter in a continuous flow system, and trout fry avoided xylene at concentrations greater than 0.1 mg/liter. The LC50 value in adult trout was determined to be 13.5 mg/liter in a static system, which probably underestimated toxicity. Reportedly, no information on the toxicity of xylenes to terrestrial wildlife and domestic animals was available in the literature reviewed by ATSDR. However, it was stated that, because of the low acute toxicity of xylenes, it is unlikely they would be toxic to wild or domestic birds and mammals. Information regarding the potential biomagnification of xylenes in the environment was not available.

c) Environmental Fate and Transport - The properties of xylene that exert the greatest influence on its environmental fate are its

volatility (vapor pressure = 10 mm Hg at 25 C°, Henry's law constant 7.19 E-3 atm. cubic meter/mole). As such, when xylene is released to surface water, volatilization will result in a substantial loss of xylene to the atmosphere. Xylene released to the surface soil can be transported to the air through volatilization, to surface water through runoff, and to groundwater as a result of leaching. For xylene in subsurface soil, the most likely transport mechanism will be leaching to groundwater. Generally, based on its the relatively low organic carbon partition coefficient (Koc = 166), xylene is considered to be moderately mobile in soils and groundwater. Other parameters that determine the leaching potential for xylene in the soil include the soil type, amount of rainfall, depth of groundwater, and potential for biological degradation.

The most significant degradation reaction for xylene in air is photo-oxidation by the hydroxyl radical. As stated earlier, the most important loss mechanism for xylenes from water is volatilization. The most important loss mechanism for xylene from surface soils is volatilization, surface runoff, and biological and photochemical degradation. Volatilization half-lives for xylenes were not available from the literature researched by ATSDR. However, based on the calculated air/soil partition coefficient (Kas) for xylene it was reported that xylenes should volatilize completely from surface soils within one year. The residence time of xylenes in soil would increase correspondingly as the soil organic carbon content increased above 1%. Biodegradation is considered to be the only significant transformation process for xylenes in subsurface soils. Generally, xylene biodegradation will occur most rapidly in aerobic conditions. Quantitative measurements of anaerobic breakdown of xylenes were not available. However, field evidence of xylene transformation during transport in anoxic waters suggests that anaerobic degradation of xylenes in landfills and leachate plumes may occur (USEPA 1985).

5.03.2.6 Lead

a) Human Toxicology - Lead compounds can be absorbed into the body with varying degrees of efficiency by both the respiratory and gastrointestinal tracts, depending on the chemical nature of the residue and the matrix in which it is contained. Lead deposited in the lung is thought to be nearly completely absorbed; whereas, absorption of dietary lead is strongly dependent on factors such as the aqueous solubility of the ingested lead residue, the age of the exposed individual, and the matrix of the residue (i.e., food article vs. soil). Dietary lead is absorbed by the gastrointestinal tract to the extent of about 50% in children, and 8% to 15% in adults. Absorption efficiency of ingested lead in dirt and dust has been estimated as 30% in children. Because of their very low solubilities, the various environmental forms of inorganic lead are not absorbed through the skin to any significant degree (ATSDR 1988). Regardless of the uptake route, the slow

excretion rates of lead result in lead accumulation in both the bone and soft tissue over the lifetime of an individual.

Once absorbed in the body, lead is capable of combining with a variety of physiologically significant proteins, with resultant adverse effects on structure and function of tissues and organ systems. As reviewed in ATSDR 1988, lead exposure can produce a variety of dose-dependant pathological changes in the central and peripheral nervous systems, which may be associated with behavioral dysfunctions and deficits in IQ in children. Subtle encephalopathic changes can occur in children exposed to environmental lead sources, and recent data suggests that there may be no demonstrable lead exposure free of such potential effects (ATSDR 1988). Children appear to be at particular risk because of a relatively higher lead absorption efficiency than older individuals and a greater probability of exposure to lead through outdoor play activities and possible intentional soil ingestion. As a result, most lead-related risk assessments center upon toxic potential to exposed groups of children. Chronic lead exposure is also linked to other forms of systemic toxicity including anemia and other hematologic effects, nephropathy, cardiovascular effects, and reproductive effects.

USEPA (IRIS 1989) classified lead as a probable human carcinogen (classification level B2), based on the findings of increased incidence of renal tumors in rodents exposed to soluble lead salts such as lead acetate in the diet or drinking water (reviewed in ATSDR 1988). There is insufficient evidence to definitively associate human exposures with carcinogenicity, however. In addition, the dose response data of the animal carcinogenicity data are insufficient to derive an estimate of lead's carcinogenic potency in order to conduct risk assessments of human carcinogenic response from exposure to lead.

b) Environmental Toxicology - Freshwater vertebrates and invertebrates are more sensitive to lead in soft water than in hard water. At a hardness of about 50 mg/liter $CaCo_3$, the median effect concentrations for nine families range from 140 ug/liter to 236,600 ug/liter (USEPA 1985). Chronic values for *Daphnia magna* and the rainbow trout are 12.26 ug/liter and 83.08 ug/liter, respectively, at a hardness of about 50 mg/liter. Bioconcentration factors, ranging from 42 for young brook trout, to 1,700 for a snail, were reported. Freshwater algae show an inhibition of growth at concentrations above 500 ug/liter. There is evidence that lead, at concentrations occasionally found near roadsides and smelters, can eliminate or reduce populations of bacteria and fungi on leaf surfaces and in the soil. Many of these microorganisms play key roles in the decomposer food chain (USEPA 1985).

c) Environmental Fate and Transport - Lead is the most abundant natural heavy element. The primary natural form of lead

is galena, or lead sulfide (PbS). Other naturally occurring lead compounds include plattnerite (PbO_2), cerussite ($PbCO_3$), and anglesite ($PbSO_4$) (Bodek et al. 1988). There are a variety of anthropogenic sources of lead. The primary source of atmospheric lead is the combustion of leaded gasoline (USEPA 1986a, National Library of Medicine 1989a). Releases of lead to the soil and water can occur as mine tailings or smelting leachate, from ore concentrate spills, and deposition from the atmosphere of lead-containing particulates from stationary or mobile sources (USEPA 1977). The primary oxidation state of lead in the environment is expected to be lead (II) (Bodek et al. 1988). The phenomena discussed below refer to lead in this oxidation state.

In surface water, the predominant lead compounds are expected to be lead carbonate ($PbCO_4$), lead sulfide (PbS), and lead sulfate ($PbSO_4$) (Bodek et al. 1988, Callahan et al. 1979). These compounds have low water solubilities of about 10 mg/L or less and their formation promotes the partitioning of lead to sediments via precipitation. Lead compounds also adsorb to humic and fulvic acids in water. Because lead exhibits increased adsorptive affinity for clays and other mineral surfaces when complexed with these organic acids, these reactions also promote the removal of lead from water (Callahan et al. 1979). Due to the limited aqueous solubility of lead compounds, their transport through water would occur as suspended solids.

There is some laboratory evidence that lead can be methylated by organisms that inhabit sediments (Callahan et al. 1979). Should biomethylation occur, the likely products are tetramethyl and tetraethyl lead. These compounds are volatile and may enter the atmosphere (Callahan et al. 1979). Tetramethyl lead is also expected to rapidly oxidize in aerobic waters (Bodek et al. 1988). This process will decrease the amount of tetramethyl lead available to enter the atmosphere by volatilization.

Lead bioconcentrates (National Library of Medicine 1989a) and may, therefore, accumulate in aquatic organisms. Bioconcentration factors of 60-200 have been measured (Callahan et al. 1979).

In soil, lead will react with common ions to form lead sulfate ($PbSO_4$), lead sulfide (PbS) and various lead phosphates. Lead oxide is also expected to form (USEPA 1984). As a consequence of the low water solubilities of these compounds, they are not expected to leach extensively to groundwater (USEPA 1984). Lead compounds can also adsorb to and be immobilized by hydrous oxides of iron and manganese (Bodek et al. 1988; Callahan et al. 1979). Reaction with humic and fulvic acids can restrict the mobility of lead as described above (Callahan et al. 1979). These adsorption phenomena will restrict the mobility of lead, thereby decreasing its tendency to leach to groundwater. The extent of adsorption apparently increases with increasing pH (Bodek et al. 1988).

Inorganic lead compounds typically have low vapor pressures (less than 1 mm Hg) at environmental temperatures. Consequently, these compounds do not readily volatilize, and would be found in the atmosphere primarily adsorbed to particulates. Tetramethyl and tetraethyl lead are volatile lead compounds that may be formed by biomethylation in aquatic sediments as described above. Should these products enter the atmosphere, they are expected to photodegrade readily by reaction with hydroxyl radicals (National Library of Medicine 1989b). In sunlit conditions, the atmospheric half-lives of tetramethyl and tetraethyl lead are expected to be several hours and approximately one hour, respectively (ATSDR 1988). Tetramethyl lead is also expected to rapidly oxidize in aerobic waters (Bodek et al. 1988), which, as noted above, will decrease the amount of this compound available to enter the atmosphere by volatilization.

In summary, the transport of lead in soil and water is limited by its tendency to form relatively insoluble compounds and precipitate, or adsorb to prevalent environmental components and precipitate or sorb to sediments. Lead compounds may bioconcentrate in aquatic organisms. Lead in the atmosphere is predominantly particulate-bound and is consequently subject to both wet and dry deposition.

5.03.2.7 Chromium

a) Human Toxicology - A variety of chromate (chromium (VI)) salts are carcinogenic in rats following inhalation, and an excess of lung cancer has been observed among workers in the chromate-producing industry. Chromium (VI) compounds have been shown to be mutagenic in animal and human cell lines. Based on the available animal and human data, the USEPA has classified chromium (VI) as a group A carcinogen (known human carcinogen) for inhalation exposures, and has published a slope factor for inhalation of 0.012 $(mg/kg/day)^{-1}$ (IRIS 1991). For oral exposures, however, there is insufficient evidence for a carcinogenic effect of chromium (VI) (HEAST 1990).

Chromium (VI) causes kidney damage in humans and animals via the oral route, and may also cause liver damage, but to a lesser extent. Based on dose response data for renal toxicity in animals, the USEPA has derived an oral Rfd for chromium of 0.005 mg/kg/day (HEAST 1990). Chromium (III) is less toxic than chromium (VI); its main effect in humans is a form of contact dermatitis.

b) Environmental Toxicology - Chromium is an essential nutrient and is accumulated in a variety of aquatic and marine biota, especially benthic organisms, to levels much higher than in ambient water. Water hardness, temperature, dissolved oxygen, species, and age of the test organism all modify the toxic effects for chromium in aquatic systems. Based on dose response data for

various species, the USEPA has published an Ambient Water Quality Criteria for freshwater organisms of 16 ug/l for acute effects, and 11 ug/l for chronic effects.

c) Environmental Fate and Transport - Hexavalent chromium is quite soluble, and is not sorbed to any significant degree by clays or hydrous metal oxides. As a result, chromium (VI) is quite mobile in soil-groundwater systems. The anionic form varies according to pH, and may be a chromate, hydrochromate, or dichromate. Chromium (VI) is a moderately strong oxidizing agent, and reacts with reducing materials to form trivalent chromium. Chromium (VI) of natural origin, therefore, is very rarely found in soils. Chromium (III) tends to adsorb strongly onto clay particles and organic matter, but can be mobilized if it is complexed with organic molecules (USEPA 1985).

5.03.2.8 Barium

a) Human Toxicology - Insoluble forms of barium, particularly barium sulfate, tend to have a low toxicity by ingestion or inhalation because only minimal amounts are absorbed. However, acute poisoning by soluble barium salts are highly toxic in animals and humans, causing a strong stimulant action on muscle, which may cause muscular paralysis and death. Chronic exposure to low doses of barium in drinking water has been associated with elevated blood pressure in humans. Based on human epidemiologic data, the USEPA has derived an Rfd for barium of 0.07 mg/kg/day (IRIS 1991).

There is no evidence for carcinogenicity, mutagenicity, or teratogenicity associated with exposure to barium salts. The USEPA has classified barium as a group D carcinogen (insufficient evidence for carcinogenic effects in humans or animals).

b) Environmental Toxicology - Adequate data for characterization of toxicity to wildlife and domestic are not available.

c) Environmental Fate and Transport - Barium is extremely reactive, decomposes in water, and readily forms insoluble carbonate and sulfate salts. Barium is generally present in solution in surface or groundwater only in trace amounts. Large amounts will not dissolve because natural waters usually contain sulfate, and the solubility of barium sulfate is generally low. However, barium sulfate may become considerably more soluble in the presence of chloride and other anions. Monitoring programs indicate that it is rare to find barium in drinking water at concentrations greater than 1 mg/liter. Bioconcentration is not an important process for barium (USEPA 1985).

5.03.2.9 Bis-2-ethyl(hexyl)phthalate (BEHP)

a) Human Toxicology - Bis-2-ethyl(hexyl)phthalate is reported to be carcinogenic in rats and mice, causing increased incidence of hepatocellular carcinomas or neoplastic nodules after oral administration. Based on animal data, the USEPA has classified BEHP as a B2 carcinogen (probable human carcinogen) for oral and inhalation exposures, and has published a slope factor for BEHP of 0.014 $(mg/kg/day)^{-1}$ (IRIS 1991).

b) Environmental Toxicology - Acute median effect values for BEHP range from 1,000 to 11,100 ug/liter for Daphnia magna, and LC50 values ranging from 18,000 ug/liter to 770,000 ug/liter for the midge, scud, and bluegill have been reported. As these values are greater than the water solubility of the chemical, it is unlikely that BEHP will be acutely toxic in natural waters. Chronic toxicity values ranging from 3 - 8.4 ug/l have been reported for Daphnia magna and rainbow trout. Acute exposures to BEHP, therefore, are unlikely to produce toxic effects in aquatic animals, though chronic exposures may have detrimental effects on the environment (USEPA 1985).

c) Environmental Fate and Transport - Adsorption onto suspended solids and particulates and complexation with natural organic substances are probably the most important environmental transport processes for BEHP. The log octanol/water partition coefficient for BEHP suggests that this compound would be adsorbed onto particulates high in organic matter. A variety of organisms can take up and accumulate BEHP, and bioaccumulation is considered an important fate-controlling process. However, biodegradation is also considered an important fate process for BEHP in aquatic systems and soils; therefore, it is unlikely that long-term biomagnification would occur (USEPA 1985).

5.03.2.10 Chloroform

a) Human Toxicology - The primary effect observed following chronic oral administration of chloroform to animals is the formation of fatty cysts in the liver in dogs. Based on animal dose response data, the USEPA has published a chronic oral Rfd for chloroform of 0.0007 mg/kg/day. Based on sufficient evidence for carcinogenic effects of chloroform in animals, the USEPA has classified chloroform as a B2 carcinogen (probable human carcinogen), and published a cancer potency factor for chloroform of 0.0061 $(mg/kg/day)^{-1}$ (IRIS 1991).

b) Environmental Toxicology - Chloroform is thought to be widely distributed in the environment, and can be detected in fish, water birds, marine mammals, and various crops. However, chloroform is not considered to be extensively bioaccumulated, based on its low octanol/water partition coefficient and short

half-life in biological species. Reported median effect concentrations for chloroform in freshwater species are relatively high (28,900 ug/liter, and 115,000 ug/liter), which indicates that chloroform is of relatively low acute toxicity in freshwater species (USEPA 1985).

c) Environmental Fate and Transport - Volatilization into the atmosphere is the major transport process for chloroform in the environment. Photolysis, hydrolysis, and sorption do not appear to be significant environmental fate processes for chloroform in water, though sorption may be of some importance in soil systems.

5.03.2.11 Tetrachloroethylene (PCE)

a) Human Toxicology - Tetrachloroethylene induces dose-dependant toxic effects in the liver which is considered to be the primary target organ for PCE toxicity. Based on animal dose response data, the USEPA has published a chronic oral Rfd for PCE of 0.01 mg/kg/day. The potential carcinogenic classification for PCE is currently being evaluated by the USEPA (IRIS 1991).

b) Environmental Toxicology - Tetrachloroethylene is of only moderate acute toxicity to aquatic organisms with reported freshwater species LC50's around 10,000 ug/liter. Chronic median effect concentrations of 840 and 450 ug/liter for freshwater and saltwater species have been reported (USEPA 1985).

c) Environmental Fate and Transport - Tetrachloroethylene rapidly volatilizes into the atmosphere where it reacts with hydroxyl radicals to produce HCl, CO, and CO_2. This is probably the most important fate and transport process for tetrachloroethylene in the environment. PCE will leach into groundwater, particularly in soils with low organic carbon content. PCE adsorbs to soils with high organic matter content, and its potential movement to groundwater may be retarded. There is good evidence to indicate that PCE is metabolized to dichloroethene and vinyl chloride in anaerobic methanogenic environments (USEPA 1985).

5.03.2.12 Methylene Chloride

a) Human Toxicology - Methylene chloride induces dose-dependant toxic effects in the liver which is considered to be the primary target organ for methylene chloride toxicity. Based on animal dose response data, the USEPA has published a chronic oral Rfd for methylene chloride of 0.06 mg/kg/day. The USEPA has classified methylene chloride as a B2 carcinogen (probable human carcinogen) and has published a cancer potency factor of 0.0075 $(mg/kg/day)^{-1}$ (HEAST 1990).

b) Environmental Toxicology - There is limited information currently available by which to evaluate the potential toxicity of

methylene chloride to domestic animals and wildlife. Reported acute toxicity values for the freshwater species Daphnia magna are 224,000, and 193,000 ug/l, which suggest that methylene chloride is of low acute toxicity to freshwater species (USEPA 1985).

c) Environmental Fate and Transport - Volatilization into the atmosphere is the major transport process for methylene chloride in the environment. Photolysis, hydrolysis, and sorption do not appear to be significant environmental fate processes for methylene chloride in water, though sorption may be of some importance in soil systems.

5.03.2.13 Acetone

a) Human Toxicology - Acetone induces dose-dependant toxic effects in the liver which is considered to be the primary target organ for acetone toxicity. Based on animal dose response data, the USEPA has published a chronic oral Rfd for acetone of 0.1 mg/kg/day. The USEPA has classified acetone as a D carcinogen (insufficient evidence for carcinogenicity) (IRIS 1991).

b) Environmental Toxicology - The toxicity of acetone to aquatic organisms is reportedly low. The LC50 value for sunfish is reported to be 14.2 g/liter, and the threshold concentration for immobilization of Daphnia magna was reported to be over 9 g/liter (USEPA 1985).

c) Environmental Fate and Transport - Acetone has a high vapor pressure and therefore would be expected to volatilize readily from surfaces. It is of high water solubility with a low octanol water partition coefficient, and therefore would be expected to be relatively mobile in soil-groundwater systems. It is unclear whether significant biodegradation of acetone would occur in the environment, though it is likely that it would be biodegraded to some extent in soil systems (USEPA 1985).

5.04 EXPOSURE ASSESSMENT

In the exposure assessment, the mechanisms by which receptors may be exposed to the indicator parameters are identified, and the concentrations of the chemicals at the locations where receptors may come into contact with them are estimated. The exposure assessment is conducted in two stages : 1) exposure pathway analysis, and 2) estimation of exposure point concentrations.

5.04.1 Exposure Pathway Analysis - General Considerations

An exposure pathway is defined as a continuous mechanism by which receptors may come into contact with chemical residues from a particular site. For example, an exposure pathway may consist of the leaching of a chemical from soils at a site to groundwater, the transport of the chemical via the groundwater to a domestic well,

and the ingestion of the chemical by human receptors that consume water from the well. In the exposure pathway analysis, the possibility that receptors may potentially be exposed to the indicator parameters is qualitatively evaluated for each potential exposure pathway identified at the site. A receptor may only be exposed to an on-site chemical via a given exposure pathway if the pathway contains each of the following components:

1) A waste source and a release mechanism from the waste source to a transport medium (e.g., volatilization, wind scour, surface runoff etc.);

2) A viable transport medium (e.g., air, surface water, groundwater) for the translocation of the contaminant from the waste source to a potential receptor;

3) Potential receptors (e.g., humans, animals, ecosystems) that may come into contact with the contaminated medium;

4) An exposure point where receptors may come into contact with contaminant, and an uptake route (e.g., inhalation, ingestion, dermal absorption) by which the contaminant may be absorbed by the receptor allowing the contaminant to exert its toxic effect.

If each of these components is present in an exposure pathway, it is assumed that there is a potential for receptors to be exposed via that pathway, and the pathway is classified as complete. If one or more of these components is missing for a given exposure pathway, there is no way in which a contaminant may interact with a receptor via that pathway, and thus the pathway poses no risk to human health or the environment. Pathways that are identified as being incomplete in the exposure pathway analysis are not considered further in the risk assessment process. For each complete pathway identified, potential receptor populations are identified, and exposure point concentrations for the indicator parameters are estimated.

To facilitate the qualitative exposure analysis, the various exposure pathways are categorized according to transport media or mechanism of environmental transport. The categories analyzed are, Air, Surface Water, Groundwater and Direct Contact. General considerations regarding each of these exposure pathways are discussed below.

a) <u>Air Exposure Pathway</u> - Two general transport mechanisms may lead to airborne concentrations of contaminants at exposure points:

1. Volatilization of waste constituents and subsequent transport by wind currents to exposure points. Generally, only surficially exposed waste materials that have sufficiently high vapor pressures will volatilize in sufficient quantities to cause significant air exposures.

2. Transport of waste materials and/or particulate bound residues to on-site and off-site locations in fugitive dusts. Fugitive dust emissions may result if exposed friable waste materials or impacted soils are accessible to wind scour, vehicular traffic, or the operation of heavy equipment.

For humans and wildlife, inhalation would be the primary uptake mechanism in the air exposure pathway.

b) Surface Water Exposure Pathway - Transport of waste materials to receptors via surface water can occur in several ways. Mechanisms of potential significance include:

1. Runoff of dissolved residues into on-site or off-site surface waters (drainage ditch, stream, lake).

2. Runoff of particulate-bound residues into surface waters.

3. Discharge of groundwater containing dissolved residues into on-site or off-site surface waters.

Potential uptake routes for humans or wildlife in the surface water exposure pathway include:

1. Intentional ingestion of drinking water (e.g., use of surface water as a domestic water supply by humans).

2. Inadvertent ingestion while swimming or wading.

3. Ingestion of residues that bioaccumulate in fish or other edible aquatic biota.

4. Dermal absorption during recreational activities (e.g., fishing, swimming), wading, bathing or showering.

5. Inhalation of volatile compounds during recreational activities (e.g., fishing, swimming), wading, bathing or showering.

c) Groundwater Exposure Pathway - The transport of contaminant residues to receptors via the groundwater pathway requires the following conditions:

1. The source must be in contact with the groundwater.

2. The contaminant should be of sufficient solubility to be released to the groundwater.

3. The contaminant must be mobile within the groundwater system so that it may translocate due to advective or dispersive forces.

Potential uptake routes in the groundwater exposure pathway include the following:

1. Ingestion of drinking water.

2. Dermal absorption while bathing or showering.

3. Inhalation of volatile organic compound vapors during showering or bathing.

d) Direct Contact Exposure Pathway - Possible mechanisms for direct contact with residue containing materials originating at a site include the following:

1. Direct contact with source materials on the site.

2. Direct contact with source materials after they have been deposited at a remote location.

Both of these mechanisms may only occur if the source materials are exposed. Uptake following direct contact can occur either by dermal absorption or by ingestion.

5.04.2 Exposure Pathway Analysis - Results

A summary of the exposure pathway analysis for each of the sites are given in Tables 5-1A, 5-1B, 5-1C, and 5-1D, respectively.

5.04.2.1 FT002 - North Burn Pit

a) Air - The air exposure pathway is classified as incomplete for the North Burn Pit. The soils surrounding the Burn Pit Area are covered with a gravel surface. The perimeter of the site is covered with native grasses. It is highly unlikely that sufficient quantities of dust to present a health or environmental concern would be generated from the gravel-covered or grass-covered surface soils. No volatile organic compounds were detected in surface soil samples collected at the site.

b) Surface Water - The surface water pathway is classified as incomplete for the North Burn Pit. Runoff from the site flows to the south and east. At the eastern fenceline of the site, there is a raised terrace behind which the surface water accumulates. According to E&E, no VOC's or TPH's were detected in the standing water at the eastern fenceline. O'Brien & Gere detected elevated lead concentrations in the soils from the eastern trench, which suggests that particulate-bound lead may be present in the surface runoff. However, most of the runoff would be contained behind the raised terrace and not flow off-site. Since the North Burn Pit is fenced and access is restricted to occasional maintenance activities (once or twice a year by base staff), there are no receptors that may routinely come into contact with the surface

water. Any runoff that would flow off-site during heavy rainfall would be extensively diluted by uncontaminated rainwater before it reached the creek one-half mile to the north of the site.

c) Groundwater - The groundwater exposure pathway is classified as incomplete for the North Burn Pit. Groundwater wells accessing the shallow groundwater at the site were installed and sampled by O'Brien & Gere and E&E. No VOC's, BNA's, or TPH's were detected in any of the wells sampled. Concentrations of lead and chromium that exceeded the USEPA MCL's for these compounds were detected in unfiltered samples collected from three of the five wells sampled by O'Brien & Gere. However, the pathway has been classified as incomplete because there are no groundwater users in the vicinity of the site.

d) Direct Contact - The direct contact pathway is classified as complete for the North Burn Pit. Concentrations of TPH's and lead exceeding background concentrations were detected in surface soils at the site. There is a potential for workers at the site to contact the contaminated soils. The potential receptors identified are maintenance staff that mow the grass at the site periodically in the summer months.

5.04.2.2 SS003 - Oil Saturated Area

a) Air - The air exposure pathway is classified as incomplete for the Oil Saturated Area. No VOC's were detected in the surface soil samples collected at the Oil Saturated Area. Soil contamination is confined to the Oil Saturated Area which has been covered with gravel and crushed rocks, or has a grass covering. Vehicular traffic over the Oil Saturated Area is limited. It is highly unlikely, therefore, that sufficient quantities of contaminated dust to pose a health or environmental hazard would be generated at the site.

b) Surface Water - The surface water pathway is classified as incomplete for the Oil Saturated Area. The surface soil samples and surface water samples collected at the site by E&E suggest that there has not been any significant migration of contaminants via surface runoff to the eastern drainage ditch or to the natural drainage path to the southwest of the area. This suggests that it is highly unlikely that surface water bodies in the vicinity of the site would be contaminated as result of runoff from the site. The subsurface soil samples collected at the site suggest that there has not been significant vertical migration of contaminants through the soils; consequently, groundwater contamination and the subsequent discharge of contaminated groundwater to surface water bodies is unlikely.

c) Groundwater - The groundwater pathway is classified as incomplete for the Oil Saturated Area. There are no potential groundwater users in the vicinity of the site.

d) Direct Contact - The direct contact pathway is classified as complete for the Oil Saturated Area. Surface soils in the Oil Saturated Area contain TPH concentrations. There is a potential for direct contact of site personnel with contaminated soils. The potential receptors identified are workers that may contact contaminated soils while working near the storage shed.

5.04.2.3 SS004 - Hazardous Waste Drum Storage

a) Air - The air exposure pathway is classified as incomplete for the Hazardous Waste Drum Storage. No VOC's were detected in the surface soil samples collected at the site. Most of the site is covered with asphalt, gravel, or has a grass covering. There is limited vehicular traffic at the site. It is highly unlikely, therefore, that significant quantities of contaminated dust would be generated at the site.

b) Surface Water - The surface water pathway is classified as incomplete for the Hazardous Waste Drum Storage. The surface soil samples and surface water samples collected at the site by E&E suggest that there has not been any significant migration of contaminants via surface runoff. This suggests that it is highly unlikely that surface water bodies in the vicinity of the site would be contaminated as result of runoff from the site.

c) Groundwater - The groundwater exposure pathway is classified as incomplete for the Hazardous Waste Drum Storage. No potential groundwater users exist in the vicinity of the site.

d) Direct Contact - The direct contact pathway is classified as complete for the Hazardous Waste Drum Storage. Surface soils at the site contain TPH concentrations. There is a potential for direct contact of site personnel with contaminated soils. The potential receptors identified are contract groundsmen that may contact contaminated soils while working in the area.

5.04.2.4 ST005 - POL Storage Yard

a) Air - The air exposure pathway is classified as complete for the POL Storage Yard. High concentrations of TPH's, which are probably related to spillage of JP-4 or fuel oil, were detected in surface soils around the tanker filling stations. JP-4 is a kerosene based petroleum product which consists of light to medium petroleum distillates (Klein and Jenkins 1980). There is a potential for inhalation of vapors and airborne particulates by workers. TPH has been detected in the surface soils within the fenced area at the POL Storage Yard. Tanker trucks used for transporting fuels to/from the site enter the Storage Yard periodically and traverse potentially contaminated areas of the site. There is a potential, therefore, for contaminated dust to be generated at the site. The potential receptors identified are workers that may be working at the site at that time.

b) Surface Water - The surface water pathway has been classified as complete for the POL Storage Yard. There is a potential for contaminated runoff to enter the creek to the west of the POL Storage Yard. According to E&E, there have been eye witness reports of unidentified iridescent sheens on the surface of the marshy area and the creek to the west of the POL Storage Yard. In addition, it is possible that contaminants from the site may leach to groundwater which may in turn discharge to the creek during rainfall events. The potential receptors are biological species that may drink or come in contact with water in the creek.

c) Groundwater - The groundwater exposure pathway is classified as incomplete for the POL Storage Yard. There are no potential groundwater users in the vicinity of the site.

d) Direct Contact - The direct contact pathway is classified as complete for the POL Storage Yard. Concentrations of TPH's have been detected in the surface soils at the site. There is a potential for workers at the site to come into contact with the contaminated soils. The potential receptors identified are workers that visit the site.

5.04.3 Estimation of Exposure Point Concentrations

Based on methodology presented in *USEPA Risk Assessment Guidance for Superfund*, (USEPA 1989), exposure point concentrations representing a Reasonable Maximum Exposure (RME) were calculated. Due to the small sample sizes, the maximum detected concentration of a chemical at a given site was utilized to estimate the RME rather than the upper 95% confidence intervals for the mean. In addition, average exposures were estimated using the arithmetic mean of the detected concentrations at a given site. The exposure point concentrations used at the four sites being evaluated are presented in Tables 5-1A, 5-1 B, 5-1 C, and 5-1D, and are discussed below.

5.04.3.1 FT002 - North Burn Pit

The only complete exposure pathway identified at the North Burn Pit was direct contact. The surface soil samples collected by E&E reportedly contained TPH concentrations ranging from 2.8 - 34 mg/kg (Table 4-7 in Appendix A). The average exposure point concentration used to estimate direct contact with TPH residues in soil was 8.7 mg/kg, and the RME exposure point concentration used was 34 mg/kg. Elevated concentrations of lead (580 mg/kg) were detected in surface soils from the trench behind the raised terrace at the eastern fenceline. This concentration was assumed to be representative of lead concentrations throughout the site since data regarding lead concentrations in surface soils in and around the Burn Pit were not available. An RME exposure point concentration of 580 mg/kg was used for direct contact with lead.

Concentrations of lead, chromium, chloroform, tetrachloroethylene, and methylene chloride were detected in groundwater wells installed at the North Burn Pit. However, since the groundwater pathway for this site was determined to be incomplete (Section 5.03.2.2), exposure point concentrations were not estimated for these parameters.

5.04.3.2 SS003 - Oil Saturated Area

The only complete exposure pathway identified at the Oil Saturated Area was direct contact. The surface soil samples collected by E&E from the oil-stained area at the site reportedly contained TPH concentrations ranging from 670 to 3,800 mg/kg (Table 4-11 in Appendix A). The average and RME exposure point concentrations for direct contact with TPH residues in surface soils at the site were 2,155 mg/kg and 3,800 mg/kg, respectively. Elevated concentrations of lead were detected by E&E in surface soils at the oil-stained area of 117 to 343 mg/kg. The average and RME exposure point concentrations used for exposures to lead were 210 mg/kg and 343 mg/kg, respectively. Xylene residues were detected in one soil sample collected from the site at a concentration of 0.006 mg/kg, which was used as the exposure point concentration for xylenes.

5.04.3.3 SS004 - Hazardous Waste Drum Storage

The only complete exposure pathway identified at the Hazardous Waste Drum Storage was direct contact. The surface soil samples collected by E&E from the site reportedly contained TPH concentrations ranging from 140 to 1,900 mg/kg (Table 4-13 in Appendix A). The average and RME exposure point concentrations for direct contact with TPH residues in surface soils at the site were 583 mg/kg and 1,900 mg/kg, respectively. In addition, methylene chloride was detected in one soil sample collected from the site at a concentration of 0.026 mg/kg, which was used as the exposure point concentration for methylene chloride.

5.04.3.4 ST005 - POL Storage Yard

Data from samples collected by the USACE indicate that soils around the tanker filling stations and surface soils around Building 953 contain high concentrations of TPH's (38 to 8,568 mg/kg). The highest measured concentration of TPH in the surface soil was 8,568 mg/kg which was from a soil sample collected from a tanker filling station at the southern corner of the site. Some of the surface soil samples collected at the fuel transfer stations were not analyzed due to the strong odor of jet fuel from the samples. The actual TPH concentrations in these samples are unknown. The highest observed TPH concentration in surface soils (8,568 mg/kg) was used as the exposure point concentration for direct contact exposures at the POL Storage Yard. The concentrations of benzene, ethylbenzene, toluene, and xylene (BETX)

in surface soils at the fuel transfer station were estimated to be 43 mg/kg, 32 mg/kg, 114 mg/kg, and 199 mg/kg, respectively, based on published values for the concentration of these compounds in fresh JP-4 jet fuel (Air Force Engineering Laboratory 1981). JP-4 was selected over fuel oil due to its higher percentage of BETX.

Benzene, lead, barium, and chromium were detected in groundwater at concentrations exceeding their respective USEPA MCL's. However, since the groundwater exposure pathway was classified as incomplete for the site, exposure point concentrations for these compounds in groundwater were not estimated.

There were insufficient data available to estimate exposure point concentrations for inhalation exposures as a result of TPH concentrations in soils at the POL Storage Yard. However, it has generally been recognized that inhalation of contaminant residues from soils, either as a vapor or a component of ambient dust, generally does not constitute a significant uptake route compared with ingestion (Paustenbach 1987). In addition, it is likely that exposure to vapors as a result of soil contamination at the fuel transfer station would be insignificant relative to the exposures as a result of general operations at the fuel transfer stations. For instance, the USEPA has estimated that the average lifetime exposure to gasoline vapors of workers at uncontrolled bulk terminal facilities is 1.41 ppm gasoline (USEPA 1984), which would correspond to an estimated average lifetime exposure to benzene of 0.0075 ppm (0.023 mg/cubic meter) for exposure to JP-4 jet fuel. The average lifetime exposures to benzene as a result of soil contamination at the fuel transfer stations is expected to be considerably lower than this exposure estimate.

There was insufficient information available to estimate exposure point concentrations for surface water in the creek adjacent to the site. No TPH concentrations have ever been detected in the surface water in the marshy area adjacent to the site and in groundwater that would discharge into the creek at the time the samples were collected. The depth to groundwater at the site, however, is relatively shallow, and it is possible that the more mobile TPH components (e.g. benzene) may leach to groundwater or be transported in surface runoff during periods of heavy rainfall. There is a potential, therefore, for the intermittent release of TPH components to the creek via surface runoff and groundwater discharge. Continued monitoring of surface water and sediment from the creek and marshy area would facilitate the evaluation of potential migration of contaminants from the POL Storage Yard to the creek.

5.05 RISK CHARACTERIZATION

In the risk characterization step, the potential adverse effects to human health or the environment that may result from the

chemical exposures are evaluated. The results of the risk characterization are presented in two separate sections: the Public Health Evaluation, and the Environmental Assessment.

5.05.1 Public Health Evaluation - General Considerations

The first step in characterizing the risks to human health as a result of chemical contamination at a site is to estimate the dose of the contaminant that would be absorbed by potential receptors as a result of their activities at the exposure points. In order to estimate the dose, information on the activity patterns of potential receptors must be obtained. Based on the estimated exposure point concentrations, routes of potential uptake for the contaminant, and the time spent by receptors at the exposure points, a total CDI for each indicator parameter is calculated. The CDI may then be used to evaluate the potential toxicological consequences of the exposure.

The potential toxicologic effects induced by the dose of the chemical are generally classified according to two criteria: carcinogenic effects and non-carcinogenic effects.

a) Non-Carcinogenic Effects - For non-carcinogenic health effects, it is believed that a dose level exists at and below which no adverse health effects would be expected. Such a level is generally referred to as a threshold dose. It is possible to estimate a human subthreshold dose at which no adverse health effects would be expected. Several types of subthreshold dose values have been developed for use in risk assessments. For the characterization of non-carcinogenic health risk, the USEPA derived RfD may be utilized. If the calculated CDI is less than the RfD, then it is believed that there will be no adverse non-carcinogenic toxicologic effects related to the exposure.

b) Carcinogenic Effects - Unlike the non-carcinogenic health effects, the USEPA assumes that there is no threshold dose for carcinogenicity, i.e., there is no dose of a carcinogenic substance that is associated with zero risk. This is a conservative assumption that may or may not be valid, as the concept of zero threshold has not been demonstrated via laboratory animal studies or human epidemiological information. The fraction of exposed individuals that would be expected to develop cancer as a result of exposure to a particular chemical may be estimated by using the "cancer potency factor". A conservative estimate of the expected cancer rate in humans may be calculated by multiplying the estimated CDI by the published potency factor for a chemical. The expected cancer rate is expressed as a "cancer risk", which is the probability that an individual would develop cancer as a result of specific contact with a chemical, relative to the probability that cancer would occur in the absence of contact with the chemical. Due to the uncertainties inherent in extending animal data to humans, the USEPA calculates potency factors after incorporating

safety factors which are designed to protect the public health. This means that expected cancer rates calculated using the USEPA's potency factors represent "worst case" estimates, i.e., the actual cancer rate is expected to be lower than the calculated estimate.

5.05.2 Public Health Evaluation - Results

In this Section the results of the public health evaluation for each site is presented. Summaries of the public health evaluations for each site are presented in Tables 5-2 to 5-10.

5.05.2.1 FT002 - North Burn Pit

The North Burn Pit is enclosed by a chain link fence with locked gates. Access to the area is limited to authorized Base personnel. The site is not currently used for any routine activities. The only potential receptors identified are groundsmen that may periodically visit the site in the summer months in order to cut the grass. As stated in Section 5.02.1, the only complete exposure pathways identified is the direct contact pathway, and the indicator parameters identified are lead and TPH's.

For the purposes of the public health evaluation it was assumed that the site would be visited by the same adult for eight hours per day, seven days per year for a period of 25 years. These are considered to be very conservative assumptions because it is likely that the actual workload would be shared by more than one individual over the course of 25 years, and the actual time spent at the site on any given week would not exceed eight hours.

In order to assess the health risks related to exposure to TPH's, it is necessary to estimate the relative concentrations of the different TPH components that may be present in the soil. As stated in Section 5.02.1, the compounds of greatest toxicologic concern that may be present in petroleum hydrocarbons are benzene and PAH's. The soil samples collected and analyzed by E&E indicated that there was no detectable benzene present in surface soils. Since benzene is a highly volatile compound, it is likely that any benzene that may have been discharged to soils at the site would have volatilized. The CaPAH concentrations were estimated based on published values for the concentrations of CaPAH's in petroleum products that may have been discharged at the site. As a conservative estimate, the average concentration of CaPAH's in used motor oil and lubricating oil (155 ppm) (Table 5-13) was used to estimate CaPAH concentrations in surface soils.

The estimated CDI's of indicator compounds for carcinogenic and non-carcinogenic at FT002, and the parameters used to calculate the CDI's are given in Table 5-11 and 5-12. A summary of the calculated Hazard Index (HI) or excess lifetime cancer risk based on the calculated CDI is given in Tables 5-2 and 5-3, respectively. The total average cancer risk calculated for the North Burn Pit

was 4.3E-10, and the RME cancer risk was calculated as 1.7E-09 (Table 5-2). The mean HI for lead at the North Burn Pit was calculated as 2.5E-02, whereas the RME HI was calculated as 2.8E-02. The HI for methylene chloride at this site was calculated as 2.0E-09 (Table 5-3).

5.05.2.2 SS003 - Oil Saturated Area

The Oil Saturated Area is located in the southwest corner of the motor pool compound. Waste oil and possibly hydraulic fluids had been discharged at the site for many years (E&E 1988). The Oil Saturated Area is covered by gravel and crushed stone, and sections of the contamination extend beyond the fence to a grassy area. Based on data from samples collected at the site, it appears that the contamination has not migrated from the site, and is confined to the Oil Saturated Area.

The Oil Saturated Area is located in the access path to the storage shed. The identified potential receptors are personnel that may traverse the area when gaining access to the storage shed. For the purposes of the public health evaluation, it was assumed that exposure to the Oil Saturated Area would occur for a total of one hour per day, five days per week for 25 years in the lifetime. Direct contact was the only complete exposure pathway identified with uptake occurring via incidental ingestion of soils and dermal absorption. CaPAH's were selected as TPH indicator components to estimate the health risks related to exposure of receptors to TPH in surface soils at SS003.

The details of the calculations and input parameters used to calculate the CDI's for indicator compounds at SS003 are summarized in Table 5-11 and 5-12. The average carcinogenic risk resulting from contaminants in soils at SS003 was estimated to be 1.2E-06 and the RME carcinogenic risk was calculated as 2.1E-06 under current conditions (Table 5-4). It should be noted, however, that these risk estimates were derived based on highly conservative assumptions (as explained in Section 5.05 of this document) and have a high potential to overestimate the potential risks to workers at the Site. The calculated average HI for lead exposure at SS003 was 4.6E-02, and the RME HI for lead exposure was calculated to be 7.5E-02. The HI for xylenes was calculated to be 1.9E-10 (Table 5-5).

5.05.2.3 SS004 - Hazardous Waste Drum Storage

The Hazardous Waste Drum Storage is located near the southwest corner of Building 923. This fenced-in area was used for an undetermined number of years for the storage of drums of waste prior to disposal. The area is partially surfaced with asphalt. Surface water flows unchecked from this area to a grassy drainage ditch to the west of the area. The site is currently a staging area for contract groundskeepers.

As stated in Section 4.03 of this document, it appears that there is localized contamination of surface soils at the site by TPH's, with a hot spot in the area north of the fenceline, adjacent to the gate. It appears that significant amounts of contaminants have not migrated from the site in surface runoff.

For the purposes of the public health evaluation, it was assumed that contract groundskeepers would be exposed to contaminated soil for a total of two hours per day, five days a week for 25 of their life while gaining access to the storage shed. The only complete exposure pathway identified was direct contact, and uptake could occur via incidental ingestion of soil and dermal absorption. CaPAH's were identified as TPH indicator compounds to calculate the health risks associated with exposure to TPHs in surface soils at SS004.

The details of the calculations and input parameters used to calculate the CDI's for indicator compounds at SS004 are summarized in Tables 5-11 and 5-12. The average carcinogenic risk resulting from contaminants in soils at SS004 was estimated to be 2.8E-07, and the RME carcinogenic risk was calculated as 1.0E-06 under current conditions (Table 5-6). It should be noted, however, that these risk estimates were derived based on highly conservative assumptions (as explained in Section 5.05 of this document) and have a high potential to overestimate the potential risks to workers at the Site. The HI for methylene chloride was calculated to be 3.5E-07.

5.05.2.4 ST005 - POL Storage Yard

ST005, the POL Storage Yard, is an area which contains several pump houses and four aboveground storage tanks. Seepage from a stormwater retention pond feeds a marshy area west of the site and drains into a system of culverts.

Based on data from soil samples collected by the USACE, it appears that surface soils around the fuel pumping stations and outside Building 953, as well as subsurface soils beneath the bermed areas, are contaminated with high concentrations of TPH. It is likely that the detected TPH concentrations are due to the discharge of jet fuel or fuel oil from the storage tanks, and spillage of fuel during transfer operations at the fuel transfer stations.

The complete exposure pathways identified were air, surface water, and direct contact. The potential receptors are Base workers that work at the fuel transfer stations and within the fenced area at the POL Storage Yard. To estimate the health risk to workers, it was assumed that workers would be exposed to TPH contaminants for two hours per day, five days a week, for 25 years. The lifetime excess cancer risk was calculated based on the estimated CDI for benzene and CaPAH's via direct contact and incidental

Table 5-2
SUMMARY OF PUBLIC HEALTH EVALUATION
FT002 - North Burn Pit

CARCINOGENIC EFFECTS

INDICATOR PARAMETER	CDI(b)	CANCER POTENCY (mg/kg-day)-1	WEIGHT OF EVIDENCE	SF SOURCE	CHEMICAL SPECIFIC CANCER RISK	TOTAL PATHWAY CANCER RISK (mean)	TOTAL PATHWAY CANCER RISK (RME*)
Exposure Pathway: Direct Contact with Soil							
Lead (mean)	1.4E-05	(c)	B2	IRIS			
Lead (RME*)	1.6E-05	(c)	B2	IRIS			
TPH (mean)	2.4E-07						
TPH (RME)	9.3E-07						
CaPAH (mean)	3.7E-11 (a)	11.53 (c)	B2	HEAST	4.3E-10		
CaPAH (max)	1.4E-10 (a)	11.53			1.7E-09		
Methylene Chloride	7.4E-11	0.0075	B2	HEAST	5.6E-13	4.3E-10	1.7E-09
Exposure Pathway: Incidental Ingestion of Soil							
Lead (mean)	2.5E-06	(d)	B2	IRIS			
Lead (RME)	2.8E-06	(d)	B2	IRIS			
TPH (mean)	4.3E-08						
TPH (RME)	1.7E-07						
CaPAH (mean)	6.7E-12	11.5 (c)	B2	HEAST	7.7E-11		
CaPAH (RME)	2.6E-11	11.5 (c)			3.0E-10		
Methylene Chloride	4.4E-11	0.0075	B2	HEAST	3.3E-13	7.7E-11	3.0E-10
				TOTAL SITE CANCER RISK		4.3E-10 Mean	1.7E-09 RME

(a) - Estimated concentration of CaPAH in TPH's based on the average concentration of CaPAH in motor oil and lubricating oil of 155 ppm CaPAH (Stokemen and Dime 1986)(Table 5-13). These are conservative estimates of potential CaPAH CDI's at the site. It is expected that the actual CDI's for CaPAH's would be lower than the calculated estimates. See Sect. 5.02.2 for the basis for the selection of indicator parameters and Sect. 5.05 for analysis of uncertainties.

(b) - Exposure scenarios and assumptions used in calculating CDI are summarized in Tables 5-11 and 5-12.

(c) - The U.S. EPA is currently reviewing the cancer potency factors for various PAH's. As a conservative guideline, the current U.S. EPA advisory is to use the cancer potency factor for Benzo-a-pyrene to assess the carcinogenic risk from exposure to PAH mixtures. However, the estimated potency of various PAHs and PAH mixtures is likely to be lower than the cancer risk estimate obtained by using the cancer potency factor for BaP.

(d) - U.S. EPA has classified lead as a probable human carcinogen based on the observed carcinogenicity of certain organic lead salts in animals. However, due to the uncertainties in quantifying the carcinogenic risk related to lead exposure, the Carcinogen Assessment Group at U.S. EPA currently recommends that a numerical estimate not be used to quantify the cancer risk related to lead exposure.

Table 5-3
SUMMARY OF PUBLIC HEALTH EVALUATION
FT002 - North Burn Pit

NONCARCINOGENIC EFFECTS

Indicator Parameter (c)	CDI(c) (mg/kg/day)	RfD (mg/kg/day)	Confidence Level	Critical Effect	RfD Source	Hazard Quotient
Exposure Pathway: Direct Contact with Soil						
Lead (mean)	3.9E-08	2.8E-04	L	(d)	(a)	1.4E-04
Lead (RME*)	4.5E-08	2.8E-04				1.6E-04
Methylene Chloride	2.1E-10	0.06	L	Liver	HEAST	3.5E-09
Exposure Pathway : Incidental Ingestion of Soil						
Lead (mean)	7.0E-06	2.8E-04	L	(d)	(a)	2.5E-02
Lead (RME*)	7.9E-06	2.8E-04				2.8E-02
Methylene chloride	1.2E-10	0.06	L	Liver	HEAST	2.0E-09

* - RME = Reasonable Maximum Exposure

(a) - There is no published RfD for chronic non-carcinogenic effects of lead. For this risk assessment, a chronic RfD which was 20% of the RfD previously published by US EPA (1.4 ug/kg-day) was derived. This was based on the EPA proposal of August 1988 to revise the acceptable lead concentration of lead in drinking water from 50 ug/l to 10 ug/l.

(b) - Exposure scenarios and assumptions used in calculating CDI are summarized in Table 5-11 and 5-12

(c) - See Section 5.02.1 for selection of indicator parameters.

(d) - There is a great deal of information on the health effects of lead exposure. It appears that some of the effects, particularly changes in the levels of some blood enzymes and in certain aspects of childrens neurobehavioral development may occur at very low blood lead levels.

Table 5-4
SUMMARY OF PUBLIC HEALTH EVALUATION
SS003 - Oil Saturated Area

CARCINOGENIC EFFECTS

INDICATOR PARAMETER	CDI(b)	CANCER POTENCY (mg/kg-day)	WEIGHT OF EVIDENCE (mg/kg-day)	SF SOURCE	CHEMICAL SPECIFIC CANCER RISK	TOTAL PATHWAY CANCER RISK (mean)	TOTAL PATHWAY CANCER RISK (RME*)
Exposure Pathway: Direct Contact with Soil							
Lead (mean)	2.1E-07	(d)	B2	IRIS			
Lead (RME*)	3.4E-07	(d)	B2	IRIS			
TPH (mean)	6.4E-04						
TPH (RME*)	1.1E-03						
CaPAH (mean)	9.8E-08 (a)	11.53 (c)	B2	HEAST	1.1E-06		
CaPAH (RME)	1.7E-07	11.53			2.0E-06	1.1E-06	2.0E-06
Exposure Pathway: Incidental Ingestion of Soil							
Lead (mean)	4.6E-06	(d)	B2	IRIS			
Lead (RME)	7.5E-06	(d)	B2	IRIS			
TPH (mean)	4.7E-05						
TPH (RME)	8.3E-05						
CaPAH (mean)	7.3E-09	11.5 (c)	B2	HEA	8.4E-08		
CaPAH (RME)	1.3E-08	11.5			1.5E-07	8.4E-08	1.5E-07
				TOTAL SITE CANCER RISK		1.2E-06 Mean	2.1E-06 RME

* - RME = Reasonable Maximum Exposure

(a) - Estimated concentration of CaPAH in TPH's based on the average concentration of CaPAH in motor oil and lubricating oil of 155 ppm CaPAH (Stokeman and Dime 1986)(Table 5-13). These are conservative estimates of potential CaPAH CDI's at the site. It is expected that the actual CDI's for CaPAH's would be lower than the calculated estimates. See Sect. 5.02.2 for the basis for the selection of indicator parameters and Sect. 5.05 for analysis of uncertainties.

(b) - Exposure scenarios and assumptions used in calculating CDI are summarized in Tables 5-11 and 5-12.

(c) - The U.S. EPA is currently reviewing the cancer potency factors for various PAH's. As a conservative guideline, the current U. EPA advisory is to use the cancer potency factor for Benzo-a-pyrene to assess the carcinogenic risk from exposure to PAH mixtures. However, the estimated potency of various PAHs and PAH mixtures is likely to be lower than the cancer risk estimate obtained by using the cancer potency factor for BaP.

(d) - U.S. EPA has classified lead as a probable human carcinogen based on the observed carcinogenicity of certain organic lead salt in animals. However, due to the uncertainties in quantifying the carcinogenic risk related to lead exposure, the Carcinogen Assessment Group at U.S. EPA currently recommends that a numerical estimate not be used to quantify the cancer risk related to lead exposure.

Table 5-5
SUMMARY OF PUBLIC HEALTH EVALUATION
SS003 - Oil Saturated Area

NONCARCINOGENIC EFFECTS

Indicator Parameter (c)	CDI(c) (mg/kg/day)	RfD (mg/kg/day)	Confidence Level	Critical Effect	RfD Source	Hazard Quotient
Exposure Pathway: Direct Contact with Soil						
Lead (mean)	5.8E-07	2.8E-04	L	(d)	(a)	2.1E-03
Lead (RME*)	9.4E-07	2.8E-04				3.4E-03
Xylenes	4.9E-09	2	L	Decreased Body Weight	HEAST	2.5E-09
Exposure Pathway : Incidental Ingestion of Soil						
Lead (mean)	1.3E-05	2.8E-04	L	(d)	(a)	4.6E-02
Lead (RME*)	2.1E-05	2.8E-04				7.5E-02
Xylenes	3.7E-10	2	L	Decreased Body Weight	HEAST	1.9E-10

* - RME=Reasonable Maximum Exposure

(a) - There is no published RfD for chronic non-carcinogenic effects of lead. for this risk assessment, a chronic RfD which was 20% of the RfD previously published by US EPA (1.4 ug/kg-day) was derived. This was based on the EPA proposal of August 1988 to revise the acceptable lead concentration of lead in drinking water from 50 ug/l to 10 ug/l.

(b) - Exposure scenarios and assumptions used in calculating CDI are summarized in Table 5-11 B and 5-12 B.

(c) - See Section 5.02.1 for selection of indicator parameters.

(d) - There is a great deal of information on the health effects of lead exposure. It appears that some of the effects, particularly changes in the levels of some blood enzymes and in certain aspects of childrens neurobehavioral development may occur at very low blood lead levels.

Table 5-6
SUMMARY OF PUBLIC HEALTH EVALUATION
SS004 - Hazardous Waste Drum Storage

CARCINOGENIC EFFECTS

INDICATOR PARAMETER	CDI(b)	CANCER POTENCY (mg/kg-day)-1	WEIGHT OF EVIDENCE	SF SOURCE	CHEMICAL SPECIFIC CANCER RISK	TOTAL PATHWAY CANCER RISK (mean)	TOTAL PATHWAY CANCER RISK (RME*)
Exposure Pathway: Direct Contact with Soil							
TPH (mean)	1.6E-04						
TPH (RME*)	5.6E-04						
CaPAH (mean)	2.4E-08 (a)	11.53 (c)	B2	HEAST	2.8E-07		
CaPAH (RME)	8.7E-08	11.53			1.0E-06		
Methylene Chloride	7.7E-09	0.0075	B2	HEAST	5.7E-11	2.8E-07	1.0E-06
Exposure Pathway: Incidental Ingestion of Soil							
TPH (mean)	1.5E-05						
TPH (RME)	8.3E-05						
CaPAH (mean)	2.3E-09 (a)	11.5	B2	HEAST	2.7E-08		
CaPAH (RME)	1.3E-08	11.5			1.5E-07		
Methylene Chloride	1.1E-09	0.0075	B2	HEAST	8.3E-12	2.7E-08	1.5E-07
				TOTAL SITE CANCER RISK		2.8E-07 Mean	1.0E-06 RME

* - RME = Reasonable Maximum Exposure

(a) - Estimated concentration of CaPAH in TPH's based on the average concentration of CaPAH in motor oil and lubricating oil of 155 ppm CaPAH (Stokeman and Dime 1986)(Table 5-13). These are conservative estimates of potential CaPAH CDI's at the site. It is expected that the actual CDI's for CaPAH's would be lower than the calculated estimates. See Sect. 5.02.2 for the basis for the selection of indicator parameters and Sect. 5.05 for analysis of uncertainties.

(b) - Exposure scenarios and assumptions used in calculating CDI are summarized in Tables 5-11 and 5-12.

(c) - The U.S. EPA is currently reviewing the cancer potency factors for various PAH's. As a conservative guideline, the current U EPA advisory is to use the cancer potency factor for Benzo-a-pyrene to assess the carcinogenic risk from exposure to PAH mixtures. However, the estimated potency of various PAHs and PAH mixtures is likely to be lower than the cancer risk estimate obtained by using the cancer potency factor for BaP.

(d) - U.S. EPA has classified lead as a probable human carcinogen based on the observed carcinogenicity of certain organic lead sal in animals. However, due to the uncertainties in quantifying the carcinogenic risk related to lead exposure, the Carcinogen Assessment Group at U.S. EPA currently recommends that a numerical estimate not be used to quantify the cancer risk related to lead exposure.

Table 5-7
SUMMARY OF PUBLIC HEALTH EVALUATION
SS004 - Hazardous Waste Drum Storage

NONCARCINOGENIC EFFECTS

Indicator Parameter (a)	CDI(a)	RfD	Confidence Level	Critical Effect	RfD Source	Hazard Quotient
	(mg/kg/day)	(mg/kg/day)				
Exposure Pathway: Direct Contact with Soil						
Methylene Chloride	2.1E-08	0.06	L	Liver	HEAST	3.5E-07
Exposure Pathway : Incidental Ingestion of Soil						
Methylene Chloride	3.2E-09	0.06	L	Liver	HEAST	5.3E-08

(a) - Exposure scenarios and assumptions used in calculating CDI are summarized in Table 5-11 C an 5-12 C.

Table 5-8
SUMMARY OF PUBLIC HEALTH EVALUATION
ST005 - POL Storage Yard

CARCINOGENIC EFFECTS

INDICATOR PARAMETER	CDI(b)	CANCER POTENCY (mg/kg-day)-1	WEIGHT OF EVIDENCE	SF SOURCE	CHEMICAL SPECIFIC CANCER RISK	TOTAL PATHWAY CANCER RISK (RME*)
Exposure Pathway: Direct Contact with Soil						
TPH (RME)	2.5E-03					
CaPAH (RME)	1.4E-09	11.53 (c)		HEAST	1.6E-08	
Benzene	1.3E-05	0.03	A	IRIS	3.8E-07	4.0E-07
Exposure Pathway: Incidental Ingestion of Soil						
TPH (RME*)	1.9E-04					
CaPAH (RME*)	1.0E-10	11.5 (c)	B2	HEAST	1.2E-09	
Benzene	9.5E-07	0.03	A	IRIS	2.9E-08	3.0E-08
				TOTAL SITE CANCER RISK		4.3E-07 RME

* - RME = Reasonable Maximum Exposure

(a) - Estimated concentration of CaPAH in TPH's based on the average concentration of CaPAH in motor oil and lubricating oil of 155 ppm CaPAH (Stokeman and Dime 1986)(Table 5-13). These are conservative estimates of potential CaPAH CDI's at the site. It is expected that the actual CDI's for CaPAH's would be lower than the calculated estimates. See Sect. 5.02.2 for the basis for the selection of indicator parameters and Sect. 5.05 for analysis of uncertainties.

(b) - Exposure scenarios and assumptions used in calculating CDI are summarized in Tables 5-11 and 5-12.

(c) - The U.S. EPA is currently reviewing the cancer potency factors for various PAH's. As a conservative guideline, the current U. EPA advisory is to use the cancer potency factor for Benzo-a-pyrene to assess the carcinogenic risk from exposure to PAH mixtures. However, the estimated potency of various PAHs and PAH mixtures is likely to be lower than the cancer risk estimate obtained by using the cancer potency factor for BaP.

(d) - U.S. EPA has classified lead as a probable human carcinogen based on the observed carcinogenicity of certain organic lead salt in animals. However, due to the uncertainties in quantifying the carcinogenic risk related to lead exposure, the Carcinogen Assessment Group at U.S. EPA currently recommends that a numerical estimate not be used to quantify the cancer risk related to lead exposure.

Table 5-9
SUMMARY OF PUBLIC HEALTH EVALUATION
ST005 - POL Storage Yard

NONCARCINOGENIC EFFECTS

Indicator Parameter (c)	CDI(c) (mg/kg/day)	RfD (mg/kg/day)	Confidence Level	Critical Effect	RfD Source	Hazard Quotient
Exposure Pathway: Direct Contact with Soil						
TPH	7E-03					
Ethylbenzene(b)	2.6E-05	0.11	L	liver, kidney	IRIS	2.4E-04
Toluene(b)	9.1E-05	0.3	M	Haematological	IRIS	3.0E-04
Xylene(b)	1.6E-04	2	M	Hyperactivity, Decreased body wgt.	IRIS	8.0E-05
Acetone	5.3E-09	0.1	L	Liver and Kidney	IRIS	5.3E-08
Exposure Pathway : Incidental Ingestion of Soil						
TPH	5.2E-04					
Ethylbenzene(b)	2.0E-06	0.11	L	liver, kidney	IRIS	1.8E-05
Toluene(b)	6.8E-06	0.3	M	Haematological	IRIS	2.3E-05
Xylene(b)	1.2E-05	2	M	Hyperactivity Decreased body wgt.	IRIS	6.0E-06
Acetone	3.9E-09	0.1	L	Liver and Kidney	IRIS	3.9E-08

(a)- Conservative estimates of CDIs for TPH indicator compounds were obtained based on estimated concentrations of ethylbenzene, toluene, and xylene in JP-4 jet fuel of 0.37%, 1.3%, and 2.3 % respectively (Air Force Engineering and Service Center 1988). These estimates are based on the concentrations of these compounds in fresh JP-4 jet fuel. It is expected that CDIs for these compounds from soil concentrations will be lower than these estimates due to volatilization, leaching, runoff, and other loss processes in the soil.

(b)- The basis for selection of these compounds as TPH indicator compounds at the POL storage yard is given in Section 5.02.1.

(c)- Exposure scenarios and assumptions used in calculating CDI are summarized in Tables 5-11 D and 5-12

Table 5-10
SUMMARY OF PUBLIC HEALTH EVALUATION
FOR FOUR IRP SITES
AT RICHARDS-GEBAUR AFB, MO

SITE	RME* TOTAL SITE CANCER RISK	RME* SITE HAZARD INDEX FOR LEAD	RME* SITE HAZARD INDEX FOR LIVER TOXINS
North Burn Pit	1.7E-09	2.8E-02	5.5E-09
Oil Saturated Area	2.1E-06	7.8E-02	
Hazardous Waste Drum Storage	1.0E-06		3.8E-07
POL Storage Yard	4.3E-07		2.6E-04
Total	3.5E-06	1.1E-01	2.6E-04

*RME = Reasonsable Maximum Exposure

Table 5-11A

Calulation of Chronic Daily Intake (CDI) by Dermal Contact
at FT002 - North Burn Pit

Intake (mg/kg-day) = (CDI)

$$\frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Variable		Units			
Cs	Soil Concentration	mg/kg	EF	Exposure Frequency	Days exposed/year
CF	Conversion Factor	kg/mg	ED	Exposure Duration	Years Exposed/Lifetime
SA	Exposed Skin Surface Area	sq. cm.	BW	Body Weight	Kg
AF	Soil to skin adherence Factor	mg/sq.cm.-day	AT	Averaging Time	Days
ABS	Dermal Absorption Factor	Unitless			

	Ca	CF	SA	AF	ABS	EF	ED	BW	AT (Non-Canc)	AT (Cancer)	CDI (Non-Canc)	CDI (Cancer)
Reference (b)	(1)		(2)	(3)	(4,5)	(1)	(6)	(6)				
Lead (mean)	510	1.0E-06	550	0.51	0.001	7	25	70	9125	25550	3.9E-08	1.40E-05
Lead (max)	580	1.0E-06	550	0.51	0.001	7	25	70	9125	25550	4.5E-08	1.59E-05
TPH (mean)	8.7	1.0E-06	550	0.51	0.3	7	25	70	9125	25550	2.0E-07	2.39E-07
TPH (max)	34	1.0E-06	550	0.51	0.3	7	25	70	9125	25550	7.8E-07	9.33E-07
CaPAH (mean) (a)	0.0014	1.0E-06	550	0.51	0.3	7	25	70	9125	25550	3.2E-11	3.84E-11
CaPAH (max) (a)	0.0053	1.0E-06	550	0.51	0.3	7	25	70	9125	25550	1.2E-10	1.45E-10
Methylene Chloride	0.009	1.0E-06	550	0.51	0.3	7	25	70	9125	25550	2.1E-10	7.41E-11

(a) - see table 5-1 A
(b) - see table 5-11 E

Table 5-11B

Calulation of Chronic Daily Intake (CDI) by Dermal Contact
at SS003 - Oil Saturated Area

$$\text{Intake (mg/kg-day) (CDI)} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Variable		Units			
Cs	Soil Concentration	mg/kg	EF	Exposure Frequency	Days exposed/year
CF	Conversion Factor	kg/mg	ED	Exposure Duration	Years Exposed/Lifetime
SA	Exposed Skin Surface Area	sq. cm.	BW	Body Weight	Kg
AF	Soil to skin adherence factor	mg/sq.cm.-day	AT	Averaging Time	Days
ABS	Dermal Absorption Factor	Unitless			

	Cs	CF	SA	AF	ABS	EF	ED	BW	AT (Non-Canc)	AT (Cancer)	CDI (Non-Canc)	CDI (Cancer)
Reference (b)	(1)		(2)	(3)	(4,5)	(1)	(6)	(6)				
Lead (mean)	210	1.0E-06	550	0.51	0.001	250	25	70	9125	25550	5.8E-07	2.06E-07
Lead (max)	343	1.0E-06	550	0.51	0.001	250	25	70	9125	25550	9.4E-07	3.36E-07
TPH (mean)	2160	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	1.8E-03	6.35E-04
TPH (max)	3800	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	3.1E-03	1.12E-03
CaPAH (mean) (a)	0.33	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	2.7E-07	9.70E-08
CaPAH (max) (a)	0.6	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	4.9E-07	1.76E-07
Xylenes	0.006	1.0E-06	550	0.51	0.3	250	25	70	9125	-	4.9E-09	

(a) - see table 5-1 B
(b) - see table 5-11 E

Table 5-11C

Calulation of Chronic Daily Intake (CDI) by Dermal Contact
at SS004 - Hazardous Waste Drum Storage

$$\text{Intake (mg/kg-day) (CDI)} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Variable		Units			
Cs	Soil Concentration	mg/kg	EF	Exposure Frequency	Days exposed/year
CF	Conversion Factor	kg/mg	ED	Exposure Duration	Years Exposed/Lifetime
SA	Exposed Skin Surface Area	sq. cm.	BW	Body Weight	Kg
AF	Soil to skin adherence Factor	mg/sq.cm.-day	AT	Averaging Time	Days
ABS	Dermal Absorption Factor	Unitless			

	Cs	CF	SA	AF	ABS	EF	ED	BW	AT (Non-Canc)	AT (Cancer)	CDI (Non-Canc)	CDI (Cancer)
Reference (b)	(1)		(2)	(3)	(4,5)	(1)	(6)	(6)				
TPH (mean)	535	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	4.4E-04	1.57E-04
TPH (max)	1900	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	1.6E-03	5.59E-04
CaPAH (mean) (a)	0.08	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	6.6E-08	2.35E-08
CaPAH (max) (a)	0.3	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	2.5E-07	8.82E-08
Methylene Chloride	0.026	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	2.1E-08	7.65E-09

(a) - see table 5-1 C
(b) - see table 5-11 E

Table 5-11D

Calulation of Chronic Daily Intake (CDI) by Dermal Contact
at ST005 - POL Storage Yard

$$\text{Intake (mg/kg-day) (CDI)} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Variable		Units			
Cs	Soil Concentration	mg/kg	EF	Exposure Frequency	Days exposed/year
CF	Conversion Factor	kg/mg	ED	Exposure Duration	Years Exposed/Lifetime
SA	Exposed Skin Surface Area	sq. cm.	BW	Body Weight	Kg
AF	Soil to skin adherence Factor	mg/sq.cm.-day	AT	Averaging Time	Days
ABS	Dermal Absorption Factor	Unitless			

	Cs	CF	SA	AF	ABS	EF	ED	BW	AT (Non-Canc)	AT (Cancer)	CDI (Non-Canc)	CDI (Cancer)
Reference (b)	(1)		(2)	(3)	(4,5)	(1)	(6)	(6)				
TPH	8570	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	7.1E-03	2.52E-03
Benzene (a)	43	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	3.5E-05	1.26E-05
Ethylbenzene (a)	32	1.0E-06	550	0.51	0.3	250	25	70	9125	-	2.6E-05	
Toluene	111	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	9.1E-05	3.26E-05
Xylenes (a)	197	1.0E-06	550	0.51	0.3	250	25	70	9125	-	1.6E-04	
CaPAH (a)	0.005	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	4.1E-09	1.47E-09
Acetone	0.018	1.0E-06	550	0.51	0.3	250	25	70	9125	25550	1.5E-08	5.29E-09

(a) - see table 5-1 D

(b) - see table 5-11 E

Table 5-11 E

References for Parameter Estimates used in Calculation of CDIs at Richards Gebaur Air Force Base

1) See Section 5.03.3 - Estimation of Exposure Point Concentrations

2) Total surface area for hands and arms - Exposure Factors Handbook U.S.EPA 1989, Office of Health and Environmental Assessment

3) Massachusetts DEQE 1988 Interim Guidance for Risk Characterization Office of Research and Standards

4) Based on data reviewed by the Agency for Toxic Substances and Disease Registry - Toxicological Profile for Lead, ATSDR 1989.

5) Based on data reviewed by the Agency for Toxic Substances and Disease Registry - Toxicological Profile for Benzene, ATSDR 1989.

6) Risk Assessment Guidance for Superfund - Volume I - Supplemental Guidance Standard Default Exposure Factors - Interim Final - U.S.EPA, 1991, Office of Emergency and Remedial Response

Table 5-12A

Calulation of Chronic Daily Intake (CDI) by Soil Ingestion
at FT002 - North Burn Pit

$$\text{Intake (mg/kg-day) (CDI)} = \frac{Cs \times CF \times FI \times IR \times EF \times ED}{BW \times AT}$$

Variable		Units	Variable		Units
Cs	Soil Concentration	mg/kg	EF	Exposure Frequency	Days exposed/year
CF	Conversion Factor	kg/mg	ED	Exposure Duration	Years Exposed/Lifetime
IR	Soil Ingestion rate	mg/day	BW	Body Weight	Kg
			AT	Averaging Time	Days
			FI	Fraction Ingested from contaminated source	Unitless

	Cs	CF	FI	IR	EF	ED	BW	AT (Non-Canc)	AT (Cancer)	CDI (Non-Canc)	CDI (Cancer)
Reference (b)	(1)		(1)	(6)	(1)	(6)	(6)				
Lead (mean)	510	1.0E-06	1	50	7	25	70	9125	25550	7.0E-06	2.5E-06
Lead (max.)	580	1.0E-06	1	50	7	25	70	9125	25550	7.9E-06	2.8E-06
TPH (mean)	8.7	1.0E-06	1	50	7	25	70	9125	25550	1.2E-07	4.3E-08
TPH (max.)	34	1.0E-06	1	50	7	25	70	9125	25550	4.7E-07	1.7E-07
CaPAH (mean) (a)	0.0014	1.0E-06	1	50	7	25	70	9125	25550	1.9E-11	6.8E-12
CaPAH (max) (a)	0.0053	1.0E-06	1	50	7	25	70	9125	25550	7.3E-11	2.6E-11
Methylene Chloride	0.009	1.0E-06	1	50	7	25	70	9125	25550	1.2E-10	4.4E-11

(a) - see table 5-1 A
(b) - see table 5-11 E

Table 5-12B

Calulation of Chronic Daily Intake (CDI) by Soil Ingestion
at SS003 - Oil Saturated Area

$$\text{Intake (mg/kg-day) (CDI)} = \frac{Cs \times CF \times FI \times IR \times EF \times ED}{BW \times AT}$$

Variable		Units	Variable		Units
Cs	Soil Concentration	mg/kg	EF	Exposure Frequency	Days exposed/year
CF	Conversion Factor	kg/mg	ED	Exposure Duration	Years Exposed/Lifetime
SA	Exposed Skin Surface Area	sq. cm.	BW	Body Weight	Kg
IR	Soil Ingestion rate	mg/day	AT	Averaging Time	Days
			FI	Fraction Ingested from contaminated source	Unitless

	Cs	CF	FI	IR	EF	ED	BW	AT (Non-Canc)	AT (Cancer)	CDI (Non-Canc)	CDI (Cancer)
Reference (b)	(1)		(1)	(6)	(1)	(6)	(6)				
Lead (mean)	210	1.0E-06	0.125	50	250	25	70	9125	25550	1.3E-05	4.6E-06
Lead (max)	343	1.0E-06	0.125	50	250	25	70	9125	25550	2.1E-05	7.5E-06
TPH (mean)	2160	1.0E-06	0.125	50	250	25	70	9125	25550	1.3E-04	4.7E-05
TPH (max)	3800	1.0E-06	0.125	50	250	25	70	9125	25550	2.3E-04	8.3E-05
CaPAH (mean) (a)	0.33	1.0E-06	0.125	50	250	25	70	9125	25550	2.0E-08	7.2E-09
CaPAH (max) (a)	0.6	1.0E-06	0.125	50	250	25	70	9125	25550	3.7E-08	1.3E-08
Xylenes	0.006	1.0E-06	0.125	50	250	25	70	9125	-	3.7E-10	-

(a) - see table 5-1 B
(b) - see table 5-11 E

Table 5-12C

Calulation of Chronic Daily Intake (CDI) by Soil Ingestion
at SS004 - Haz. Waste Drum Storage

Intake (mg/kg-day) = (CDI)

$$\frac{Cs \times CF \times FI \times IR \times EF \times ED}{BW \times AT}$$

Variable		Units	Variable		Units
Cs	Soil Concentration	mg/kg	EF	Exposure Frequency	Days exposed/year
CF	Conversion Factor	kg/mg	ED	Exposure Duration	Years Exposed/Lifetime
SA	Exposed Skin Surface Area	sq. cm.	BW	Body Weight	Kg
IR	Soil Ingestion rate	mg/day	AT	Averaging Time	Days
			FI	Fraction Ingested from contaminated source	Unitless

	Cs	CF	FI	IR	EF	ED	BW	AT (Non-Canc)	AT (Cancer)	CDI (Non-Canc)	CDI (Cancer)
Reference (b)	(1)		(1)	(6)	(1)	(6)	(6)				
TPH (mean)	353	1.0E-06	0.25	50	250	25	70	9125	25550	4.3E-05	1.5E-05
TPH (max)	1900	1.0E-06	0.25	50	250	25	70	9125	25550	2.3E-04	8.3E-05
CaPAH (mean) (a)	0.08	1.0E-06	0.25	50	250	25	70	9125	25550	9.8E-09	3.5E-09
CaPAH (max) (a)	0.3	1.0E-06	0.25	50	250	25	70	9125	25550	3.7E-08	1.3E-08
Methylene Chloride	0.026	1.0E-06	0.25	50	250	25	70	9125	25550	3.2E-09	1.1E-09

(a) - see table 5-1 C
(b) - see table 5-11 E

Table 5-12D

Calulation of Chronic Daily Intake (CDI) by Soil Ingestion
at ST005 - POL Storage Yard

$$\text{Intake (mg/kg-day) (CDI)} = \frac{Cs \times CF \times FI \times IR \times EF \times ED}{BW \times AT}$$

Variable		Units	Variable		Units
Cs	Soil Concentration	mg/kg	EF	Exposure Frequency	Days exposed/year
CF	Conversion Factor	kg/mg	ED	Exposure Duration	Years Exposed/Lifetime
SA	Exposed Skin Surface Area	sq. cm.	BW	Body Weight	Kg
IR	Soil Ingestion rate	mg/day	AT	Averaging Time	Days
			FI	Fraction Ingested from contaminated source	Unitless

	Cs	CF	FI	IR	EF	ED	BW	AT (Non-Canc)	AT (Cancer)	CDI (Non-Canc)	CDI (Cancer)
Reference (b)	(1)		(1)	(6)	(1)	(6)	(6)				
TPH (max)	8570	1.0E-06	0.125	50	250	25	70	9125	25550	5.2E-04	1.9E-04
Benzene (a)	43	1.0E-06	0.125	50	250	25	70	9125	25550	2.6E-06	9.4E-07
Ethylbenzene (a)	32	1.0E-06	0.125	50	250	25	70	9125	-	2.0E-06	
Toluene	111	1.0E-06	0.125	50	250	25	70	9125	-	6.8E-06	
Xylenes (a)	197	1.0E-06	0.125	50	250	25	70	9125	-	1.2E-05	
CaPAH (a)	0.005	1.0E-06	0.125	50	250	25	70	9125	2550	3.1E-10	1.1E-09
Acetone	0.018	1.0E-06	0.125	50	250	25	70	9125	2550	1.1E-09	3.9E-09

(a) - See table 5-1 D
(b) - see table 5-11 E

TABLE 5-13

Estimated Concentrations of CaPAH's and Benzene in Selected Petroleum Products

Product	Total CaPAH's (ppm)	Benzene (% vol)
Crude Oil	12 ; 26.3	0.2
Gasoline (regular)	9.3	1.1 - 2.9
Gasoline (high octane)	7.4	-
Gasoline (low octane)	1.7	1.1 - 2.9
Gasoline (unleaded)	-	0.6 - 2.3
Petroleum naptha	-	0.2
Fuel Oil No. 1 (jet fuel)	0.15	-
Fuel Oil No. 1 (kerosene)	0.05	-
Fuel Oil No. 2 (heating oil)	4.0	-
Fuel Oil No. 2 (diesel oil)	0.7; 0.03; 37.3	-
Fuel Oil No. 6 (Bunker "C")	329	-
Lubricating Oil	0.3	-
Fresh Motor Oil	0.2	-
Used Motor Oil	5.8	-
Used Motor Oil (> 5,000km)	303.6	-
Used Motor Oil (> 10,000 km)	466.6	-

From Stokman and Dime 1986. The original references from which the data were compiled are not cited here.

ingestion (Tables 5-11 and 5-12). A total cancer risk of 4.3E-07 was calculated for the POL Storage Yard (Table 5-8). A total HI for non-carcinogenic compounds of 8.0E-04 was calculated (Table 5-9). It should be noted, however, that the calculated risk estimates are based on the assumption that current conditions will prevail at the site, and no future discharges of petroleum products that would lead to soil concentrations exceeding the observed soil TPH concentrations would occur. Should future discharges of petroleum products occur at the site, the human health risk may exceed the estimates calculated in this analysis.

5.05.2.5 Total of the Four Sites at Richards-Gebaur AFB

In order to evaluate the potential health risks for a single individual that may experience multiple exposures to chemical residues present at the four sites being evaluated in this assessment, the cancer risks and relevant hazard indices were summed to obtain a total risk for the four sites. The average total cancer risk calculated for the four sites is 1.4E-06, and the calculated RME cancer risk is 3.5E-06. The most significant exposure to non-carcinogenic compounds at the sites is potential exposure to lead. The total calculated average HI for lead exposure the four sites is 7.6E-02, and the calculated RME HI is 1.1E-01 (Table 5-10). It should be emphasized, however, that it is extremely unlikely that the same individual would visit each of the four sites on a daily basis for a period of 25 years, and, therefore, the derived total cancer risks overestimate the potential health risks to a given worker at Richards-Gebaur AFB. Given that the sites are separated by large distances and exposures for each site were based on a number of hours per day, it can be shown that this multi-site exposure scenario is not reasonable.

5.05.3 Environmental Assessment

The Environmental Assessment of the four IRP sites on Richards-Gebaur AFB is presented in this section. The assessment was prepared based solely on the information presented in two reports prepared by Ecology and Environment in July, 1988 (E&E 1988) and CH2M HILL in March, 1983 (CH2M HILL 1983). It is assumed the data is accurate in these reports.

Richards-Gebaur AFB covers 428 acres. Much of the land around the base is unimproved. The unimproved areas consist of annual grassland communities composed of fescue, bluegrass, brome grass, and clover. Small tracts of trees, consisting of honey locust, maple, oak, and Osage orange, occur in some of the more isolated areas of the Base. Scope Creek meanders near the Base for a half a mile and has some small associated tributaries. The creek receives stormwater runoff from the Base.

The purpose of the Environmental Assessment was to identify the habitats and wildlife species expected to be present on-site.

This identification process provides information regarding the species potentially impacted by releases from the site which either directly affect individuals or adversely affect habitats which result in secondary impacts to wildlife populations.

The majority of the sites assessed in this report have very little value to wildlife. These sites consist of large areas of pavement, concrete, or gravel covering which prevents the growth of vegetation for wildlife food and cover. The use of herbicides also keeps vegetation in check. The lack of habitat diversity on the Base limits the diversity of wildlife species. Wildlife reported on the Base is limited to small mammals and song birds. No endangered species are known to inhabit the site. Adjacent to ST005, a wooded and marshy area provides significant wildlife value for several bird and mammal species. Each of the four sites are discussed below.

5.05.3.1 FT002 - North Burn Pit

FT002 is 2.4 acres in size and is located at the top of a rise at the northern end of a runway. The site is completely surrounded by a chain-link fence with a locking gate and City of Kansas City property. The majority of the site is covered with crushed stone which was placed around a large round concrete pad where fire training activities formerly occurred. The area between the crushed stone and the fence is covered with grass which is occasionally mowed. Runoff from the pad is directed toward a bermed area at the eastern edge of the site where the water is collected during storm events. The area outside of the fence does not appear to be influenced by activities which were conducted within the fence.

The existing site does not appear to contain any significant wildlife habitat. The area is fenced which prevents access to any large mammals and the concrete and rock-covered areas of the site leave little room for vegetation and cover. The grassed area may provide a food source for several bird species. However, there are several more desirable feeding areas on the Base. Any releases from this site would have very little impact on wildlife due to the poor habitat conditions caused by the concrete and stone covered areas.

5.05.3.2 SS003 - Oil Saturated Area

SS003 is an area less than one acre in size which contains the southeast corner of a fenced-in maintenance area. The area within the fence is paved and contains a metal storage shed and a drum storage area. More than one-half of the site is located outside of the fenced area and is composed of flat grassland which is occasionally mowed. A portion of the soil outside of the fence is covered with gravel which was used to stabilize an area of oil saturation. Some oil-stained ground is present at the edges of the

gravel. Storm water runoff is channeled through a ditch just west of the fenceline. This ditch is dry most of the time.

This site does not contain any significant wildlife habitat. Much of the site is either paved or covered with gravel and, therefore, does not have vegetative cover. Portions of the site are not accessible to large mammals because of the fence. The grassed areas may provide feeding habitat for some bird species. Burrowing mammals, such as mice, could enter the stained soil areas. However, the limited food source and lack of cover in the immediate area do not make this a favorable location for small mammals. Storm water runoff from the site enters a drainage ditch which is sometimes dry. No contaminants were detected in sediment or surface water samples from this ditch. Based on the analytical data, the ditch sediments and the surface storm runoff are not impacted by the stained soil on the site and, therefore, would not affect wildlife utilizing these areas for food or cover.

5.05.3.3 SS004 - Hazardous Waste Drum Storage

SS004 is located in the northwestern edge of a three-acre fenced in area formerly used for the storage of drummed waste prior to disposal. The site is less than one acre in size and is paved within the fenced area (eastern two-thirds) and covered with gravel outside of the fence. The area outside of the fence contains a drainage ditch which drains southeast toward Scope Creek. The ditch is dry most of the time.

This site does not contain any significant wildlife habitat. The majority of the site is paved and therefore is not vegetated. Portions of the site are not accessible to large mammals because of the fence. The limited grassed areas may provide feeding habitat for some bird species and small mammals; however, the limited food source and lack of cover do not make this a favorable location for small mammals. No contaminants were detected in sediment or surface water samples from this ditch. Based on the analytical data, the ditch sediments and the surface storm runoff are probably not impacted by the stained soil on the site and therefore would not affect wildlife utilizing these areas for food or cover.

5.05.3.4 ST005 - POL Storage Yard

ST005 covers approximately 12 acres and contains an aboveground tank farm comprised of three pump houses and four aboveground fuel storage tanks. The majority of the tank farm is covered with gravel. The tanks are surrounded by asphalt covered earth berms. The southwestern three acres of the site are a mixture of hardwood trees and a low-lying marshy area. Tree species reported on the Base include honey locust, maple, oak, and Osage orange. A variety of bird and mammalian species were reported to inhabit the Base. Reported bird species include sparrows, cardinals, quail, shrikes, brown thrasher, red-tailed

hawk, and prairie horned lark. Reported mammalian species include rabbits, squirrels, muskrats, coyotes, opossums, and groundhogs. Many of these species may be found in this portion of the site. Topographically upgradient from the marsh is a four-acre man-made stormwater retention pond.

The concern at this site would be the release of petroleum hydrocarbons from the tank farm either by surface water runoff or through the groundwater system. One major and several minor fuel spills have been reported from this site and the integrity of the pump house floor drain system is unknown (E&E 1988). In addition, the tank containment areas are weathered and cracks must be periodically maintained; iridescent sheens have been observed on water in the marshy area and in the tank containment sump system; and, petroleum hydrocarbons were detected in soils inside the tank berms.

A surface water sample collected from the marsh did not contain detectable levels of petroleum hydrocarbons when sampled. In addition, a downgradient groundwater monitoring well did not contain any detectable concentrations of petroleum hydrocarbons when sampled. However, the presence of contaminated surface soils and fractured containment areas in the tank farm present the potential for these releases to occur.

The tank farm area does not provide any suitable wildlife habitat since the ground is covered with either gravel or asphalt and there is no vegetation present that may provide food or cover. However, the wooded and marshy area of the site may provide food and cover for a number of the species identified above. Releases of petroleum hydrocarbons from the tank farm via groundwater discharge or surface water runoff into the marshy area could impact the flora and fauna of the marsh. The biota could be exposed to contaminants via ingestion of water or by direct contact. In addition, food sources for the biota could be impacted which would result in a secondary impact to wildlife populations. Potentially impacted food sources include insects, macroinvertebrates, fish, and aquatic plants.

5.06 ANALYSIS OF UNCERTAINTIES

In any given risk assessment, there is some uncertainty about the parameters used in calculating the CDI of a contaminant. In order to ensure that the calculated risk estimate does not underestimate the actual risk to human health and the environment, Multiple conservative assumptions are made regarding the exposure scenario. The actual risk to human health and the environment as a result of contamination at a site, therefore, is expected to be less than the calculated risk estimate. The following key assumptions were made in conducting the baseline risk assessment.

a) Estimation of CaPAH Concentration in Surface Soils - For most of the sites considered, acceptable analytical data indicating the concentration of specific PAH's in the soils was not available. The concentration of CaPAH's that may have been present in surface soils was estimated based on published values for CaPAH concentrations in different petroleum products (Table 5-13). As a conservative measure, it was assumed that all the TPH's detected at each of sites were from used motor oil, which has the highest concentration of CaPAH's of all the petroleum products reviewed. The published value reflects concentrations that would be present in recently used motor oil. It is anticipated that actual CaPAH concentrations in the soil would be lower than this estimate because a certain proportion of the discharged PAH's would be lost from the soil over time as a result of volatilization, runoff, leaching, and biodegradation.

b) Estimation of Exposure Duration - It was assumed that the same receptors would come into contact with chemicals at a single site on a regular basis for 25 years of their life. In fact, it is highly unlikely that the same individual would perform the same activity consistently for 25 years. This means that the true exposure duration for any one individual would probably be less than 25 years.

c) Estimation of the Number of Hours Per Day that Receptors are Exposed to Contaminants - For sites SS003, SS004 and ST005, it was assumed that receptors would come into contact with contaminated soil at each of the sites for a total of two hours per day. This is considered to be a conservative estimate of potential average daily exposure. It is expected that the actual exposure duration per day would probably be less than this value.

d) Estimation of Dermal and Ingestion Uptake Factors - Dermal and ingestion uptake factors were taken as the estimated absorption factors for benzene. Benzene is a relatively well absorbed hydrocarbon. The actual absorption factors for other petroleum hydrocarbons are expected to be less than that for benzene. In addition, the uptake factor for benzene was estimated based on studies in which humans or animals were exposed to 100% benzene or benzene solutions. The uptake of petroleum hydrocarbons adsorbed to soils is expected to be lower than the uptake rate of liquid hydrocarbon mixtures.

SECTION SIX - SUMMARY AND CONCLUSIONS

6.01 FT002 - NORTH BURN PIT

Data from soil and water samples collected in the North Burn Pit indicate that soils in the North Burn Pit are contaminated with low concentrations of TPH's and lead. There is little potential for the significant migration of on-site chemicals via surface

runoff, dust generation, volatilization, or leaching to groundwater. The baseline risk assessment indicates that, under current conditions, the site poses negligible risk to human health or the environment since access to the site is restricted, use of the site by human receptors is very infrequent, and the site does not provide a favorable habitat or feeding area for potential wildlife receptors.

6.02 SS003 - OIL SATURATED AREA

Analytical data from soil samples collected at the site indicate that there is a contamination of surface soils at the Oil Saturated Area with lead and TPH's. Soil and water samples collected at downgradient locations with respect to surface runoff suggest that the contamination is confined to the immediate vicinity of the oil-stained area at the site. An RME cancer risk for TPH exposure for workers at the site of 2.1E-06 was calculated. It should be noted that this risk estimate was calculated under highly conservative exposure assumptions, and has a very high probability of overestimating potential health risks to workers. Removal or isolation of the oil-stained soils would minimize the potential for future exposures at SS003.

6.03 SS004 - HAZARDOUS WASTE DRUM STORAGE

The data from soil and water samples collected at the site indicate that surface soils at the Hazardous Waste Drum Storage are contaminated with concentrations of TPH's. The data suggest that there has not been significant off-site migration of contaminants from the site in surface runoff. An RME cancer risk of 1.0E-06 was calculated for SS004. It should be noted that this risk estimate was calculated under highly conservative exposure assumptions, and has a very high probability of overestimating potential health risks to workers. A hot spot outside the northwestern fenceline with relatively high concentrations of TPH in surface soils was identified. Removal of this hot spot should be evaluated.

6.04 ST005 - POL STORAGE YARD

The data collected by the USACE indicate that surface and subsurface soils at the POL Storage Yard are contaminated by TPH's. The likely source of the TPH's is JP-4 jet fuel or fuel oil discharged from the fuel storage tanks and spillage during fuel transfer to tankers at the fuel transfer stations (E&E 1988). Based on current conditions, a lifetime cancer risk of 4.3E-07 was calculated for workers exposed to contaminants at the POL Storage Yard. This suggests that, based on the available data, soil contaminants present at the POL Storage Yard do not currently pose a significant risk to human health. The data from soil and groundwater samples collected by E&E and O'Brien & Gere at the POL Storage Yard suggest that there had not been a significant migration of contaminants to groundwater or to surface water via

surface runoff. However, the groundwater at the site is relatively shallow and there is a potential for on-site contaminants to migrate to groundwater and discharge to the creek. In addition, contaminants may discharge to the creek in surface runoff. The potential discharge of contaminants to the creek may have an adverse effect on biota in the creek and marshy area, and other organisms that utilize the creek and marshy area. Control of potential future discharges of petroleum products to soils at the POL Storage Yard would diminish the potential for adverse environmental impacts related to activities at the POL Storage Yard.

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SITE IDENTIFICATION CODE CROSS-REFERENCE

Early on during the Installation Restoration Program, sites were identified by various names and numbers, depending on the description the contractor selected. During the latter part of this RI, all the sites were given Official identification codes and names. Presented below are the official names of the sites in this study and various aliases the reader will come across in the appendices.

OFFICIAL NAME	ALIASES
North Burn Pit, FT002	* North Burn Pit Area * Burn Pit Area * Site 6
Oil Saturated Area, SS003	* Site 9
Hazardous Waste Drum Storage, SS004	* Hazardous Waste Drum Storage Area * Site 10
POL Storage Yard, ST005	* POL Storage Area * POL Storage Yard Area * Site 12

APPENDIX A

O'BRIEN & GERE ENGINEERS ANALYTICAL DATA

ANALYTICAL PACKAGE

Richards-Gebaur Air Force Base

Belton, Missouri

Volume 1 of 1

Sediment and Water Samples Collected August 7th-10th, 1989

Prepared for: O'Brien & Gere Engineers, Inc.
5000 Cedar Plaza Parkway
Suite 211
St. Louis, Missouri 63128

Prepared by: OBG Laboratories, Inc.
1304 Buckley Road
Syracuse, New York 13221

Authorized Michael D. Pettrelli

Date 9-21-89

Reviewed [signature]

Date 9-21-89

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NARRATIVE

Introduction/Analytical Results

This Report summarizes the laboratory results for seventeen solid samples and ten water samples collected from the Richards-Gebaur Air Force Base in Belton, Missouri. The samples were collected by O'Brien & Gere Engineers, Inc. and analyzed by OBG Laboratories, Inc. for total metals, volatile organics, polynuclear aromatic hydrocarbons, and percent solids. The analytical results are reported in Section 1 on standard laboratory report forms.

Chain of Custody/Laboratory Chronicle

The samples were collected at the Richards-Gebaur Air Force Base in Belton, Missouri and shipped in coolers by Federal Express to OBG Laboratories, Inc. in Syracuse, New York. The chain of custody forms documenting this transfer and the case file which describes the condition of the shipment is presented in Section 2.

When the samples were received by the laboratory, the sample coordinators inspected and processed the samples for analysis. The samples were then placed in a walk-in cooler and were signed in and out by the chemists and technicians performing the tests. The sample control record which documents this process is also included in Section 2.

Methodology

The following references were utilized to perform the analyses:

PARAMETER	METHOD	REFERENCE
Metals Digestion		
solid	3050	(1)
water	3010/3020	(1)
Arsenic	7060	(1)
Selenium	7740	(1)
Mercury	7470/7471	(1)
All Other Metals	6010	(1)
Volatile Organics	8240	(1)
Polynuclear Aromatics	8270	(1)
Percent Solids	209F	(2)

1). Test Methods for Evaluating Solid Wastes, SW-846 Third Edition, November 1986

2.) Standard Methods for the examination of Water and Wastewater, 16th Edition 1985

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Quality Control
The quality control program included matrix spikes, matrix spike duplicates, duplicates, surrogate recoveries, and method blanks. The results are summarized in Section 3.

Raw Data
The raw data was not required for this report. The raw data will be kept on file for five years.

SECTION 1

ANALYTICAL RESULTS

LABORATORIES, INC.

Laboratory Report

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Soils

DATE COLLECTED See Below DATE REC'D See Below DATE ANALYZED

Description	S6S1	S6S2	S6S3	S9S1	S9S2	S6S3	S9S4	S12S1	S12S2	S12S3	S12S4
Date Collected	8-7-89	8-7-89	8-7-89	8-9-89	8-9-89	8-9-89	8-9-89	8-9-89	8-9-89	8-9-89	8-9-89
Date Received	8-8-89	8-8-89	8-8-89	8-10-89	8-10-89	8-10-89	8-10-89	8-10-89	8-10-89	8-10-89	8-10-89
Sample #	I8768	I8769	I8770	I8888	I8889	I8890	I8891	I8892	I8893	I8894	I8895
Total Metals:											
ARSENIC	6.8	6.6	6.1	5.1	6.2	7.6	5.8	13.	5.1	9.0	6.8
BARIUM	270.	230.	270.	160.	220.	400.	260.	240.	180.	300.	320.
CADMIUM	2.3	<1.2	3.4	<2.4*	<1.1	<1.1	<1.2	<1.2	<1.2	<1.2	<1.2
CHROMIUM	46.	22.	56.	18.	23.	27.	29.	24.	23.	40.	30.
LEAD	440.	17.	580.	94.	20.	170.	44.	19.	13.	28.	12.
MERCURY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
SELENIUM	<2.5*	<2.5*	<2.5*	<0.6	<2.5*	<2.5*	<2.5*	<2.5*	<2.5*	<2.5*	<2.5*
SILVER	<1.3	<1.2	<1.3	<2.4*	<1.1	<1.1	<1.2	<1.2	<1.2	<1.2	<1.2
Other Analysis:											
PERCENT TOTAL SOLIDS	78.	81.	76.	82.	89.	89.	86.	82.	82.	81.	81.

UNITS: mg/kg dry weight

Methodology Federal Register — 40 CFR Part 136 October 26, 1984

Units, mg/l (ppm) unless otherwise noted

Comments * The detection limit has been raised due to the presence of matrix interferences.

CHEM Laboratories Inc. an O'Brien & Gere Limited Company
Box 1912 / 1304 Buckley Rd / Syracuse NY / 13221 / (315) 457-1494

Authorized Michael W. Petkewich

Date September 6, 1989

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37 118

Purgeable Priority Pollutants

OBG LABORATORIES, INC.

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S6S1 Soil

SAMPLE NO. I8768 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-11-89

Chloromethane	<13.	t-1,3-Dichloropropene	<6.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<6.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-t,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<13.
t-1,2-Dichloroethene		Bromoform	<6.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Acetone	<13.
Carbon disulfide	<6.
2-Butanone	<13.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<6.

Authorized: Michael U. Pettarelli

Date: September 6, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8708

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: I8708

Sample wt/vol: 5.0 (g/mL) G Lab File ID: [illegible]2909

Level: (low/med) Low Date Received: 08/08/89

% Moisture: not dec. 23 Date Analyzed: 08/11/89

Column: (pack/cap) Pack Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) [illegible]

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S6S2 Soil

SAMPLE NO. I8769 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-11-89

Chloromethane	<12.	t-1,3-Dichloropropene	<6.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<6.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<12.
t-1,2-Dichloroethene		Bromoform	<6.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	<12.
Carbon disulfide	<6.
2-Butanone	<12.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<6.

Authorized: Michael W. Pettelli

Date: September 6, 1989

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37 121
EPA SAMPLE NO.

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

I8769

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: I8769

Sample wt/vol: 5.0 (g/mL) G Lab File ID: [illegible]

Level: (low/med) Low Date Received: 05/09/89

% Moisture: not dec. 19 Date Analyzed: 05/11/89

Column: (pack/cap) PACK Dilution Factor: 1

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S6S3 Soil

SAMPLE NO. I8770 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-11-89

Chloromethane	<13.	t-1,3-Dichloropropene	<6.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	9.	1,1,2-Trichloroethane	
1,1-Dichloroethene	<6.	c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<13.
t-1,2-Dichloroethene		Bromoform	<6.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	<13.
Carbon disulfide	<6.
2-Butanone	<13.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<6.

Authorized: Michael D. Pettavell

Date: September 6, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8770

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8770

Sample wt/vol: 5.0 (g/mL) G Lab File ID: >V29V

Level: (low/med) Low Data Received: 08/08/89

% Moisture: not dec. 24 Data Analyzed: 08/11/89

Column: (pack/cap) PACK Dilution Factor: 1

Number TICs found: 2 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Trichlorofluoromethane	7.32	20	*
2.	UNKNOWN	26.07	7	J
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* Compound quantified as standard

OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S1 Soil

SAMPLE NO. I8888 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-14-89

Chloromethane	<12.	t-1,3-Dichloropropene	<6.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<6.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<12.
t-1,2-Dichloroethene		Bromoform	<6.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	<12.
Carbon disulfide	<6.
2-Butanone	<12.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<6.

Authorized: Michael N. Pettenelli

Date: September 6, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8888

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8888

Sample wt/vol: 5.0 (g/mL) G Lab File ID: [illegible]

Level: (low/med) Low Date Received: 08/0/89

% Moisture: not dec. 18 Date Analyzed: 09/[illegible]/89

Column: (pack/cap) Pack Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) [illegible]

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S2 Soil

SAMPLE NO. I8889 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-14-89

Chloromethane	<11.	t-1,3-Dichloropropene	<6.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<6.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<11.
t-1,2-Dichloroethene		Bromoform	<6.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	<11.
Carbon disulfide	<6.
2-Butanone	<11.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<6.

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Authorized: Michael W. Pettitt

Date: September 6, 1989

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8889

Lab Name: OBG LABORATORIES, INC. Contract: 3608.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: I8889

Sample wt/vol: 5.0 (g/mL) G Lab File ID: [illegible]

Level: (low/med) Low Date Received: 08/10/89

% Moisture: not dec. 11 Date Analyzed: [illegible]

Column: (pack/cap) Pack Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) [illegible]

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8890

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: I8890

Sample wt/vol: 5.0 (g/mL) G Lab File ID: V2923

Level: (low/med) Low Date Received: 08/10/89

% Moisture: not dec. 11 Date Analyzed: 08/10/89

Column: (pack/cap) Pack Dilution Factor: 1

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S4 Soil

SAMPLE NO. I8891 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-15-89

Chloromethane	<12.	t-1,3-Dichloropropene	<6.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<6.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<12.
t-1,2-Dichloroethene		Bromoform	<6.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	6.

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	<12.
Carbon disulfide	<6.
2-Butanone	<12.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<6.

Authorized: Michael N. Pettalli

Date: September 6, 1989

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37 130

EPA SAMPLE NO.

I 8891

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.010.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: I 889

Sample wt/vol: 50 (g/mL) G Lab File ID: >V29930

Level: (low/med) Low Date Received: 05/10/89

% Moisture: not dec. 16 Date Analyzed: 05/15/89

Column: (pack/cap) Pack Dilution Factor: 1

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S1 Soil

SAMPLE NO. I8892 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-15-89

Chloromethane	<12.	t-1,3-Dichloropropene	<6.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<6.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<12.
t-1,2-Dichloroethene		Bromoform	<6.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	18.
Carbon disulfide	<6.
2-Butanone	<12.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<6.

Authorized: Michael K. Pettelli

Date: September 6, 1989

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EPA SAMPLE NO.

I8892

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: I8892

Sample wt/vol: 5.0 (g/mL) G Lab File ID: D12931

Level: (low/med) Low Date Received: 05/10/89

% Moisture: not dec. 18 Date Analyzed: 05/5/89

Column: (pack/cap) Pack. Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S2 Soil

SAMPLE NO. I8893 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-15-89

Chloromethane	<12.	t-1,3-Dichloropropene	<6.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<6.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<12.
t-1,2-Dichloroethene		Bromoform	<6.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	12.
Carbon disulfide	<6.
2-Butanone	<12.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<6.

Authorized: Michael R. Pittelli

Date: September 7, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8593

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8593

Sample wt/vol: 5.0 (g/mL) G Lab File ID: D18932

Level: (low/med) LOW Date Received: 08/16/89

% Moisture: not dec. 18 Date Analyzed: 08/16/89

Column: (pack/cap) PACK Dilution Factor: 1

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S3 Soil

SAMPLE NO. I8894 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-16-89

Chloromethane	<15.	t-1,3-Dichloropropene	<8.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<8.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<15.
t-1,2-Dichloroethene		Bromoform	<8.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	33. B
Carbon disulfide	<8.
2-Butanone	<15.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<8.

Values flagged with a "B" indicate that the analyte was detected in the blank as well as the sample.

Authorized: Michael N. Pettitt

Date: September 7, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
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37 136

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I 8894

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I 8894

Sample wt/vol: 4.0 (g/mL) G Lab File ID: SK 8940

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. 18 Date Analyzed: 08/16/89

Column: (pack/cap) PACK Dilution Factor: 1

Number TICs found: 9

CONCENTRATION UNITS:
(ug/L or ug/Kg) [illegible]

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 4126787	Cyclohepta[illegible], methyl	23.3[illegible]	47	J
2.	UNKNOWN	25.[illegible]	76	J
3.	UNKNOWN	27.[illegible]	61	J
4.	UNKNOWN	28.[illegible]	110	J
5.	UNKNOWN	29.9[illegible]	76	J
6.	UNKNOWN	30.[illegible]	99	J
7. 14676290	heptane 3-ethyl-2-methyl	34.[illegible]	120	J
8.	UNKNOWN	36.[illegible]	44	J
9.	UNKNOWN	39.[illegible]	2[illegible]	J
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S4 Soil

SAMPLE NO. I8895 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-16-89

Chloromethane	<12.	t-1,3-Dichloropropene	<6.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<6.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<12.
t-1,2-Dichloroethene		Bromoform	<6.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Acetone	14. B
Carbon disulfide	<6.
2-Butanone	<12.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<6.

Values flagged with a "B" indicate that the analyte was detected in the blank as well as the sample.

Authorized: Michael K. Pettelli

Date: September 7, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8895

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8895

Sample wt/vol: 5.0 (g/mL) G Lab File ID: >V2942

Level: (low/med) LOW Date Received: 08/16/89

% Moisture: not dec. 19 Date Analyzed: 08/16/89

Column: (pack/cap) PACK Dilution Factor: _____

Number TICs found: 9

CONCENTRATION UNITS:
(ug/L or ug/Kg) [illegible]

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 108872	Cyclohexane methyl	18.45	2[illegible]	T
2.	UNKNOWN	[illegible]	[illegible]	T
3.	UNKNOWN	27.09	3[illegible]	T
4.	UNKNOWN	28.3[illegible]	8.2	T
5.	UNKNOWN	29.97	3[illegible]	
6.	Hydrocarbon type	32.1[illegible]	3[illegible]	T
7. 14670290	Heptane, 3-ethyl-2-methyl	34.7[illegible]	8[illegible]	T
8.	UNKNOWN	36.7	8[illegible]	T
9.	UNKNOWN	39.43	170	T
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S10S2 Soil

SAMPLE NO. I8947 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-21-89

Chloromethane	<12.	t-1,3-Dichloropropene	<6.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<6.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<12.
t-1,2-Dichloroethene		Bromoform	<6.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	<12.
Carbon disulfide	<6.
2-Butanone	<12.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<6.

Authorized: Michael H. Pettitt

Date: September 7, 1989

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Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I 8947

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil

Lab Sample ID: I 8947

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: [illegible]

Level: (low/med) Low

Date Received: 08/[illegible]/89

% Moisture: not dec. 17

Date Analyzed: 08/21/89

Column: (pack/cap) Pack

Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base

S10S3 Soil

SAMPLE NO. I8948 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-21-89

Chloromethane	<47.	t-1,3-Dichloropropene	<24.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	26.	1,1,2-Trichloroethane	
1,1-Dichloroethene	<24.	c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<47.
t-1,2-Dichloroethene		Bromoform	<24.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	90. B
Carbon disulfide	<24.
2-Butanone	<47.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<24.

Values flagged with a "B" indicate that the analyte was detected in the blank as well as the sample.

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Authorized: Michael H. Pettrelli

Date: September 7, 1989

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8948

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: I8948

Sample wt/vol: 1.1 (g/mL) G Lab File ID: 21:29:09

Level: (low/med) Low Date Received: 08/11/89

% Moisture: not dec. 4 Date Analyzed: 08/31/89

Column: (pack/cap) Pac Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base

S10S4 Soil

SAMPLE NO. I8949 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-21-89

Chloromethane	<16.	t-1,3-Dichloropropene	<8.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<8.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<16.
t-1,2-Dichloroethene		Bromoform	<8.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Acetone	87. B
Carbon disulfide	<8.
2-Butanone	<16.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<8.

Values flagged with a "B" indicate that the analyte was detected in the blank as well as the sample.

Authorized: Michael H. Pettarelli

Date: September 7, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8949

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8949

Sample wt/vol: 3.3 (g/mL) G Lab File ID: [illegible]

Level: (low/med) LOW Date Received: [illegible]

% Moisture: not dec. 7 Date Analyzed: [illegible]

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 6 - Burn Pit Area S6S1 Soil

SAMPLE NO. I8768 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-10-89

1,3-Dichlorobenzene	<4300.	Diethylphthalate	<4300.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<22000.
Isophorone		Butyl benzyl phthalate	<4300.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<8600.
Acenaphthylene		Di-n-octylphthalate	<4300.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments: Elevated detection limits due to matrix interferences.

Authorized: Michael W. Pettodi

Date: September 12, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068,016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 6 - Burn Pit Area S6S1 Soil

SAMPLE NO. I8768 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-10-89

2-Chlorophenol	<4300.	2,4,6-Trichlorophenol	<4300.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<22000.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<4300.
2-Methylphenol	↓
4-Methylphenol	
Benzoic Acid	<22000.
4-Chloroaniline	<4300.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<22000.
2-Nitroaniline	↓
3-Nitroaniline	
Dibenzofuran	<4300.
4-Nitroaniline	<22000.

Elevated detection limits due to matrix interferences.

Authorized: Michael N. Pettitt

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8768

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8768DL

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B0898

Level: (low/med) LOW Date Received: 08/08/89

% Moisture: not dec. 23 dec. _____ Date Extracted: 08/10/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 08/22/89

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 10

Number TICs found: 5

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	5.71	4600	J
2.	"	8.24	4000	
3.	"	12.44	2200	
4.	"	13.91	1400	
5.	"	33.79	2000	
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 6 - Burn Pit Area S6S2 Soil

SAMPLE NO. I8769 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-10-89

1,3-Dichlorobenzene	<410.	Diethylphthalate	<410.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<2100.
Isophorone		Butyl benzyl phthalate	<410.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<810.
Acenaphthylene		Di-n-octylphthalate	<410.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Authorized: Michael W. Pettitt

Date: September 12, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 6 - Burn Pit Area S6S2 Soil

SAMPLE NO. I8769 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-10-89

2-Chlorophenol	<410.	2,4,6-Trichlorophenol	<410.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<2200.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<410.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<2100.
4-Chloroaniline	<410.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<2100.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<410.
4-Nitroaniline	<2100.

Authorized: Michael N. Pittelli

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8769

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8769

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B0897

Level: (low/med) LOW Date Received: 08/08/89

% Moisture: not dec. 19 dec. _____ Date Extracted: 08/10/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 08/22/89

GPC Cleanup: (Y/N) N pH: 6.2 Dilution Factor: 1

Number TICs found: 17

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	3.58	180	J B
2.	UNKNOWN C7H14	4.67	590	
3.	UNKNOWN	5.60	360	B
4.	"	5.99	1800	
5.	"	6.14	170	B
6.	"	6.35	250	B
7.	"	6.52	130	B
8.	"	7.87	560	
9.	"	8.21	1100	
10.	"	23.93	4300	
11.	"	24.40	210	
12.	"	27.96	200	
13.	"	29.97	350	
14.	"	31.32	260	
15.	"	37.36	8400	
16.	"	38.31	340	
17.	"	38.60	420	
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LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 6 - Burn Pit Area S6S3 Soil

SAMPLE NO. I8770 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-10-89

1,3-Dichlorobenzene	<4300.	Diethylphthalate	<4300.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<22000.
Isophorone		Butyl benzyl phthalate	<4300.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<8700.
Acenaphthylene		Di-n-octylphthalate	<4300.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments: Elevated detection limits due to matrix interferences.

Authorized: Michael N. Pettrall

Date: September 12, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 6 - Burn Pit Area S6S3 Soil

SAMPLE NO. I8770 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-10-89

2-Chlorophenol	<4300.	2,4,6-Trichlorophenol	<4300.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol	↓	2,4-Dinitrophenol	<22000.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<4300.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<22000.
4-Chloroaniline	<4300.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<22000.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<4300.
4-Nitroaniline	<22000.

Elevated detection limits due to matrix interferences.

Authorized: Michael D. Pettitt

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8770

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8770OL

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B0899

Level: (low/med) LOW Date Received: 08/08/89

% Moisture: not dec. 14 dec. _____ Date Extracted: 08/10/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 08/22/89

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 10

Number TICs found: 5

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	5.71	4900	J
2.		"	8.25	4700	
3.		"	13.91	1800	
4.		"	23.74	1900	
5.		"	23.78	3900	
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FORM I SV-TIC 1/87 Rev.

OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S1 Soil

SAMPLE NO. I8888 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

1,3-Dichlorobenzene	<810.	Diethylphthalate	<810.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<4100.
Isophorone		Butyl benzyl phthalate	<810.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<1600.
Acenaphthylene		Di-n-octylphthalate	<80.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Authorized: Michael N. Pettrell

Date: September 12, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S1 Soil

SAMPLE NO. I8888 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

2-Chlorophenol	<810.	2,4,6-Trichlorophenol	<810.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<4100.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<810.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<4100.
4-Chloroaniline	<810.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<4100.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<810.
4-Nitroaniline	<4100.

Elevated detection limits due to matrix interferences.

Authorized: Michael W. Pittelli

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
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1F

EPA SAMPLE NO.

I8888

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8888D42

Sample wt/vol: 30.0 (g/mL) g Lab File ID: 2B0928

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. 18 dec. _____ Date Extracted: 08/11/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 08/24/89

GPC Cleanup: (Y/N) N pH: 8.0 Dilution Factor: 2

Number TICs found: 7

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN C7H14	4.44	470	J B
2.		UNKNOWN C9H20	5.40	560	B
3.		UNKNOWN	5.59	2700	
4.		"	6.17	370	
5.		"	7.74	510	
6.		"	8.17	2300	
7.		"	9.12	480	
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S2 Soil

SAMPLE NO. I8889 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

1,3-Dichlorobenzene	<370.	Diethylphthalate	<370.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<1900.
Isophorone		Butyl benzyl phthalate	<370.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<750.
Acenaphthylene		Di-n-octylphthalate	<370.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Authorized: Michael N. Pettrell

Date: September 12, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S2 Soil

SAMPLE NO. I8889 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

2-Chlorophenol	<370.	2,4,6-Trichlorophenol	<370.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<1900.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<370.
2-Methylphenol	↓
4-Methylphenol	
Benzoic Acid	<1900.
4-Chloroaniline	<370.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<1900.
2-Nitroaniline	↓
3-Nitroaniline	
Dibenzofuran	<370.
4-Nitroaniline	<1900.

Authorized: Michael A. Pettelli

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F

EPA SAMPLE NO.

I8889

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8889

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B0929

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. 11 dec. _____ Date Extracted: 08/11/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 08/24/89

GPC Cleanup: (Y/N) N pH: 8.0 Dilution Factor: 1

Number TICs found: 18

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	141797	3-PENTEN-2-ONE, 4-METHYL-	4.45	340	J
2.		UNKNOWN C_9H_{10}	5.44	330	B
3.		UNKNOWN	5.64	2300	
4.		"	5.77	350	
5.		"	6.20	320	
6.	2216338	OCTANE, 3-METHYL-	6.37	220	
7.		UNKNOWN	7.74	1600	
8.		"	8.18	1300	
9.		"	10.10	180	
10.		"	10.24	450	
11.	117817	BIS (2-ETHYLHEXYL) PHTHALATE	27.85	200	B
12.		UNKNOWN HYDROCARBON	31.18	220	
13.		UNKNOWN	32.62	340	
14.		UNKNOWN HYDROCARBON	34.17	310	
15.		UNKNOWN	34.36	270	
16.		"	37.61	4200	
17.		"	38.11	1200	
18.		"	38.57	360	
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S3 Soil

SAMPLE NO. I8890 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

1,3-Dichlorobenzene	<370.	Diethylphthalate	<370.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<1900.
Isophorone		Butyl benzyl phthalate	<370.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<750.
Acenaphthylene		Di-n-octylphthalate	<370.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Authorized: Michael D. Pettorelli

Date: September 12, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S3 Soil

SAMPLE NO. I8890 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

2-Chlorophenol	<370.	2,4,6-Trichlorophenol	<370.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<1900.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<370.
2-Methylphenol	↓
4-Methylphenol	
Benzoic Acid	<1900.
4-Chloroaniline	<370.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<1900.
2-Nitroaniline	↓
3-Nitroaniline	
Dibenzofuran	<370.
4-Nitroaniline	<1900.

Authorized: Michael N. Pettitt

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8890

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8890

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B0902

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. 11 dec. _____ Date Extracted: 08/11/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 08/22/89

GPC Cleanup: (Y/N) N pH: 8.0 Dilution Factor: 1

Number TICs found: 15

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	4.67	460	J B
2.	"	5.29	130	
3.	"	5.46	160	
4.	"	5.63	410	
5.	"	5.81	2700	
6.	"	6.15	370	
7.	"	6.37	330	
8.	"	6.54	200	
9.	"	7.99	1200	B
10.	"	8.32	790	
11.	"	26.49	750	
12.	"	27.98	240	
13.	"	30.20	190	
14.	"	37.56	2400	
15.	"	38.37	350	
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S4 Soil

SAMPLE NO. I8891 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

1,3-Dichlorobenzene	<400.	Diethylphthalate	<400.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<2000.
Isophorone		Butyl benzyl phthalate	<400.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<790.
Acenaphthylene		Di-n-octylphthalate	<400.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Authorized: Michael W. Pettitt

Date: September 12, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S4 Soil

SAMPLE NO. I8891 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

2-Chlorophenol	<400.	2,4,6-Trichlorophenol	<400.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol	↓	2,4-Dinitrophenol	<2000.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<400.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<2000.
4-Chloroaniline	<400.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<2000.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<400.
4-Nitroaniline	<2000.

Authorized: Michael N. Pettault

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8891

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8891RE

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >00925

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. 16 dec. _____ Date Extracted: 08/11/89

Extraction: (SepF/Cont/Sonc) - Date Analyzed: 08/24/89

GPC Cleanup: (Y/N) N pH: 8.0 Dilution Factor: 1

Number TICs found: 13

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN C7H14	4.45	460	J B
2.		UNKNOWN C9H20	5.43	410	J
3.		UNKNOWN	5.63	3100	J
4.		"	5.96	290	
5.		"	6.19	360	
6.		"	6.36	240	
7.		"	7.73	990	
8.		"	8.19	2000	
9.		"	10.10	320	
10.		"	10.23	410	
11.	117817	BIS(2-ETHYLHEXYL)PHTHALATE	27.86	280	
12.		UNKNOWN	37.60	6000	
13.		"	38.11	740	Y
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CH2M HILL

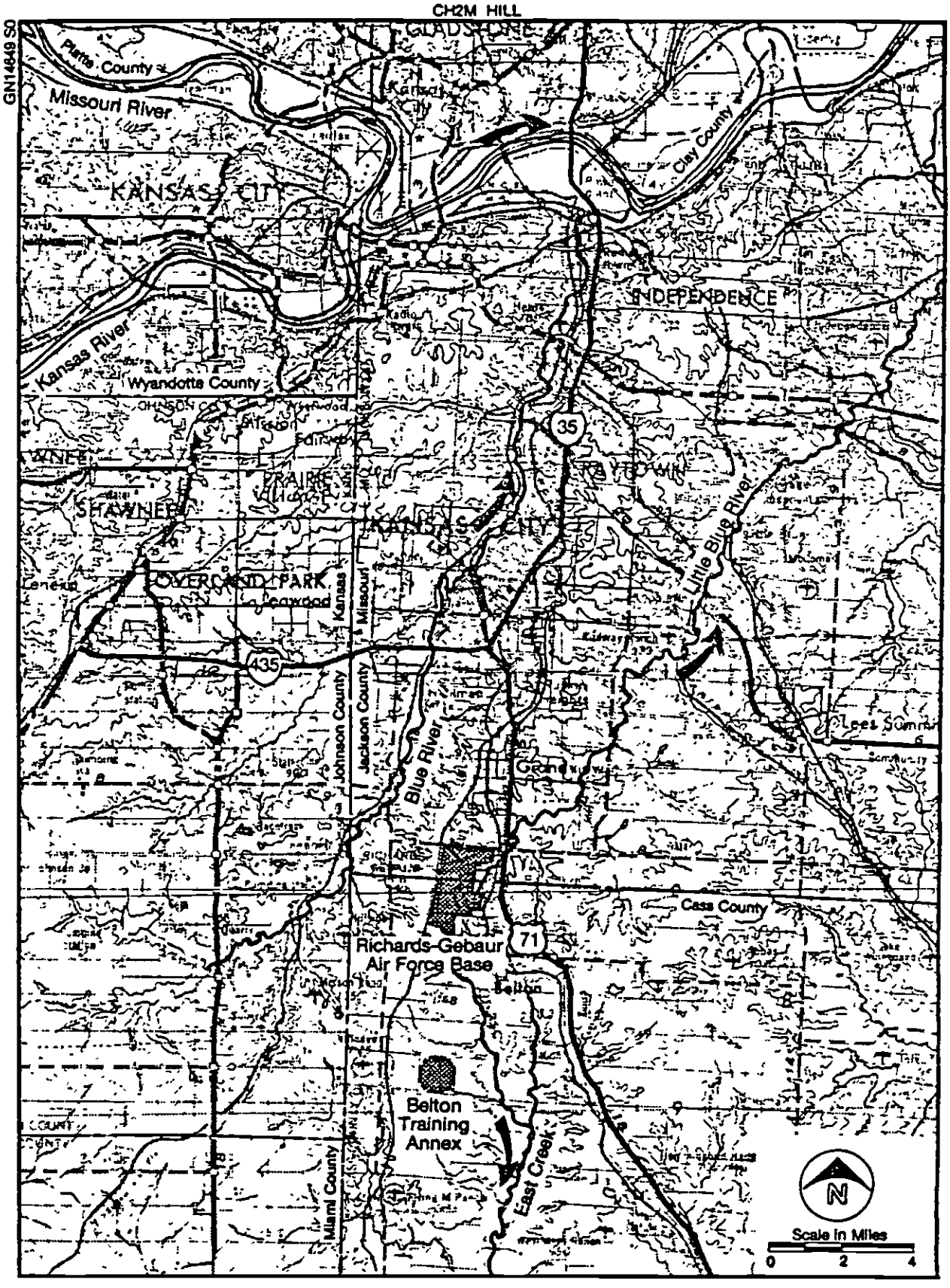

FIGURE 2. Location map of Richards-Gebaur AFB, Missouri.

OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S1 Soil

SAMPLE NO. I8892 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

1,3-Dichlorobenzene	<410.	Diethylphthalate	<410.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<2000.
Isophorone		Butyl benzyl phthalate	<410.
Naphthalene		Bis(2-ethylhexyl)phthalate	1600. B
Bis (2-chloroethoxy) methane		Chrysene	<410.
Hexachlorocyclopentadiene		Benzo(a)anthracene	<410.
2-Chloronaphthalene		3,3-Dichlorobenzidine	<820.
Acenaphthylene		Di-n-octylphthalate	<410.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Values flagged with a "B" indicate that the analyte was detected in the blank as well as the sample.

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Authorized: _____

Date: September 12, 1989

LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S1 Soil

SAMPLE NO. I8892 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

2-Chlorophenol	<410.	2,4,6-Trichlorophenol	<410.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<2000.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<410.
2-Methylphenol	↓
4-Methylphenol	
Benzoic Acid	<2000.
4-Chloroaniline	<410.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<2000.
2-Nitroaniline	↓
3-Nitroaniline	
Dibenzofuran	<410.
4-Nitroaniline	<2000.

Authorized: Michael W. Pettitt

Date: September 13, 1989

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1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I3892

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I3892RE

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B0917

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. 16 dec. _____ Date Extracted: 08/11/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 08/24/89

GPC Cleanup: (Y/N) N pH: 7.7 Dilution Factor: 1

Number TICs found: 12

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN C7H14	4.56	410	J B
2.		UNKNOWN C9H20	5.51	490	B
3.		UNKNOWN	5.73	2500	B
4.	3074713	HEPTANE, 2,3-DIMETHYL-	6.05	260	
5.		UNKNOWN	6.38	330	
6.		"	6.44	260	
7.		"	7.52	870	B
8.		"	8.23	600	
9.		"	10.30	700	
10.		"	13.70	240	
11.		"	20.16	230	
12.		"	37.72	410	
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S2 Soil

SAMPLE NO. I8893 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

1,3-Dichlorobenzene	<410.	Diethylphthalate	<410.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<2000.
Isophorone		Butyl benzyl phthalate	<410.
Naphthalene		Bis(2-ethylhexyl)phthalate	1700. B
Bis (2-chloroethoxy) methane		Chrysene	<410.
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<810.
Acenaphthylene		Di-n-octylphthalate	<410.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments: Values flagged with a "B" indicate that the analyte was detected in the blank as well as the sample.

Authorized: Michael W. Pettardi

Date: September 12, 1989

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OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S2 Soil

SAMPLE NO. I8893 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

2-Chlorophenol	<410.	2,4,6-Trichlorophenol	<410.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<2000.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<410.
2-Methylphenol	↓
4-Methylphenol	
Benzoic Acid	<2000.
4-Chloroaniline	<410.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<2000.
2-Nitroaniline	↓
3-Nitroaniline	
Dibenzofuran	<410.
4-Nitroaniline	<2000.

Authorized: Michael N. Pettitt

Date: September 13, 1989

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1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8893

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.510

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8893

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >80905

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. 18 dec. _____ Date Extracted: 08/11/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 08/22/89

GPC Cleanup: (Y/N) N pH: 7.1 Dilution Factor: 1

Number TICs found: 8

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN C7H14	4.46	490	J B
2. 2216333	OCTANE, 3-METHYL-	5.39	300	
3.	UNKNOWN	5.70	2800	
4.	"	6.20	210	
5.	"	7.85	720	
6.	"	8.26	690	
7.	"	10.63	280	
8.	"	37.81	480	
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S3 Soil

SAMPLE NO. I8894 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

1,3-Dichlorobenzene	<410.	Diethylphthalate	<410.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<2000.
Isophorone		Butyl benzyl phthalate	<410.
Naphthalene		Bis(2-ethylhexyl)phthalate	470. B
Bis (2-chloroethoxy) methane		Chrysene	<410.
Hexachlorocyclopentadiene		Benzo(a)anthracene	<410.
2-Chloronaphthalene		3,3-Dichlorobenzidine	<810.
Acenaphthylene		Di-n-octylphthalate	<410.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Values flagged with a "B" indicate that the analyte was detected in the blank as well as the sample.

Authorized: _____

Date: September 12, 1989

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OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S3 Soil

SAMPLE NO. I8894 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

2-Chlorophenol	<410.	2,4,6-Trichlorophenol	<410.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol	↓	2,4-Dinitrophenol	<2000.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<410.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<2000.
4-Chloroaniline	<410.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<2000.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<410.
4-Nitroaniline	<2000.

Authorized: Michael W. Pettell

Date: September 13, 1989

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1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8894

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8894

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B0912

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. 18 dec. _____ Date Extracted: 08/11/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 08/23/89

GPC Cleanup: (Y/N) N pH: 8.0 Dilution Factor: 1

Number TICs found: 18

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	2.74	1100	J
2.		UNKNOWN C7H14	4.57	500	B
3.	1072055	HEPTANE, 2,6-DIMETHYL-	5.35	190	
4.		UNKNOWN C9H20	5.53	490	B
5.		UNKNOWN	5.73	2500	B
6.		"	6.06	310	B
7.		"	6.28	331	B
8.	2216333	OCTANE, 3-METHYL-	6.44	330	B
9.		UNKNOWN C10H22	7.92	460	
10.		UNKNOWN C10H22	8.07	350	
11.		UNKNOWN	8.24	500	
12.		"	8.33	310	
13.		"	8.73	310	
14.		UNKNOWN C11H24	9.78	710	
15.		UNKNOWN	9.94	190	
16.		"	11.70	150	
17.		"	26.37	290	
18.		"	26.42	400	
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LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S4 Soil

SAMPLE NO. I8895 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

1,3-Dichlorobenzene	<410.	Diethylphthalate	<410.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<2100.
Isophorone		Butyl benzyl phthalate	<410.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<820.
Acenaphthylene		Di-n-octylphthalate	<410.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Authorized: Michael W. Petterelli

Date: September 12, 1989

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Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S4 Soil

SAMPLE NO. I8895 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-11-89

2-Chlorophenol	<410.	2,4,6-Trichlorophenol	<410.
2-Nitrophenol		4-Chloro-3-methylphenol	
Phenol		2,4-Dinitrophenol	<2100.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<410.
2-Methylphenol	
4-Methylphenol	
Benzoic Acid	<2100.
4-Chloroaniline	<410.
2-Methylnaphthalene	
2,4,5-Trichlorophenol	<2100.
2-Nitroaniline	
3-Nitroaniline	
Dibenzofuran	<410.
4-Nitroaniline	<2100.

Authorized: Michael N. Pettault

Date: September 13, 1989

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1F

EPA SAMPLE NO.

I8895

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8895

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B0913

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. 19 dec. _____ Date Extracted: 08/11/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 08/23/89

GPC Cleanup: (Y/N) N pH: 8.0 Dilution Factor: 1

Number TICs found: 17

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	3.48	180	J
2. 141797	3-PENTEN-2-ONE, 4-METHYL-	4.55	510	
3.	UNKNOWN C9H20	5.52	490	B
4.	UNKNOWN	5.73	3600	B
5.	"	6.05	270	B
6.	"	6.28	330	B
7.	UNKNOWN C9H20	6.44	300	B
8.	UNKNOWN	7.52	170	
9.	"	7.81	260	
10. 15869940	OCTANE, 3,6-DIMETHYL	7.91	270	
11.	UNKNOWN C10H22	8.06	180	
12.	UNKNOWN	8.24	900	
13.	UNKNOWN C11H24	9.77	380	
14.	UNKNOWN	10.56	190	
15.	"	26.37	400	
16.	"	26.41	360	
17. 117817	BIS(2-ETHYLHEXYL) PHTHALATE	27.91	350	
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 10 S10S2 Soil

SAMPLE NO. I8947 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-18-89

1,3-Dichlorobenzene	<4000.	Diethylphthalate	<4000.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<20000.
Isophorone		Butyl benzyl phthalate	<4000.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<8000.
Acenaphthylene		Di-n-octylphthalate	<4000.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments: Elevated detection limits due to matrix interferences.

Authorized: Michael N. Pettell

Date: September 12, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 10 S10S2 Soil

SAMPLE NO. I8947 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-18-89

2-Chlorophenol	<4000.	2,4,6-Trichlorophenol	<4000.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol	↓	2,4-Dinitrophenol	<20000.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<4000.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<20000.
4-Chloroaniline	<4000.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<20000.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<4000.
4-Nitroaniline	<20000.

Elevated detection limits due to matrix interferences.

Authorized: Michael N. Pettrall

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8947

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8947DL

Sample wt/vol: 30.0 (g/mL) g Lab File ID: 280977

Level: (low/med) LOW Date Received: 08/11/89

% Moisture: not dec. 17 dec. _____ Date Extracted: 08/18/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 09/01/89

GPC Cleanup: (Y/N) N pH: 7.8 Dilution Factor: 10

Number TICs found: 2

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	4.88	4200	J
2.		"	7.51	2000	J
3.					
4.					
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 10 S10S2 Soil

SAMPLE NO. I8948 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-18-89

1,3-Dichlorobenzene	<35000.	Diethylphthalate	<35000.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<170000.
Isophorone		Butyl benzyl phthalate	<35000.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<69000.
Acenaphthylene		Di-n-octylphthalate	<35000.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments: Elevated detection limits due to matrix interferences.

Authorized: Michael N. Pittelli

Date: September 12, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 10 S10S2 Soil

SAMPLE NO. I8948 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-18-89

2-Chlorophenol	<35000.	2,4,6-Trichlorophenol	<35000.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<170000.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<35000.
2-Methylphenol	↓
4-Methylphenol	
Benzoic Acid	<170000.
4-Chloroaniline	<35000.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<170000.
2-Nitroaniline	↓
3-Nitroaniline	
Dibenzofuran	<35000.
4-Nitroaniline	<170000.

Elevated detection limits due to matrix interferences.

Authorized: Michael N. Pettitt

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

EPA SAMPLE NO.

I8948

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8948DL2

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B0992

Level: (low/med) LOW Date Received: 08/11/89

% Moisture: not dec. 4 dec. _____ Date Extracted: 08/18/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 09/02/89

GPC Cleanup: (Y/N) N pH: 7.8 Dilution Factor: 100

Number TICs found: 3

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN HYDROCARBON	19.02	6800	J
2.	UNKNOWN	19.38	8400	↓
3.	UNKNOWN HYDROCARBON	20.31	12000	↓
4.				
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FORM I SV-TIC 1/87 Rev.

OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 10 S10S4 Soil

SAMPLE NO. I8949 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-18-89

1,3-Dichlorobenzene	<3600.	Diethylphthalate	<3600.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<18000.
Isophorone		Butyl benzyl phthalate	<3600.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<7200.
Acenaphthylene		Di-n-octylphthalate	<3600.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments: Elevated detection limits due to matrix interferences.

Authorized: Michael N. Pettoulli

Date: September 12, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 10 S10S4 Soil

SAMPLE NO. I8949 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-18-89

2-Chlorophenol	<3600.	2,4,6-Trichlorophenol	<3600.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<18000.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<3600.
2-Methylphenol	
4-Methylphenol	↓
Benzoic Acid	<18000.
4-Chloroaniline	<3600.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<18000.
2-Nitroaniline	
3-Nitroaniline	↓
Dibenzofuran	<3600.
4-Nitroaniline	<18000.

Elevated detection limits due to matrix interferences.

Authorized: Michael K. Pettitt

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8949

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: I8949DL

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B0918

Level: (low/med) LOW Date Received: 08/11/89

% Moisture: not dec. 7 dec. _____ Date Extracted: 08/18/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 09/01/89

GPC Cleanup: (Y/N) N pH: 7.9 Dilution Factor: 10

Number TICs found: 2

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	4.87	4400	J
2.		"	7.50	1500	↓
3.					
4.					
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OBG LABORATORIES, INC.

Laboratory R port

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base Waters

DATE COLLECTED See Below DATE REC'D See Below DATE ANALYZED

Description	S6S4	S9S5	S12S5	S13S4	S10S5
Date Collected	8-7-89	8-9-89	8-9-89	8-10-89	8-10-89
Date Received	8-8-89	8-10-89	8-10-89	8-11-89	8-11-89
Sample #	I8771	I8896	I8897	I8945	I8950
Total Metals:					
ARSENIC	<0.005	<0.005	<0.005	<0.005	<0.005
BARIUM	<0.2	<0.2	<0.2	<0.2	<0.2
CADMIUM	<0.01	<0.01	<0.01	<0.01	<0.01
CHROMIUM	<0.05	<0.05	<0.05	<0.05	<0.05
LEAD	<0.05	<0.05	<0.05	<0.05	<0.05
MERCURY	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SELENIUM	<0.005	<0.005	<0.005	<0.005	<0.005
SILVER	<0.01	<0.01	<0.01	<0.01	<0.01

UNITS: mg/l

Methodology Federal Register — 40 CFR Part 136 October 26, 1984

Units mg/l (ppm) unless otherwise noted

Comments.

Authorized Michael H Pettault

Date September 1, 1989

OBG Laboratories Inc an O Brien & Gere Limited Company
Box 4912 / 1304 Buckley Rd / Syracuse, NY / 13221 / (315) 457-1494

90

37 188

DBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT: U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION: Richards-Gebaur Air Force Base

S6S4 Water

SAMPLE NO. I8771 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-17-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
1,1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Pettrell

Date: September 6, 1989

DBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

91

EPA SAMPLE NO.

I8771

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Contract: 3068.016.517

Lab Name: OBG LABORATORIES, INC.

Case No.: _____ SAS No.: _____ SDG No.: _____

Lab Code: _____

Lab Sample ID: I8771

Matrix: (soil/water) WATER

Lab File ID: 21,2947

Sample wt/vol: 5.0 (g/mL) mL

Date Received: 08/08/89

Level: (low/med) LOW

Date Analyzed: 08/17/89

% Moisture: not dec. —

Dilution Factor: 1.0

Column: (pack/cap) PACK

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S6S5 Water

SAMPLE NO. I8772 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-17-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Pettarelli

Date: September 6, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8772

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: I8772

Sample wt/vol: 50 (g/mL) mL Lab File ID: [illegible]

Level: (low/med) LOW Date Received: 08/08/89

% Moisture: not dec. — Date Analyzed: 08/7/89

Column: (pack/cap) PACK Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) [illegible]

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base

S9S5 Water

SAMPLE NO. I8896 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-17-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<10.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael C. Pettelli

Date: September 7, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
I8896

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: I8896

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: >1299

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. — Date Analyzed: 08/17/89

Column: (pack/cap) PACK Dilution Factor: 1

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S6 Water

SAMPLE NO. I8898 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-17-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Pettelli

Date: September 7, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8898

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: I8898

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: >1/2957

Level: (low/med) LOW Date Received: 05/10/89

% Moisture: not dec. — Date Analyzed: 05/10/89

Column: (pack/cap) PACK Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S10S5 Water

SAMPLE NO. I8950 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-17-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

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Authorized: Michael W. Pettinelli

Date: September 7, 1989

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EPA SAMPLE NO.

I 8950

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: I 8950

Sample wt/vol: 50 (g/mL) mL Lab File ID: [illegible]

Level: (low/med) LOW Date Received: 05/11/89

% Moisture: not dec. — Date Analyzed: 05/17/89

Column: (pack/cap) PACK Dilution Factor: 1

Number TICs found: 0

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base

S10S6 Water

SAMPLE NO. I8951 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-24-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Pettelli

Date: September 7, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

T8951

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: T8951

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: V3013

Level: (low/med) LOW Date Received: 05/1/89

% Moisture: not dec. — Date Analyzed: 05/2/89

Column: (pack/cap) PACK Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S5 Water

SAMPLE NO. I8897 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-17-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Pettarelli

Date: September 7, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I 8890

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: I 8890

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: [illegible]

Level: (low/med) LOW Date Received: 05/10/89

% Moisture: not dec. — Date Analyzed: 05/17/89

Column: (pack/cap) PACK Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
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LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S6 Water

SAMPLE NO. I8899 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-17-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael K. Pettelli

Date: September 7, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8899

Lab Name: OBG LABORATORIES, INC. Contract: 3608.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: I8899

Sample wt/vol: 5.0 (g/mL) ml Lab File ID: V12952

Level: (low/med) LOW Date Received: 05/10/89

% Moisture: not dec. — Date Analyzed: 05/17/89

Column: (pack/cap) PACK Dilution Factor: _____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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3.				
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 6 - Burn Pit Area S6S4 Water

SAMPLE NO. I8771 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-10-89

	ppb		ppb
1,3-Dichlorobenzene	<15.	Diethylphthalate	<15.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<77.
Isophorone		Butyl benzyl phthalate	<15.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<31.
Acenaphthylene		Di-n-octylphthalate	<15.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael V. Pettarelli

Date: September 12, 1989

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OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 6 - Burn Pit Area S6S4 Water

SAMPLE NO. I8771 DATE COLLECTED 8-7-89 DATE REC'D. 8-8-89 DATE ANALYZED 8-10-89

	ppb		ppb
2-Chlorophenol	<15.	2,4,6-Trichlorophenol	<15.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<77.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<15.
2-Methylphenol	↓
4-Methylphenol	
Benzoic Acid	<77.
4-Chloroaniline	<15.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<77.
2-Nitroaniline	↓
3-Nitroaniline	
Dibenzofuran	<15.
4-Nitroaniline	<77.

Authorized: Michael N. Petteutti

Date: September 13, 1989

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EPA SAMPLE NO.

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

I8871

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: I8871

Sample wt/vol: 650 (g/mL) mL Lab File ID: B0896

Level: (low/med) LOW Date Received: 08/08/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 08/10/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 08/22/89

GPC Cleanup: (Y/N) N pH: - Dilution Factor: 1

Number TICs found: 3

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	5.76	100	J A
2.	"	19.95	26	↓
3.	"	22.93	8	↓
4.				
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base

S9S5 Water

SAMPLE NO. I8896 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-14-89

	ppb		ppb
1,3-Dichlorobenzene	<10.	Diethylphthalate	<10.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<50.
Isophorone		Butyl benzyl phthalate	<10.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<20.
Acenaphthylene		Di-n-octylphthalate	<10.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: *Federal Register — 40 CFR, Part 136, October 26, 1984*

Comments:

Authorized: Michael N. Petterelli

Date: September 12, 1989

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OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S9S5 Water

SAMPLE NO. I8896 DATE COLLECTED 8-8-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-14-89

	ppb		ppb
2-Chlorophenol	<10.	2,4,6-Trichlorophenol	<10.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol	↓	2,4-Dinitrophenol	<50.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<10.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<50.
4-Chloroaniline	<10.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<50.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<10.
4-Nitroaniline	<50.

Authorized: Michael N. Pettarelli

Date: September 13, 1989

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1F

EPA SAMPLE NO.

I8896

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: I8896

Sample wt/vol: 1000 (g/mL) ML Lab File ID: A58276

Level: (low/med) LOW Date Received: 08/10/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 08/14/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 08/17/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1

Number TICs found: 7

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/l

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	2.83	5	J B
2.		"	3.87	5	B
3.		"	4.77	10	B
4.		"	6.75	9	B
5.		"	7.17	4	
6.	4291796	CYCLOHEXANE 1-METHYL-2-PROP	7.43	4	B
7.	119619	BENZOPHENONE	18.25	4	
8.					
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 10 S10S5 Water

SAMPLE NO. I8950 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-18-89

	ppb		ppb
1,3-Dichlorobenzene	<11.	Diethylphthalate	<11.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<56.
Isophorone		Butyl benzyl phthalate	<11.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<22.
Acenaphthylene		Di-n-octylphthalate	<11.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael N. Pettitt

Date: September 12, 1989

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37 212

Acid Priority Pollutants

OBG LABORATORIES, INC.

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
Site 10 S10S5 Water

SAMPLE NO. I8950 DATE COLLECTED 8-10-89 DATE REC'D. 8-11-89 DATE ANALYZED 8-18-89

	ppb		ppb
2-Chlorophenol	<11.	2,4,6-Trichlorophenol	<11.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol		2,4-Dinitrophenol	<56.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<11.
2-Methylphenol	↓
4-Methylphenol	
Benzoic Acid	<56.
4-Chloroaniline	<11.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<56.
2-Nitroaniline	↓
3-Nitroaniline	
Dibenzofuran	<11.
4-Nitroaniline	<56.

Authorized: Michael U. Pettitt

Date: September 13, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8950

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: I8950

Sample wt/vol: 900 (g/mL) mL Lab File ID: >B0930

Level: (low/med) LOW Date Received: 08/11/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 08/18/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 08/24/89

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1

Number TICs found: 3

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN C7H8	3.58	13	J B
2.		UNKNOWN	5.57	22	J B
3.	119619	BENZOPHENONE	18.89	10	✓
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S5 Water

SAMPLE NO. I8897 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-14-89

	ppb		ppb
1,3-Dichlorobenzene	<13.	Diethylphthalate	<13.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<63.
Isophorone		Butyl benzyl phthalate	<13.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<25.
Acenaphthylene		Di-n-octylphthalate	<13.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael N. Pettrell

Date: September 12, 1989

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OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S5 Water

SAMPLE NO. I8897 DATE COLLECTED 8-9-89 DATE REC'D. 8-10-89 DATE ANALYZED 8-14-89

	ppb		ppb
2-Chlorophenol	<13.	2,4,6-Trichlorophenol	<13.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	↓
Phenol	↓	2,4-Dinitrophenol	<63.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<13.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<63.
4-Chloroaniline	<13.
2-Methylnaphthalene	↓
2,4,5-Trichlorophenol	<63.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<13.
4-Nitroaniline	<63.

Authorized: Michael N. Pettitt

Date: September 13, 1989

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1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

I8897

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: I8897

Sample wt/vol: 790 (g/mL) mL Lab File ID: >38277

Level: (low/med) Low Date Received: 08/10/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 08/14/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 08/17/89

GPC Cleanup: (Y/N) N pH: - Dilution Factor: 1

Number TICs found: 6

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	2.84	7	J B
2.		UNKNOWN C7H8	3.12	5	
3.		UNKNOWN	3.87	6	B
4.		"	4.97	25	B
5.		"	6.76	12	B
6.	4291796	CYCLOHEXANE, 1-METHYL-2-PR	7.44	6	J B
7.					
8.					
9.					
10.					
11.					
12.					
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SECTION 2

CHAIN OF CUSTODY

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3058.01C

SURVEY Richards-Gebner AFB Site C - Burn Pit Area

SAMPLERS: (Signature) Kurt J. Unterstall

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water	Soil Comp.	Soil Grab	Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
	SG51	8/7/89	12:00pm			V			2-4oz	Volatiles EPA 8240
						V			1-8oz	PAH's EPA 8270
						V			1-8oz	Total Metals 6010
										As EPA 7060
										Hg EPA 7470
										Se EPA 7741

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Kurt J. Unterstall		
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by: Linda Smith	Date/Time 8/8/89 10:30
Method of Shipment: U.P.S.		

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37 219

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.016

SURVEY: Richards-Gebaur AFB Site C Burn Pit Area

SAMPLERS: (Signature) Kurt J. Unmatell

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Comp.	SAMPLE TYPE Grab	SAMPLE TYPE Soil	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
	S652	8/7/89	1230		✓			2-4oz	Volatiles EPA 8240
					✓			1-8oz	PAHs EPA 8270
					✓			1-8oz	Total Metals EPA 6010
									As EPA 7060
									Hg " 7470
									Se " 7741

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Kurt J. Unmatell		
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		Wendy Smith	8/8/89 10:30

Method of Shipment: U.P.S.

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37 220

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.016

SURVEY Richards-Gebaur AFB
Site 6 - Burn Pit Area

SAMPLERS: (Signature) Kurt J. Unverstall

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Soil Comp.	Grab.	Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
	S653	8/7/89	12:00 pm		V			2-4oz	Volatiles EPA 8240
					V			1-8oz	PAHs EPA 8270
					V			1-8oz	Total Metals EPA 6010
									As EPA 7060
									Hg EPA 7470
									Se EPA 7741

Relinquished by: (Signature) Kurt J. Unverstall	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by: Wendy Smith	Date/Time 8/8/89 10:30
Method of Shipment: U.P.S.		

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37 221

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.016

SURVEY Richards-Gebaur AFB
Site 6 - Burn Pit Area

SAMPLERS: (Signature) Kurt J. Unterstall

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	SAMPLE TYPE Water Grab	SAMPLE TYPE Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
	SG54	8/7/87	12:15 pm		✓			2-40ml	Volatiles EPA 8240
					✓			2-liter	PAHs EPA 8270
					✓			1000ml	Total Metals EPA 6010
									As 7060
									Hg 7470
									Se 7741
	SG55		11:00am		✓			2-40ml	Volatiles

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Kurt J. Unterstall		
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		[illegible]	8/10/87 [illegible]

Method of Shipment: U.P.S.

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O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.016

SURVEY Richard-Gebaur AFB Site 9-01 Saturated Area

SAMPLERS: (Signature) Kurt J. Unterstall / [illegible]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Comp.	SAMPLE TYPE Grab	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
	S9S1				✓		2-4oz	Volatiles EPA 8240
					✓		1-8oz	PAH's EPA 8270
					✓		1-8oz	Total Metals EPA 6010
								As EPA 7060
								Hg " 7470
								Se " 7741
	S9S2				✓		2-4oz	Volatiles EPA 8240
					✓		1-8oz	PAHs EPA 8270
					✓		1-8oz	Total Metals 6010
								As 7060
								Hg 7470
								Se 7741

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Kurt J. Unterstall		
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by:	Date/Time

Method of Shipment: U.P.S. Next Day Air

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O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.016

SURVEY Richards-Gebaur AFB Site 9 Oil Saturated Area

SAMPLERS: (Signature) Kurt J. Unmentall / [illegible]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	SAMPLE TYPE Soil Grab	SAMPLE TYPE Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
	S9S3				✓			2-4oz	Volatiles EPA 8240
					✓			1-8oz	PAHs EPA 8270
					✓			1-8oz	Total Metals EPA 6010
									As 7060
									Hg 7470
									Se 7741
	S9S4				✓			2-4oz	Volatiles EPA 8240
					✓			1-8oz	PAHs EPA 8270
					✓			1-8oz	Total Metals 6010
									As EPA 7060
									Hg " 7470
									Se " 7741

Relinquished by: (Signature) Kurt J. Unmentall	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by:	Date/Time
Method of Shipment: U.P.S. Next Day Air		

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CHAIN OF CUSTODY RECORD

3068.016

SURVEY Richards-Gebaur AFB
Site 9 - Oil Saturated Area

SAMPLERS: (Signature) Kurt J. Unverzagt / [illegible]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	SAMPLE TYPE Water Grab	SAMPLE TYPE Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
	S9S5				✓			2-40ml	Volatiles (EPA 8240)
					✓			2-liter	PAH's (EPA 8270)
					✓			1000ml	Total Metals (EPA CLP)
									As EPA 7060
									Hg " 7470
									Se " 7741
	S9S6				✓			2-40ml	Volatiles (EPA 8240)

Relinquished by: (Signature) Kurt J. Unverzagt	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by:	Date/Time
Method of Shipment: U.P.S. Next Day Air		

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37 225

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.016

SURVEY Richards-Gebaur AFB
Site 12 - POL Storage Yard

SAMPLERS: (Signature) Kurt J. Unnerstall

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Soil Comp.	Grab.	Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
	S12S4				✓			2-4oz	Volatiles (EPA 8240)
					✓			1-8oz	PAH's (EPA 8270)
					✓			1-8oz	Total Metals (EPA 6010)
									As EPA 7060
									Hg " 7470
									Se " 7741

Relinquished by: (Signature) Kurt J. Unnerstall	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by:	Date/Time
Method of Shipment: U.P.S. Next Day Air		

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O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3008.01C

SURVEY Richards-Gebaur AFB Site 12 - POL Storage Yard

SAMPLERS: (Signature) Kurt J. Unverstall

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Soil Air Comp. Grab	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
	S12S3			✓		2-4oz	Volatiles (EPA 8240)
				✓		1-8oz	PAH's (EPA 8270)
				✓		1-8oz	Total Metals (EPA 6010)
							As EPA 7060
							Hg " 7470
							Se " 7741

Relinquished by: (Signature) Kurt J. Unverstall	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by:	Date/Time

Method of Shipment: U.P.S. Next Day Air

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CHAIN OF CUSTODY RECORD

3068.016

SURVEY Richards-Gebaur AFB
Site 12 - POL Storage Yard

SAMPLERS: (Signature) Kurt J. Unverstall

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water	Soil Comp.	Soil Grab	Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
	S1252					✓			2-4oz	Volatiles EPA 8240
						✓			1-8oz	PAHs EPA 8270
						✓			1-8oz	Total Metals EPA 6010
										As EPA 7060
										Hg " 7470
										Se " 7741

Relinquished by: (Signature) Kurt J. Unverstall	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by:	Date/Time
Method of Shipment: U.P.S. Next Day Air		

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O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.016

SURVEY: Richards-Gebaur AFB Site 12 - POL Storage Yard

SAMPLERS: (Signature) Kurt J. Unverstell

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Soil Comp.	Grab	Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
	S1251				✓			2-4oz	Volatiles EPA 8240
					✓			1-8oz	PAH's EPA 8270
					✓			1-8oz	Total Metals EPA 6010
									As EPA 7060
									Hg " 7470
									Se " 7741

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Kurt J. Unverstell		
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by:	Date/Time
Method of Shipment: U.P.S. Next Day Air		

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37 229

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.016

SURVEY Richards-Gebaur AFB Site 12-POL Storage Yard

SAMPLERS: (Signature) Kurt J. Unnerstall

STATION NUMBER	STATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab.	Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
	S12S5				✓			2-40ml	Volatiles EPA 8240
					✓			2-liter	PAHs EPA 8270
					✓			1000ml	Total Metals EPA 6010
									As EPA 7060
									Hg " 7470
									Se " 7741
	S12S6				✓			2-40ml	Volatiles EPA 8240

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Kurt J. Unnerstall		
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time

Method of Shipment: UPS. Next Day Air

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O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.016

SURVEY Richards-Gebaur AFB Site 10 Haz Waste Drum Storage Area

SAMPLERS: (Signature) Kurt J. Unverstell

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	SAMPLE TYPE Soil Grab	SAMPLE TYPE Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
	S10S2				✓			2-4oz	Volatiles EPA 8240
					✓			1-8oz	PAHs EPA 8270
					✓			1-8oz	Total Metals 6010
									As EPA 7060
									Hg " 7470
									Se " 7741
	S10S3				✓			2-4oz	Volatiles (8240)
					✓			1-8oz	PAHs (8270)
					✓			1-8oz	Total Metals (6010)
									As EPA 7060
									Hg " 7470
									Se " 7741

Relinquished by: (Signature) Kurt J. Unverstell	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) / Date/Time	Received for Laboratory by: Wendy Smith	Date/Time 8/11/89 12:00
Method of Shipment:		

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Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St Louis, MO / White Plains, NY

37 231

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.016

SURVEY Richards-Gebaur AFB
Site 10 Haz Waste Drum Storage Area

SAMPLERS: (Signature) Kurt J. Thurnbell

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Comp.	SAMPLE TYPE Grab (Soil)	SAMPLE TYPE Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
	S10S1				✓			2-4oz	Volatiles EPA 8240
					✓			1-8oz	PAHs EPA 8270
					✓			1-8oz	Total Metals EPA 6010
									As EPA 7060
									Hg " 7470
									Se " 7741
	S10S4				✓			2-4oz	Volatiles 8240
					✓			1-8oz	PAHs 8270
					✓			1-8oz	Total Metals
									As EPA 7060
									Hg " 7470
									Se " 7741

Relinquished by: (Signature) Kurt J. Thurnbell	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by: Wendy Smith	Date/Time 9/11/89 12:00
Method of Shipment:		

O Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St Louis MO / White Plains, NY

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O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

3068.01C

SURVEY Richards-Gebaur AFB
Site 10 Haz Waste Drum Storage Area

SAMPLERS: (Signature) Kurt J. Unterstall

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab	Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
	S1055				✓			2-40ml	Volatiles EPA 8240
					✓			2-liter	PAHs EPA 8270
					✓			1000ml	Total Metals 6010
									As EPA 7060
									Hg " 7470
									Se " 7741
	S1056				✓			2-40ml	Volatiles EPA 8240

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Kurt J. Unterstall		
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		Wendy Smith	8/11/89 12:00

Method of Shipment:

O'Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover MD / New York, NY / St Louis, MO / White Plains, NY

CASE FILE

Survey: Richards AFB (Corp. of Eng.) Date Collected: 8-7-89

Sampler: Kurt Unnerstall Date Received: 8-8-89

Client Name and Ref. # : O'Brien + Gere

Laboratory Number: 3068.016.517

Condition of Shipment: Good, packed well. Some leakage of water from zip lock bags. Cooler and containers did not have a custody seal.

Archive? If so how long ? No.

Signed: Wendy Smith
Sample Coordinator

****

Disposal Procedure*: Routine

Signed: Mark Pettrello
Date: 9-21-89

* The routine disposal procedure for non-hazardous samples is to dispose of the samples 4 weeks after a typed report is signed and mailed to the client. Water samples are filtered through carbon to the sanitary sewer. Solid samples are sent to a sanitary landfill.

CASE FILE

Survey: Richards A.F.B. (COE) Date Collected: 8/8 + 8/9/89

Sampler: Kurt Unnerstall Date Received: 8/10/89

Client Name and Ref. # : O'Brien + Gere 3068.016.

Laboratory Number: 3068.016.517

Condition of Shipment: Good - some jars were labeled as collected on 8/10/89 - we rec'd. these samples via mail on 8/10/89. Per phone conversation w/ K Unnerstall on 8/11/89: samples were all collected on 8/9/89; Chain of custodies do not have any dates listed.

Archive? If so how long ? No.

Signed: Wendy Smith
Sample Coordinator

****

Disposal Procedure*: Routine

Signed: [signature]

Date: 9-21-89

* The routine disposal procedure for non-hazardous samples is to dispose of the samples 4 weeks after a typed report is signed and mailed to the client. Water samples are filtered through carbon to the sanitary sewer. Solid samples are sent to a sanitary landfill.

CASE FILE

Survey: C.O.E.-Richards A.F.B. Date Collected: 8-10-89

Sampler: Kurt Unnerstall Date Received: 8-11-89

Client Name and Ref. # : O'Brien & Gere Ref# 3068.016

Laboratory Number: 3068.016.517

Condition of Shipment: Good. No dates listed on chain of custody; labels are dated as collected on 8/8 + 8/9/89. Per phone conversation w/ K. Unnerstall on 8/11/89 - these samples were collected on 8/10/89.

Archive? If so how long ? No.

Signed: Wendy Smith
Sample Coordinator

****

Disposal Procedure*: Routine

Signed: [illegible]
Date: 9-21-89

* The routine disposal procedure for non-hazardous samples is to dispose of the samples 4 weeks after a typed report is signed and mailed to the client. Water samples are filtered through carbon to the sanitary sewer. Solid samples are sent to a sanitary landfill.

SAMPLE CONTROL RECORD

CLIENT: C.O.E. - Richards A.F.B. DATE REC'D: August 8, 1989

JOB #: 3068.016.517 BIN NUMBER: 53

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED
I8768-71	M. Flynn	8-10-89 8:45 AM	BNA	8-10-89 10:30 AM
I8768-71	K Stone	08/10/89 1406	VOACP ~~1500~~ RA	08/10/89 1500
I8768-70	K. Stone	08/11/89 1059	VOACP	08/11/89 1641
I8768-70	J. Kovacevich	8.11.89 13:45	PCTS	8.11.89 14:45
I8768 → 70	C. Tran	8/14/89 13:00	Hg Analysis	8/14/89 15:00
I8771, I8772	K Stone	08/17/89 1058	VOACP	08/17/89 1301
I8771	C. Tran	8/17/89 15:30	Hg Analysis	8/17/89 16:00
I8768-70	D. Cuvey	8/18/89 16:00	METALS	8/18/89 16:15
I8771	D. Cuvey	8/20/89 12:00	METALS	8/20/89 12:30
I8771	M Toshinski	8/22/89 11:30	metals	8/22/89 2:00

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Sample Custodian Signature: Wendy Smith

Date of Sample Login: August 8, 1989

Airbill Number: None

Client Name: C.D.E.-Richards A.F.B.

Project No.: 3068.016.517

Bin Number : 53

Circle The Appropriate Response:

1) Custody Seal — Present/Absent; Intact/Not Intact

2) Chain-of-Custody — Present/Absent

3) Sample Tags — Present/Absent

4) Sample Tag #'s — Listed/Not Listed

5) SMO Forms — Present/Absent

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks
8-8-89	10:30	—	—	S6S1	I8768	See the attached	case
				S6S2	I8769	file.	
				S6S3	I8770		
				S6S4	I8771		
				S6S5	I8772		

SAMPLE CONTROL RECORD

CLIENT: Co.E.-Richards AFB DATE REC'D: August 10, 1989

JOB #: 3068.016.517 BIN NUMBER: 6 & 10

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED
I8888-95	M. Flynn	8-11-89 10:10 AM	BNA	8-11-89 11 45 AM
I 3338-95	[illegible]	8 11 89 ~~PCTS~~ 13:45	PCTS	8 11-89 14 45
I8896, 97	M. Flynn	8-14-89 1:30 PM	ENA	all sample used
I8888 - I8890	K. Storm	08/14/89 1409	VOACLP	08/14/89 1646
I8888 → I8895	C. Tran	8/14/89 13:00	Hg Analysis	8/14/89 15:00
I8891 - I8893	K. Storm	08/15/89 1321	VOACLP	08/15/89 1648
I8893, 94, 95	K Sto	08/16/89 1340	VOACLP	08/16/89 1848
I8896 - I8897	K Storm	08/17/89 1305	VOACLP	08/17/89 1607
I8896, 97	C. Tran	8/17/89 15:30	Hg Analysis	8/17/89 16:00
I8888-93 I8894-5	D. Cassy	8/18/89 16:15	METALS	8/18/89 16:30
I8896-97	D. Cassy	8/20/89 12:00	METALS	8/20/89 12:30

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Sample Custodian Signature: Wendy Smith

Date of Sample Login: August 10, 1989

Airbill Number: None

Client Name: C.O.E.-Richards AFB

Project No.: 3068.016.517

Bin Number : 6 & 10

Circle The Appropriate Response:

1) Custody Seal — Present/Absent; Intact/Not Intact

2) Chain-of-Custody — Present/Absent

3) Sample Tags — Present/Absent

4) Sample Tag #'s — Listed/Not Listed

5) SMO Forms — Present/Absent

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks
8-10-89	10:00	—	—	5951	I8888	See the attached case file.	
				5952	I8889		
				5953	I8890		
				5954	I8891		
				51251	I8892		
				51252	I8893		
				51253	I8894		
				51254	I8895		
				5955	I8896		
				51255	I8897		
				5956	I8898		
				51256	I8899		

SAMPLE CONTROL RECORD

CLIENT: C.O.E.- Richards A.F.B DATE REC'D: 08/11/89

JOB #: 3008.016.517 BIN NUMBER: 99

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED
I8947-I8949	K. Stan	08/21/89 11:00	VOACLP	08/21/89 1409
I8945 & I8950	M. Tasbandi	8/22/89 1130	metals	8/22/89 2:00
I8949	K. Stan	08/22/89 1335	VOACLP	08/22/89 1658
I8940, I8941	K Stan	08/23/89 932	VOACLP	08/23/89 1350
I8951	K Stan	08/24/89 1531	VOACLP	08/24/89 1632

SAMPLE CONTROL RECORD

CLIENT: C.O.E. - Richards A.F.B. DATE REC'D: 8-11-89

JOB #: 3068.016.617 BIN NUMBER: 99

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED
I8942, 43, 44, 47, 48, 49	D. Kovacs	08 14 89 10:20	PCTS	08. 14 89 11:20
I8942, 43, 44, 47, 48, 49	C. Tran	8/14/89 13:00	Hg Analysis	8/14/89 15:00
I8942-8943	K Stone	08/16/89 1850	VOACIP	08/16/89 2000
I8945 I8946	K Stone	08/17/89 1518	VOACIP	08/17/89 1607
I8942 43	K Stone	08/17/89 1515	VOACIP	08/17/89 1607
I 8950, I8945	C. Tran	8/17/89 15:30	Hg Analysis	8/17/89 16:00
I8942-5 I8947-50	M. Flynn	8-18-89 7:30 Am	SNA	8-18-89 9.00 AM I8945, 50 all used
I8942 I8943 I8944	K Stone	08/18/89 1115	VOACIP	08/18/89 1343
I8947 I8948 I8949	K Stone	08/15/89 1344	VOACIP	08/15/89 1622
I8942-49	D. Conway	8/19/89 14:30	METALS	8/19/89 14:45
I8945, I8950	D. Conway	8/20/89 12:00	METALS	[illegible]

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Sample Custodian Signature: Wendy Smith

Date of Sample Login: August 11, 1989

Airbill Number: 4711783731

Client Name: C.O.E. - Richards A.F.B.

Project No.: 3068.016.517

Bin Number : 99

Circle The Appropriate Response:

1) Custody Seal — Present/Absent; Intact/Not Intact

2) Chain-of-Custody — Present/Absent

3) Sample Tags — Present/Absent

4) Sample Tag #'s — Listed/Not Listed

5) SMO Forms — Present/Absent

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks
8-11-89	12:00	—	—	S13S1	I8942	See the attached	
				S13S2	I8943	case file.	
				S13S3	I8944		
				S13S4	I8945		
				S13S6	I8946		
				S10S2	I8947		
				S10S3	I8948		
				S10S4	I8949		
				S10S5	I8950		
				S10S6	I8951		

ORG LABORATORIES, INC.

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SUBJECT	SHEET	BY	DATE	JOB NO.
C.O.E. - Richards A.F.B.	1/1	WS	8-11-89	3068-016-517

FEDERAL EXPRESS

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL
PACKAGE TRACKING NUMBER 4711783731

4711783731

RECIPIENT'S COPY

Date 8/11/89

1 From (Your Name) Please Print: O'Brien & Gere (Kent Smith) Your Phone Number (Very Important): 682-4000

2 To (Recipient's Name) Please Print: ORG Laboratories Recipient's Phone Number (Very Important): (315) 451-1700

Company: O'Brien & Gere Engineers Department/Floor No.

Company: ORG Laboratories Department/Floor No.

Street Address: 5000 Cedar Plaza

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 1304 Buckley Rd

City: St. Louis State: MO ZIP Required: 63128

City: Syracuse State: NY ZIP Required: 13221

3 YOUR BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice)

4 IF HOLD FOR PICK-UP, Print FEDEX Address Here: Street Address / City / State / ZIP Required

PAYMENT 1 [X] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash

5 SERVICES (Check only one box)

Priority Overnight Service (Delivery by next business morning†): 11 [X] YOUR PACKAGING; 10 [ ] FEDEX LETTER*; 12 [ ] FEDEX PAK*; 13 [ ] FEDEX BOX; 14 [ ] FEDEX TUBE

Standard Overnight Service (Delivery by next business afternoon†): 51 [ ]; 56 [ ] FEDEX LETTER*; 52 [ ] FEDEX PAK*; 53 [ ] FEDEX BOX; 54 [ ] FEDEX TUBE

Economy Express Service (Formerly Standard Air) (Delivery by second business day†): 30 [ ] ECONOMY EXPRESS

Heavyweight Service (for Extra Large or any package over 150 lbs.): 70 [ ] HEAVYWEIGHT**; 80 [ ] DEFERRED HEAVYWEIGHT**

†Delivery commitment may be delay in some areas. *Declared Value Limit $500. **Call for delivery schedule.

DELIVERY AND SPECIAL HANDLING

1 [ ] HOLD FOR PICK-UP
2 [X] DELIVER WEEKDAY
3 DELIVER SATURDAY (Extra charge) [ ]
4 [ ] DANGEROUS GOODS (Extra charge)
5 [ ] CONSTANT SURVEILLANCE SVC. (CSS) (Extra charge)
6 [ ] DRY ICE
7 [ ] OTHER SPECIAL SERVICE
8 [ ]
9 [ ] SATURDAY PICK-UP (Extra charge)
10 [ ]
11 [ ] DESCRIPTION
12 [ ] HOLIDAY DELIVERY (Extra charge)

Packages	Weight	Total Declared Value	Pickup Rate
1	38		
1	35		
1			
Total 2	Total 73	Total	

DIM SHIPMENT (Heavyweight Services Only) [ ]

Received At: [ ] Regular Stop [ ] On-Call Stop [ ] Drop Box [ ] B.S.C. [ ] Station

FedEx Emp. No.

Emp. No. / Date

[ ] Cash Received
[ ] Return Shipment
[ ] Third Party [ ] Chg. To Dist. [ ] Chg. To Host

Street Address

City / State / Zip

Received By

Date/Time Received / FedEx Employee Number

6 Recipient Signature

Federal Express Use: Base Charges / Declared Value Charge / Other 1 / Other 2 / Total Charges

REVISION DATE 8/89 PART #119500 SRC#F 7/89 FORMAT #014

014

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SECTION 3

QUALITY CONTROL

OBG LABORATORIES, INC.

Laboratory Report

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base Quality Control Summary

Trace Metals: Matrix Spike, Duplicate and Method Blank

DATE COLLECTED 8-7-9-89 DATE REC'D 8-8-10-89 DATE ANALYZED See Below

PARAMETER	MATRIX	DATE ANALYZED	LABORATORY NUMBER OF SPIKED SAMPLE	SPIKED SAMPLE RESULT (SSR)	SAMPLE RESULT (SR)	SPIKE ADDED (SA)	SPIKE (%R)	LABORATORY NUMBER OF DUPLICATE SAMPLE	SAMPLE RESULT (S)	DUPLICATE RESULT (D)	DUPLICATE RPD	METHOD BLANK
ARSENIC	Water	8-22-89	18771	0.042	<0.005	0.04	105.	18896	<0.005	<0.005	-	<0.005
BARIUM				0.093	<0.2	0.1	93.		<0.2	<0.2	-	<0.2
CADMIUM				0.0873	<0.01	0.1	87.		<0.01	<0.01	-	<0.01
CHROMIUM				0.082	<0.05	0.1	82.		<0.05	<0.05	-	<0.05
LEAD				0.120	<0.05	0.1	120.		<0.05	<0.05	-	<0.05
MERCURY		8-18-89		0.00122	<0.0005	0.001	122.		<0.0005	<0.0005	-	<0.0005
SELENIUM				0.014	<0.005	0.01	140.		<0.005	<0.005	-	<0.005
SILVER				0.901	<0.01	1.0	90.		<0.01	<0.01	-	<0.01

NOTES: 1) Spike % Recovery = $\frac{(SSR - SR)}{SA} \times 100$

2) Duplicate RPD = $\frac{|S - D|}{(S+D)/2} \times 100\%$

UNITS: mg/l

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Units mg/l (ppm) unless otherwise noted

Comments:

Authorized: Michael U. Pettelli

Date September 6, 1989

OBG Laboratories, Inc. an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd / Syracuse NY / 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Laboratory Report

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base Quality Control Summary

Trace Metals: Matrix Spike, Duplicate and Method Blank

DATE COLLECTED 8-7-89 DATE REC'D 8-8-89 DATE ANALYZED See Below

PARAMETER	MATRIX	DATE ANALYZED	LABORATORY NUMBER OF SPIKED SAMPLE	SPIKED SAMPLE RESULT (SSR)	SAMPLE RESULT (SR)	SPIKE ADDED (SA)	SPIKE (%R)	LABORATORY NUMBER OF DUPLICATE SAMPLE	SAMPLE RESULT (S)	DUPLICATE RESULT (D)	DUPLICATE RPD	METHOD BLANK
ARSENIC	soil	8-22-89	I8768	11.8	6.8	5.12	98.	I8768	6.8	6.5	4.5	<0.5
BARIUM		8-22-89		523.	270.	256.	99.		270.	270.	0.0	<20.
CADMIUM				7.86	2.3	6.4	87.		2.3	2.1	9.1	<1.
CHROMIUM				59.1	46.	25.6	51.		46.	45.	2.2	<5.
LEAD				414.	440.	64.	-		440.	360.	20.	<5.
MERCURY		8-15-89		0.644	<0.5	0.641	100.		<0.5	<0.5	-	<0.5
SELENIUM		8-22-89		<2.5	<2.5	1.3	-		<2.5	<2.5	-	<0.5
SILVER		8-22-89		6.18	<1.3	6.4	97.		<1.3	<1.3	-	<1.

NOTES: 1) Spike % Recovery = $\frac{(SSR - SR)}{SA} \times 100$

2) Duplicate RPD = $\frac{|S - D|}{(S+D)/2} \times 100\%$

UNITS: mg/kg dry weight

Methodology Federal Register — 40 CFR, Part 136, October 26 1984

Units. mg/l (ppm) unless otherwise noted

Comments.

Authorized Michael H. Pettell

Date September 6, 1989

OBG Laboratories Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd / Syracuse NY / 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Laboratory Report

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base
S12S2, Matrix Spike, Matrix Spike Duplicate for Soils

DATE COLLECTED 8-9-89 DATE REC'D 8-10-89 DATE ANALYZED 8-15-89

	UNITS	LAB # OF SPIKED SAMPLE	CONC. OF SPIKE	SAMPLE RESULT	CONC. MS	% REC.	CONC. MSD	% REC.	RPD %
1,1-DICHLOROETHENE	µg/kg wet weight	18893	50.0	<5.	50.9	102.	51.4	103.	1.
TRICHLOROETHENE					48.0	96.	49.0	98.	2.
BENZENE					48.8	98.	50.3	101.	3.
TOLUENE					49.9	100.	50.1	100.	1.
CHLOROBENZENE					49.2	98.	50.5	101.	3.

Methodology. Federal Register — 40 CFR, Part 136, October 26, 1984

Units mg/l (ppm) unless otherwise noted

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
RPD = RELATIVE PERCENT DIFFERENCE

Comments.

Authorized: Michael N. Pettaulli

Date September 6, 1989

OBG Laboratories Inc. an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd / Syracuse, NY / 13221 / (315) 457-1494

2D
SOIL SEMIVOLATILE SURROGATE RECOVERY

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Lab Name: OBG LABORATORIES, INC. Contract: 3068.016 517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Level: (low/med) LOW

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01	SBLK0810891S	90	88	98	85	71	41		0
02	SBLK0811891S	86	90	90	80	95	85		0
03	SBLK0818891S	78	78	87	71	83	74		0
04	I8768 DL	90	98	142*	96	111	77		1
05	I8769	84	86	92	82	98	92		0
06	I8770 DL	90	100	144*	94	110	83		1
07	I8888	90	82	168*	94	106	90		1
08	I8888 DL	90	98	136	86	105	102		0
09	I8889	84	90	110	86	96	92		0
10	I8890	86	82	128	88	104	90		0
11	I8891 RE	88	88	112	87	96	94		0
12	I8891	88	86	160*	95	106	90		1
13	I8892	78	86	106	84	93	55		0
14	I8892 RE	86	90	84	85	90	81		0
15	I8893	84	82	118	87	102	[illegible]		0
16	I8894	90	88	84	85	90	87		0
17	I8895	90	92	98	87	92	92		0
18	I8942 DL	68	104	96	87	95	105		0
19	I8943 DL	88	102	88	82	98	77		0
20	I8944 DL	104	112	92	97	114	101		0
21	I8893 MS	84	84	80	91	95	92		0
22	I8893 MSD	86	86	86	89	91	92		0
23	I8947 DL	80	78	88	78	83	72		0
24	I8949 DL	74	72	102	75	80	68		0
25	I8948 DL2	74	108	122	56	64	84		0
26	I8948	82	88	128	74	84	65		0
27									
28									
29									
30									

		QC LIMITS
S1 (NBZ)	= Nitrobenzene-d5	(23-120)
S2 (FBP)	= 2-Fluorobiphenyl	(30-115)
S3 (TPH)	= Terphenyl-d14	(18-137)
S4 (PHL)	= Phenol-d5	(24-113)
S5 (2FP)	= 2-Fluorophenol	(25-121)
S6 (TBP)	= 2,4,6-Tribromophenol	(19-122)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

FORM II SV-2

1/87 Rev.

LABORATORIES, INC.

Laboratory Report

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base

QA/QC Summary; Semivolatile Organics Matrix Spike & Matrix Spike Duplicate

DATE COLLECTED 8-9-89 DATE REC'D 8-10-89 DATE ANALYZED 8-11-89

	UNITS	LAB # OF SPIKED SAMPLE	CONC. OF SPIKE ADDED	SAMPLE RESULT	CONC. MS	% REC.	CONC. MSD	% REC.	% RPD
PHENOL	µg/kg dry weight	18893	4060.	<410.	3130.	77.	2960.	73.	6.
2-CHLOROPHENOL			4060.		3090.	76.	2950.	73.	5.
1,4-DICHLOROBENZENE			2030.		1770.	87.	1680.	82.	5.
N-NITROSO-DI-N-PROPYLAMINE					1790.	88.	1660.	82.	8.
1,2,4-TRICHLOROBENZENE					1800.	88.	1760.	86.	4.
4-CHLORO-3-METHYLPHENOL			4060.		3250.	80.	3140.	77.	3.
ACENAPHTHENE			2030.		1720.	84.	1690.	83.	2.
4-NITROPHENOL			4060.	<2000.	3580.	88.	3320.	82.	7.
2,4-DINITROTOLUENE			2030.	<410.	1630.	80.	1620.	80.	1.
PENTACHLOROPHENOL			4060.	<2000.	3840.	95.	3230.	80.	17.
DI-N-BUTYLPHTHALATE			2030.	<410.	1810.	89.	1780.	88.	2.
PYRENE			2030.	<410.	1680.	83.	1640.	80.	2.

Methodology. Federal Register — 40 CFR, Part 136 October 26 1984

Units. mg/l (ppm) unless otherwise noted

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLCIATE
RPD = RELATIVE PERCENT DIFFERENCE

Comments.

OBG Laboratories Inc., an O'Brien & Gere Limited Company
Box 4915 / 1304 Buckley Rd / Syracuse, NY / 13221 / (315) 457 1494

Authorized Michael W. Pettelle

Date September 12, 1989

2B
SOIL VOLATILE SURROGATE RECOVERY

Name: OBG Laboratories, Inc. Contract: 3068.016.517

Code: ----- Case No.: - SAS No.: - SDG No.: -

Matrix: (low/med) LOW

	EPA SAMPLE NO.	S1 (TOL)#	S2 (BFB)#	S3 (DCE)#	OTHER	TOT OUT
01	VBLK081101	104	107	97		0
02	I8768	127 *	90	101		1
03	I8769	109	103	102		0
04	I8770	127 *	88	102		1
05	I8768RE	136 *	80	98		1
06	I8770RE	130 *	85	102		1
07	VBLK081401	106	109	98		0
08	I8888	112	99	101		0
09	I8890	116	96	103		0
10	I8889	114	98	104		0
11	VBLK081501	100	105	99		0
12	I8891	112	98	99		0
13	I8892	111	93	98		0
14	I8893	103	110	102		0
15	VBLK081601	103	104	98		0
16	I8893MS	102	99	98		0
17	I8893MSD	102	104	101		0
18	I8894	93	114	100		0
19	I8895	90	109	100		0
20	VBLK081801	104	106	100		0
21	I8943	114	95	103		0
22	VBLK082101	108	109	100		0
23	I8947	116	91	102		0
24	I8948	114	99	101		0
25	I8949	126 *	82	102		1
26	VBLK082201	106	108	102		0
27	I8949RE	120 *	88	100		1
28						
29						
30						

	QC LIMITS
S1 (TOL) = Toluene-d8	(81-117)
S2 (BFB) = Bromofluorobenzene	(74-121)
S3 (DCE) = 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

ANALYTICAL PACKAGE

Richards-Gebaur Air Force Base

Belton, Missouri

Volume 1 of 1

Sediment and Water Samples Collected September 13-15th, 1989

Prepared for: O'Brien & Gere Engineers, Inc.
5000 Cedar Plaza Parkway
Suite 211
St. Louis, Missouri 63128

Prepared by: OBG Laboratories, Inc.
1304 Buckley Road
Syracuse, New York 13221

Authorized Michael N. Pettitt

Date 11-1-89

Reviewed [illegible]

Date 11-1-89

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NARRATIVE

Introduction/Analytical Results

This Report summarizes the laboratory results for one solid sample and twenty water samples collected from the Richards-Gebaur Air Force Base in Belton, Missouri. The samples were collected by O'Brien & Gere Engineers, Inc. and analyzed by OBG Laboratories, Inc. for total metals, volatile organics, polynuclear aromatic hydrocarbons, and percent solids. The analytical results are reported in Section 1 on standard laboratory report forms.

Chain of Custody/Laboratory Chronicle

The samples were collected at the Richards-Gebaur Air Force Base in Belton, Missouri and shipped in coolers by Federal Express to OBG Laboratories, Inc. in Syracuse, New York. The chain of custody forms documenting this transfer and the case file which describes the condition of the shipment is presented in Section 2.

When the samples were received by the laboratory, the sample coordinators inspected and processed the samples for analysis. The samples were then placed in a walk-in cooler and were signed in and out by the chemists and technicians performing the tests. The sample control record which documents this process is also included in Section 2.

Methodology

The following references were utilized to perform the analyses:

PARAMETER	METHOD	REFERENCE
Metals Digestion		
solid	3050	(1)
water	3010/3020	(1)
Arsenic	7060	(1)
Selenium	7740	(1)
Mercury	7470/7471	(1)
All Other Metals	6010	(1)
Volatile Organics	8240	(1)
Polynuclear Aromatics	8270	(1)
Percent Solids	209F	(2)

1). Test Methods for Evaluating Solid Wastes, SW-846 Third Edition, November 1986

2.) Standard Methods for the examination of Water and Wastewater, 16th Edition 1985

Quality Control
The quality control program included a matrix spike, a matrix spike duplicate, a duplicate, surrogate recoveries, and a method blank. The results are summarized in Section 3.

Raw Data
The raw data was not required for this report. The raw data will be kept on file for five years.

OBG LABORATORIES, INC.

Laboratory Report

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Waters

DATE COLLECTED See Below DATE REC'D See Below DATE ANALYZED

Description	605	607	608	1205	1208	1206	1210	609	1207	1209	604	606	GMW4
Date Collected	9-13-89	9-13-89	9-13-89	9-14-89	9-14-89	9-14-89	9-14-89	9-14-89	9-14-89	9-14-89	9-15-89	9-15-89	9-15-89
Date Received	9-14-89	9-14-89	9-14-89	9-18-89	9-18-89	9-18-89	9-18-89	9-18-89	9-18-89	9-18-89	9-18-89	9-18-89	9-18-89
Sample #	J0457	J0458	J0459	J0644	J0645	J0646	J0647	J0686	J0687	J0688	J0689	J0690	J0691
Total Metals:													
SILVER	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ARSENIC	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	0.005	0.026	0.023	<0.005
BARIUM	0.8	0.4	0.6	1.1	1.9	0.8	<0.2	<0.2	1.5	1.7	0.7	0.8	0.5
CADMIUM	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CHROMIUM	<0.05	0.11	<0.05	0.09	0.37	0.07	<0.05	<0.05	0.24	0.36	0.18	0.29	<0.05
MERCURY	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LEAD	<0.05	0.11	0.07	0.15	0.20	0.07	<0.05	<0.05	0.26	0.28	0.12	0.20	<0.05
SELENIUM	<0.05*	<0.05*	<0.05*	<0.05*	<0.05*	<0.05*	<0.005	<0.005	<0.05*	<0.05*	<0.005	<0.005	<0.005

UNITS: mg/l

Methodology. Federal Register — 40 CFR, Part 136, October 26, 1984

Units mg/l (ppm) unless otherwise noted

Comments. *The detection limit has been raised due to the presence of matrix interferences.

OBG Laboratories Inc an O Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd / Syracuse NY / 13221 / (315) 457-1494

Authorized Michael N. Pettrull

Date October 10, 1989

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Laboratory Report

OBG LABORATORIES, INC.

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Soil
S10S1

DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED

Sample #	J0695				
Total Metals:					
SILVER	<1.3				
ARSENIC	8.7				
BARIUM	120				
CADMIUM	<1.3				
CHROMIUM	23				
MERCURY	<0.5				
LEAD	50				
SELENIUM	<5.*				
Other Analysis:					
PERCENT TOTAL SOLIDS	75				
				UNITS:	mg/kg dry weight

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Units: mg/ℓ (ppm) unless otherwise noted

Comments: *The detection limit has been raised due to the presence of matrix interferences.

Authorized: Michael W. Pottell

Date: October 10, 1989

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Purgeable Priority Pollutants

OBG LABORATORIES, INC.

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
605

SAMPLE NO. J0457 DATE COLLECTED 9-13-89 DATE REC'D. 9-14-89 DATE ANALYZED 9-18-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

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Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

Authorized: Michael D. Pettarelli

Date: October 10, 1989

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EPA SAMPLE NO.

J0457

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0457

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 21 3126

Level: (low/med) LOW Date Received: 09/14/89

% Moisture: not dec. 100 Date Analyzed: 09/18/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 7

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	10.73	9	J
2. 75832	BUTANE 2,2-dimethyl	13.25	39	J
3.	UNKNOWN	15.02	22	J
4.	UNKNOWN	15.83	6	J
5.	UNKNOWN	18.35	12	J
6.	UNKNOWN	19.50	30	J
7.	UNKNOWN hydrocarbon	21.90	110	J
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FORM I VOA-TIC 1/87 Rev.

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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
607

SAMPLE NO. J0458 DATE COLLECTED 9-13-89 DATE REC'D. 9-14-89 DATE ANALYZED 9-18-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

Authorized: Michael D. Pettenuti

Date: October 10, 1989

37 260

EPA SAMPLE NO.

JO458

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.S7

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JO458

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 21.3127

Level: (low/med) LOW Date Received: 09/14/89

% Moisture: not dec. 100 Date Analyzed: 09/19/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 608

SAMPLE NO. J0459 DATE COLLECTED 9-13-89 DATE REC'D. 9-14-89 DATE ANALYZED 9-18-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Pettelli

Date: October 10, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

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EPA SAMPLE NO.

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

J04459

Lab Name: OBG LABORATORIES, INC. Contract: 3068.010.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J04459

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 21/3128

Level: (low/med) LOW Date Received: 09/14/89

% Moisture: not dec. 100 Date Analyzed: 09/18/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 5

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	79298	BUTANE, 2,3-dimethyl	13.22	13	J
2.		UNKNOWN	15.02	7	J
3.	565593	PENTANE, 2,3-dimethyl	15.32	18	J
4.		UNKNOWN HYDROCARBON	19.50	75	J
5.		UNKNOWN	21.87	3	J
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
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30.					

OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
610 Travel Blank

SAMPLE NO. J0460 DATE COLLECTED 9-13-89 DATE REC'D. 9-14-89 DATE ANALYZED 9-18-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael K. Pettevell

Date: October 10, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
JC460

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC460

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 3129

Level: (low/med) LOW Date Received: 09/14/89

% Moisture: not dec. 100 Date Analyzed: 09/18/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1205

SAMPLE NO. J0644 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-18-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael W. Pettitt

Date: October 10, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
JC6W

Lab Name: OBG LABORATORIES, INC. Contract: 3068016 517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC6W

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: >V3130

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/18/89

Column: (pack/cap) Pack Dilution Factor: 1.0

Number TICs found: 9

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	10.73	150	J
2.	UNKNOWN	13.84	15	J
3. 79298	BUTANE, 2,3-dimethyl	15.02	17	J
4.	UNKNOWN	15.83	5	J
5.	UNKNOWN	16.20	11	J
6.	UNKNOWN	18.38	61	J
7.	UNKNOWN	21.90	140	J
8.	UNKNOWN	23.30	4	J
9.	HEPTANE, 2,2-dimethyl	26.05	4	J
10.				
11.				
12.				
13.				
14.				
15.				
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27.				
28.				
29.				
30.				

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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 1208

SAMPLE NO. J0645 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-18-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Petteall

Date: October 10, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
JC645

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC645

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: >V3131

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/18/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1206

SAMPLE NO. J0646 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-18-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	<5.
Vinyl chloride		Benzene	7.
Chloroethane		Dibromochloromethane	<5.
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Pettrell

Date: October 10, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

JD16416

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JD16416

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 3V3132

Level: (low/med) LOW Data Received: 09/18/89

% Moisture: not dec. 100 Data Analyzed: 09/18/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1210

SAMPLE NO. J0647 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-19-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

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Authorized: Michael W. Pettitt

Date: October 10, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

J0647

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0647

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: 21,3136

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/19/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1214A

SAMPLE NO. J0648 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-19-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Petteutt

Date: October 10, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

J0604

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0604

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: SV3137

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/19/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
GW1212

SAMPLE NO. J0649 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-19-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael W. Petterell.

Date: October 10, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
JC649

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC649

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: >V3138

Level: (low/med) Low Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/19/89

Column: (pack/cap) Pack Dilution Factor: 1.0

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	21.90	10	J
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1213A

SAMPLE NO. J0650 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-19-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Pettitt

Date: October 10, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE No. JC6500

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC6500

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: >1 3139

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/19/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
609

SAMPLE NO. J0686 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-19-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael V. Pettelli

Date: October 10, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
JO1686

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JO1686

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: >13140

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/19/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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Purgeable Priority Pollutants

OBG LABORATORIES, INC.

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 1207

SAMPLE NO. J0687 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-19-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

Authorized:

Date: October 10, 1989

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
JC687

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC687

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 21 3-1

Level: (low/med) LOW Data Received: 09/19/89

% Moisture: not dec. 100 Data Analyzed: 09/19/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 1209

SAMPLE NO. J0688 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-19-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael H. Pettwell

Date: October 10, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
JO1688

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JO1688

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: [illegible]

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/19/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water

604

SAMPLE NO. J0689 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-19-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Pettewell

Date: October 10, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
JC1689

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC1689

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: DV 3143

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/19/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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37 287

OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 606

SAMPLE NO. J0690 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-19-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

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Authorized: Michael N. Pettach

Date: October 10, 1989

37 288

EPA SAMPLE NO.

JD690

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JD690

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: [illegible]

Level: (low/med) LOW Date Received: 09/15/89

% Moisture: not dec. 100 Date Analyzed: 09/19/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
GMW4

SAMPLE NO. J0691 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael U. Pettault

Date: October 10, 1989

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1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

J0691

Lab Name: OBG LABORATORIES, INC. Contract: 3069.06.57

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0691

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: >V3148

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/20/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 4

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	10.73	18	J
2.	UNKNOWN	15.02	1	J
3.	UNKNOWN	18.32	1	J
4.	UNKNOWN	21.47	3	J
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
616

SAMPLE NO. J0692 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

Authorized: Michael N. Pettacalli

Date: October 10, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

J0692

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0692

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: 7V3149

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 100 Date Analyzed: 09/20/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
TB#1

SAMPLE NO. J0693 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

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Authorized: Michael W. Pettrell

Date: October 10, 1989

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

JC6093

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC6093

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: [illegible]

Level: (low/med) LOW Date Received: 09/15/89

% Moisture: not dec. 100 Date Analyzed: 09/20/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water

GW1211

SAMPLE NO. J0694 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
Chloromethane	<10.	t-1,3-Dichloropropene	<5.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<5.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<10.
t-1,2-Dichloroethene		Bromoform	<5.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Comments:

Acetone	<10.
Carbon disulfide	<5.
2-Butanone	<10.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<5.

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Authorized: Michael N. Petterelli

Date: October 10, 1989

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EPA SAMPLE NO.

JD694

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JD694

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 2V3157

Level: (low/med) LOW Date Received: 09/19/89

% Moisture: not dec. 100 Date Analyzed: 09/20/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Soil S10S1

SAMPLE NO. J0694 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-21-89

Chloromethane	<13.	t-1,3-Dichloropropene	<7.
Bromomethane		Trichloroethene	
Vinyl chloride		Benzene	
Chloroethane		Dibromochloromethane	
Methylene chloride	<7.	1,1,2-Trichloroethane	
1,1-Dichloroethene		c-1,3-Dichloropropene	
1,1-Dichloroethane		2-Chloroethylvinyl ether	<13.
t-1,2-Dichloroethene		Bromoform	<7.
Chloroform		1,1,2,2-Tetrachloroethane	
1,2-Dichloroethane		Tetrachloroethene	
1,1,1-Trichloroethane		Toluene	
Carbon tetrachloride		Chlorobenzene	
Bromodichloromethane		Ethylbenzene	
1,2-Dichloropropane		Xylenes	

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Units; µg/kg dry weight

Comments:

Acetone	56.
Carbon disulfide	<7.
2-Butanone	<13.
Vinyl acetate	
4-Methyl-2-pentanone	
2-Hexanone	
Styrene	<7.

Authorized: Michael N. Pettell

Date: October 10, 1989

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
JC695

Lab Name: OBG LABORATORIES, INC. Contract: 3008.010.510

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Soil Lab Sample ID: JC695

Sample wt/vol: 5.0 (g/mL) G Lab File ID: 21/3158

Level: (low/med) LOW Date Received: 09/15/89

% Moisture: not dec. 25 Date Analyzed: 09/21/89

Column: (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 605

SAMPLE NO. J0457 DATE COLLECTED 9-13-89 DATE REC'D. 9-14-89 DATE ANALYZED 9-18-89

	ppb		ppb
1,3-Dichlorobenzene	<10.	Diethylphthalate	<10.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<52.
Isophorone		Butyl benzyl phthalate	<10.
Naphthalene		Bis(2-ethylhexyl)phthalate	10.
Bis (2-chloroethoxy) methane		Chrysene	<10.
Hexachlorocyclopentadiene		Benzo(a)anthracene	<10.
2-Chloronaphthalene		3,3-Dichlorobenzidine	<21.
Acenaphthylene		Di-n-octylphthalate	<10.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael V. Petteli

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
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OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
605

SAMPLE NO. J0457 DATE COLLECTED 9-13-89 DATE REC'D. 9-14-89 DATE ANALYZED 9-18-89

	ppb		ppb
2-Chlorophenol	<10.	2,4,6-Trichlorophenol	<10.
2-Nitrophenol		4-Chloro-3-methylphenol	<10.
Phenol		2,4-Dinitrophenol	<52.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<10.
2-Methylphenol	
4-Methylphenol	
Benzoic Acid	<52.
4-Chloroaniline	<10.
2-Methylnaphthalene	<10.
2,4,5-Trichlorophenol	<52.
2-Nitroaniline	
3-Nitroaniline	
Dibenzofuran	<10.
4-Nitroaniline	<52.

Authorized: Michael D. Pettitt

Date: October 24, 1989

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1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

605

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0457

Sample wt/vol: 970 (g/mL) mL Lab File ID: >B1123

Level: (low/med) LOW Date Received: 09/14/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/18/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 09/21/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 10

Number TICs found: 12

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN C6H12O	2.40	6	J B
2.	UNKNOWN	3.31	7	
3.	"	4.44	10	B
4.	"	5.16	14	
5.	"	6.36	12	B
6.	"	10.35	13	
7.	"	10.63	20	
8.	"	12.70	5	
9.	"	14.94	310	
10.	"	27.94	12	
11.	"	32.84	28	
12.	"	36.51	17	
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FORM I SV-TIC 1/87 Rev.

OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
607

SAMPLE NO. J0458 DATE COLLECTED 9-13-89 DATE REC'D. 9-14-89 DATE ANALYZED 9-18-89

	ppb		ppb
1,3-Dichlorobenzene	<11.	Diethylphthalate	<11.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<53.
Isophorone		Butyl benzyl phthalate	<11.
Naphthalene		Bis(2-ethylhexyl)phthalate	11.
Bis (2-chloroethoxy) methane		Chrysene	<11.
Hexachlorocyclopentadiene		Benzo(a)anthracene	<11.
2-Chloronaphthalene		3,3-Dichlorobenzidine	<21.
Acenaphthylene		Di-n-octylphthalate	<11.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael W. Pettwell

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

37 303

Acid Priority Pollutants

OBG LABORATORIES, INC.

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
607

SAMPLE NO. J0458 DATE COLLECTED 9-13-89 DATE REC'D. 9-14-89 DATE ANALYZED 9-18-89

	ppb		ppb
2-Chlorophenol	<11.	2,4,6-Trichlorophenol	<11.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	<11.
Phenol	↓	2,4-Dinitrophenol	<53.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<11.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<53.
4-Chloroaniline	<11.
2-Methylnaphthalene	<11.
2,4,5-Trichlorophenol	<53.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<11.
4-Nitroaniline	<53.

Authorized: Michael W. Pettrell

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

607

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0458

Sample wt/vol: 940 (g/mL) mL Lab File ID: >B1124

Level: (low/med) LOW Date Received: 09/14/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/18/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 09/21/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1.0

Number TICs found: 9

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	2.40	5	J B
2.		"	3.31	5	
3.		"	4.44	13	B
4.		"	6.37	9	B
5.		"	6.41	4	
6.	4291796	CYCLOHEXANE, 1-METHYL-2-PR	7.08	5	B
7.		UNKNOWN	10.73	6	
8.		"	20.60	5	
9.		UNKNOWN BROMINATED COMP.	21.69	77	
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11.					
12.					
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FORM I SV-TIC 1/87 Rev.

OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 608

SAMPLE NO. J0459 DATE COLLECTED 9-13-89 DATE REC'D. 9-14-89 DATE ANALYZED 9-18-89

	ppb		ppb
1,3-Dichlorobenzene	<10.	Diethylphthalate	<10.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<53.
Isophorone		Butyl benzyl phthalate	<10.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<21.
Acenaphthylene		Di-n-octylphthalate	<10.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael D. Pettwell

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

37 306

LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 608

SAMPLE NO. J0459 DATE COLLECTED 9-13-89 DATE REC'D. 9-14-89 DATE ANALYZED 9-18-89

	ppb		ppb
2-Chlorophenol	<10.	2,4,6-Trichlorophenol	<10.
2-Nitrophenol		4-Chloro-3-methylphenol	<10.
Phenol		2,4-Dinitrophenol	<53.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<10.
2-Methylphenol	
4-Methylphenol	
Benzoic Acid	<53.
4-Chloroaniline	<10.
2-Methylnaphthalene	<10.
2,4,5-Trichlorophenol	<53.
2-Nitroaniline	
3-Nitroaniline	
Dibenzofuran	<10.
4-Nitroaniline	<53.

Authorized: Michael W. Pettwell

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

608

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0459

Sample wt/vol: 950 (g/mL) mL Lab File ID: >B1125

Level: (low/med) LOW Date Received: 09/14/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/18/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 09/21/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 10

Number TICs found: 19

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN C6H12O	2.40	5	J B
2.	UNKNOWN	3.31	6	
3.	"	4.44	12	B
4.	"	5.15	13	
5.	"	6.37	11	B
6.	"	9.25	6	
7.	"	10.43	6	
8.	"	10.50	8	
9.	"	10.55	9	
10.	"	10.64	7	
11.	"	10.98	4	
12.	"	12.71	4	
13.	"	14.85	210	
14.	"	14.93	31	
15.	"	16.36	6	
16. 603112	1,2-BENZENEDICARBOXYLIC ACID	26.77	18	
17. 85609	PHENOL 4,4'-BUTYLIDENEBIS[	27.95	11	
18.	UNKNOWN	32.55	22	
19.	"	36.51	14	
20.				
21.				
22.				
23.				
24.				
25.				
26.				
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37 308

OBG LABORATORIES, INC.

Bas /Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 1205

SAMPLE NO. J0644 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
1,3-Dichlorobenzene	<11.	Diethylphthalate	<11.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<56.
Isophorone		Butyl benzyl phthalate	<11.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<22.
Acenaphthylene		Di-n-octylphthalate	<11.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael W. Pettell

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

37 309

Acid Priority Pollutants

OBG LABORATORIES, INC.

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1205

SAMPLE NO. J0644 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
2-Chlorophenol	<11.	2,4,6-Trichlorophenol	<11.
2-Nitrophenol		4-Chloro-3-methylphenol	<11.
Phenol		2,4-Dinitrophenol	<56.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<11.
2-Methylphenol	
4-Methylphenol	
Benzoic Acid	<56.
4-Chloroaniline	<11.
2-Methylnaphthalene	<11.
2,4,5-Trichlorophenol	<56.
2-Nitroaniline	
3-Nitroaniline	
Dibenzofuran	<11.
4-Nitroaniline	<56.

Authorized: Michael N. Pettell

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
1205

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0644

Sample wt/vol: 890 (g/mL) mL Lab File ID: >B1216

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/20/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 10/04/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1

Number TICs found: 14

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown C6H12O	2.26	8.0	J B
2.	Unknown	3.12	8.0	J B
3.	Unknown	4.21	22	J B
4.	Unknown	4.97	51	J
5.	Unknown C6H10O	5.49	5.0	J
6.	Unknown	6.15	16	J B
7.	Unknown	6.19	9.0	J B
8.	Unknown C10H20	6.86	9.0	J B
9.	Unknown	9.54	6.0	J
10.	Unknown	10.21	10	J
11.	Unknown	10.61	5.0	J
12.	Unknown	18.45	4.0	J
13. 10544500	~~Unknown~~ sulfur, mol. (S8)	22.03	12	J
14. 117817	Bis(2-ethylhexyl) phthalate	26.51	16	J
15.				
16.				
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 1208

SAMPLE NO. J0645 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
1,3-Dichlorobenzene	<11.	Diethylphthalate	<11.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<56.
Isophorone		Butyl benzyl phthalate	<11.
Naphthalene		Bis(2-ethylhexyl)phthalate	23.
Bis (2-chloroethoxy) methane		Chrysene	<11.
Hexachlorocyclopentadiene		Benzo(a)anthracene	<11.
2-Chloronaphthalene		3,3-Dichlorobenzidine	<22.
Acenaphthylene		Di-n-octylphthalate	<11.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael D. Pettelli

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

37 312

LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 1208

SAMPLE NO. J0645 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
2-Chlorophenol	<11.	2,4,6-Trichlorophenol	<11.
2-Nitrophenol		4-Chloro-3-methylphenol	<11.
Phenol		2,4-Dinitrophenol	<56.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<11.
2-Methylphenol	
4-Methylphenol	
Benzoic Acid	<56.
4-Chloroaniline	<11.
2-Methylnaphthalene	<11.
2,4,5-Trichlorophenol	<56.
2-Nitroaniline	
3-Nitroaniline	
Dibenzofuran	<11.
4-Nitroaniline	<56.

Authorized: Michael O. Pettadi

Date: October 24, 1989

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Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

37 313
EPA SAMPLE NO.

1208

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0645

Sample wt/vol: 900 (g/mL) mL Lab File ID: >B1217

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/20/89

Extraction: (SepF/Cont/Sonc) SepF Date Analyzed: 10/04/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1

Number TICs found: 6

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN $C_6H_{12}O$	2.27	5.0	J A
2.		UNKNOWN	3.11	6.0	J A
3.		UNKNOWN	4.23	35	J A
4.		UNKNOWN	6.18	15	J A
5.		UNKNOWN	6.22	8.0	J A
6.		UNKNOWN $C_{10}H_{20}$	6.90	11	J A
7.					
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FORM I SV-TIC 1/87 Rev.

OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1206

SAMPLE NO. J0646 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
1,3-Dichlorobenzene	<12.	Diethylphthalate	<12.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<58.
Isophorone		Butyl benzyl phthalate	<12.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<23.
Acenaphthylene		Di-n-octylphthalate	<12.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael D. Pettelli

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1206

SAMPLE NO. J0646 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
2-Chlorophenol	<12.	2,4,6-Trichlorophenol	<12.
2-Nitrophenol		4-Chloro-3-methylphenol	<12.
Phenol		2,4-Dinitrophenol	<58.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<12.
2-Methylphenol	
4-Methylphenol	
Benzoic Acid	<58.
4-Chloroaniline	<12.
2-Methylnaphthalene	<12.
2,4,5-Trichlorophenol	<58.
2-Nitroaniline	
3-Nitroaniline	
Dibenzofuran	<12.
4-Nitroaniline	<58.

Authorized: Michael H. Pettelli

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
1206

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0646

Sample wt/vol: 860 (g/mL) mL Lab File ID: >B1213

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/20/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 10/04/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1

Number TICs found: 10

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 123159	PENTANAL, 2-METHYL-	2.26	6	J B
2.	UNKNOWN	3.11	7	B
3.	"	4.20	20	B
4.	"	4.99	90	
5.	"	6.15	19	B
6.	"	6.19	8	B
7. 4291296	CYCLOHEXANE, 1-METHYL-2-PRO	6.86	9	B
8.	UNKNOWN	7.44	7	
9.	"	10.58	5	
10. 117817	BIS(2-ETHYLHEXYL)PHTHALATE	26.52	12	
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1210

SAMPLE NO. J0647 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
1,3-Dichlorobenzene	<11.	Diethylphthalate	<11.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<54.
Isophorone		Butyl benzyl phthalate	<11.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<22.
Acenaphthylene		Di-n-octylphthalate	<11.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael W. Pettedt

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1210

SAMPLE NO. J0647 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
2-Chlorophenol	<11.	2,4,6-Trichlorophenol	<11.
2-Nitrophenol		4-Chloro-3-methylphenol	<11.
Phenol		2,4-Dinitrophenol	<54.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<11.
2-Methylphenol	
4-Methylphenol	
Benzoic Acid	<54.
4-Chloroaniline	<11.
2-Methylnaphthalene	<11.
2,4,5-Trichlorophenol	<54.
2-Nitroaniline	
3-Nitroaniline	
Dibenzofuran	<11.
4-Nitroaniline	<54.

Authorized: Michael N. Pettault

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
1210

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC6471

Sample wt/vol: 930 (g/mL) mL Lab File ID: >81219

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/20/89

Extraction: (SepF/Cont/Sonc) SepF Date Analyzed: 10/04/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1

Number TICs found: 8

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	2.26	5	J B
2.	"	3.11	6	B
3.	"	4.21	31	B
4.	"	6.15	15	
5.	"	6.20	7	B
6. 429796	CYCLOHEXANE, 1-METHYL-2-PROD	6.87	11	B
7. 119619	BENZOPHENONE	17.59	5	
8. 117817	BIS(2-ETHYLHEXYL) PHTHALATE	26.53	18	
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
609

SAMPLE NO. J0686 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
1,3-Dichlorobenzene	<11.	Diethylphthalate	<11.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<54.
Isophorone		Butyl benzyl phthalate	<11.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<22.
Acenaphthylene		Di-n-octylphthalate	<11.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael K. Pettell

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
609

SAMPLE NO. J0686 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
2-Chlorophenol	<11.	2,4,6-Trichlorophenol	<11.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	<11.
Phenol	↓	2,4-Dinitrophenol	<54.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<11.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<54.
4-Chloroaniline	<11.
2-Methylnaphthalene	<11.
2,4,5-Trichlorophenol	<54.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<11.
4-Nitroaniline	<54.

Authorized: Michael W. Pettinelli

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

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EPA SAMPLE NO.

609

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC686

Sample wt/vol: 920 (g/mL) mL Lab File ID: >B1212

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/20/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 10/04/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1

Number TICs found: 9

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN C6H12O	2.25	5.0	JB
2.	UNKNOWN	3.11	7.0	JB
3.	UNKNOWN	4.20	26	JB
4.	UNKNOWN	5.92	6.0	J
5.	UNKNOWN	6.14	13	JB
6.	UNKNOWN	6.18	8.0	JB
7.	UNKNOWN	6.86	8.0	JB
8. 119619	Benzophenone	17.57	6.0	J
9. 117817	Bis(2-ethylhexyl)phthalate	26.51	8.0	J
10.				
11.				
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FORM I SV-TIC 1/87 Rev.

OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 1207

SAMPLE NO. J0687 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
1,3-Dichlorobenzene	<11.	Diethylphthalate	<11.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<53.
Isophorone		Butyl benzyl phthalate	<11.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<21.
Acenaphthylene		Di-n-octylphthalate	<11.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael W. Pettarelli

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

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LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1207

SAMPLE NO. J0687 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
2-Chlorophenol	<11.	2,4,6-Trichlorophenol	<11.
2-Nitrophenol		4-Chloro-3-methylphenol	<11.
Phenol		2,4-Dinitrophenol	<53.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<11.
2-Methylphenol	
4-Methylphenol	
Benzoic Acid	<53.
4-Chloroaniline	<11.
2-Methylnaphthalene	<11.
2,4,5-Trichlorophenol	<53.
2-Nitroaniline	
3-Nitroaniline	
Dibenzofuran	<11.
4-Nitroaniline	<53.

Authorized: Michael K. Pettuell

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
1207

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0687

Sample wt/vol: 940 (g/mL) mL Lab File ID: >B1213

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/20/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 10/04/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1.0

Number TICs found: 9

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	2.26	7	J B
2.	"	3.11	8	B
3.	"	4.20	30	B
4.	"	6.14	15	B
5.	"	6.18	10	B
6. 4291796	CYCLOHEXANE, 1-METHYL-2-PR	6.96	10	B
7.	UNKNOWN	10.55	7	
8.	"	21.27	6	
9. 117817	BIS(2-ETHYLHEXYL)PHTHALATE	26.51	13	
10.				
11.				
12.				
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water 1209

SAMPLE NO. J0688 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
1,3-Dichlorobenzene	<11.	Diethylphthalate	<11.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<56.
Isophorone		Butyl benzyl phthalate	<11.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<22.
Acenaphthylene		Di-n-octylphthalate	<11.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael R. Pettelle

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
1209

SAMPLE NO. J0688 DATE COLLECTED 9-14-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
2-Chlorophenol	<11.	2,4,6-Trichlorophenol	<11.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	<11.
Phenol	↓	2,4-Dinitrophenol	<56.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<11.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<56.
4-Chloroaniline	<11.
2-Methylnaphthalene	<11.
2,4,5-Trichlorophenol	<56.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<11.
4-Nitroaniline	<56.

Authorized: Michael S. Pettell

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

1209

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC1688

Sample wt/vol: 890 (g/mL) mL Lab File ID: >B1248

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/20/89

Extraction: (SepF/Cont/Sonc) SepF Date Analyzed: 10/06/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1.0

Number TICs found: 12

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 123159	PENTANAL, 2-METHYL-	2.20	7	J B
2.	UNKNOWN	3.02	8	B
3.	"	4.11	39	B
4.	"	6.04	18	B
5.	"	6.09	7	B
6. 4291796	CYCLOHEXANE, 1-METHYL-2-PRO	6.17	13	B
7. 556672	CYCLOTETRASILOXANE, OCTAM	7.05	30	
8. 149575	HEXANOIC ACID, 2-ETHYL-	12.45	5	
9.	UNKNOWN	10.73	19	
10.	"	21.12	5	
11. 117817	BIS(2-ETHYLHEXYL)PHTHALATE	26.40	10	
12.	UNKNOWN	28.57	6	
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
604

SAMPLE NO. J0689 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
1,3-Dichlorobenzene	<11.	Diethylphthalate	<11.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<54.
Isophorone		Butyl benzyl phthalate	<11.
Naphthalene		Bis(2-ethylhexyl)phthalate	21.
Bis (2-chloroethoxy) methane		Chrysene	<11.
Hexachlorocyclopentadiene		Benzo(a)anthracene	<11.
2-Chloronaphthalene		3,3-Dichlorobenzidine	<22.
Acenaphthylene		Di-n-octylphthalate	<11.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael O. Pattarelli

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
604

SAMPLE NO. J0689 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
2-Chlorophenol	<11.	2,4,6-Trichlorophenol	<11.
2-Nitrophenol		4-Chloro-3-methylphenol	<11.
Phenol		2,4-Dinitrophenol	<54.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<11.
2-Methylphenol	
4-Methylphenol	
Benzoic Acid	<54.
4-Chloroaniline	<11.
2-Methylnaphthalene	<11.
2,4,5-Trichlorophenol	<54.
2-Nitroaniline	
3-Nitroaniline	
Dibenzofuran	<11.
4-Nitroaniline	<54.

Authorized: Michael D. Pettault

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

604

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: JC6689

Sample wt/vol: 925 (g/mL) mL Lab File ID: >B1249

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/20/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 10/06/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1

Number TICs found: 7

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	123159	PENTANAL, 2-METHYL-	2.20	6	J B
2.		UNKNOWN	3.02	7	B
3.		"	4.11	36	B
4.		"	6.04	16	B
5.		"	6.08	7	B
6.	4291796	CYCLOHEXANE, 1-METHYL-2-PR	6.77	9	B
7.		UNKNOWN	7.33	7	
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9.					
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37 332

Base/Neutral Priority Pollutants

OBG LABORATORIES, INC.

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
606

SAMPLE NO. J0690 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
1,3-Dichlorobenzene	<12.	Diethylphthalate	<12.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<60.
Isophorone		Butyl benzyl phthalate	<12.
Naphthalene		Bis(2-ethylhexyl)phthalate	100.
Bis (2-chloroethoxy) methane		Chrysene	<12.
Hexachlorocyclopentadiene		Benzo(a)anthracene	<12.
2-Chloronaphthalene		3,3-Dichlorobenzidine	<24.
Acenaphthylene		Di-n-octylphthalate	<12.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Authorized: Michael N. Pettarelli

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
606

SAMPLE NO. J0690 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
2-Chlorophenol	<12.	2,4,6-Trichlorophenol	<12.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	<12.
Phenol	↓	2,4-Dinitrophenol	<60.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<12.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<60.
4-Chloroaniline	<12.
2-Methylnaphthalene	<12.
2,4,5-Trichlorophenol	<60.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<12.
4-Nitroaniline	<60.

Authorized: Michael W. Petterelli

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

37 334

EPA SAMPLE NO.

606

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0690

Sample wt/vol: 830 (g/mL) mL Lab File ID: >B1251

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/20/89

Extraction: (SepF/Cont/Sonc) SepF Date Analyzed: 10/06/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 1

Number TICs found: 9

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	2.19	5	J B
2.		"	3.21	7	B
3.		"	4.11	39	B
4.		"	6.05	18	B
5.	4291796	CYCLOHEXANE, 1-METHYL-2-PRO	6.75	7	B
6.		UNKNOWN	7.35	6	
7.	1921796	PENTADECANE, 2,6,10,14-TETRA	19.34	5	
8.		UNKNOWN	21.11	6	
9.		"	23.06	5	
10.					
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water GMW4

SAMPLE NO. J0691 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
1,3-Dichlorobenzene	<110.	Diethylphthalate	<110.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<540.
Isophorone		Butyl benzyl phthalate	<110.
Naphthalene		Bis(2-ethylhexyl)phthalate	1600.
Bis (2-chloroethoxy) methane		Chrysene	<110.
Hexachlorocyclopentadiene		Benzo(a)anthracene	<110.
2-Chloronaphthalene		3,3-Dichlorobenzidine	<220.
Acenaphthylene		Di-n-octylphthalate	<110.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Elevated detection limits due to matrix interferences.

Authorized: Michael K. Pettcoth

Date: October 24, 1989

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Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water
GMW4

SAMPLE NO. J0691 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-20-89

	ppb		ppb
2-Chlorophenol	<110.	2,4,6-Trichlorophenol	<110.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	<110.
Phenol	↓	2,4-Dinitrophenol	<540.
2,4-Dimethylphenol	↓	2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol	↓	Pentachlorophenol	↓
		4-Nitrophenol	↓

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Comments:

Benzyl Alcohol	<110.
2-Methylphenol	↓
4-Methylphenol	↓
Benzoic Acid	<540.
4-Chloroaniline	<110.
2-Methylnaphthalene	<110.
2,4,5-Trichlorophenol	<540.
2-Nitroaniline	↓
3-Nitroaniline	↓
Dibenzofuran	<110.
4-Nitroaniline	<540.

Elevated detection limits due to matrix interferences.

Authorized: Michael N. Pettuelli

Date: October 24, 1989

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Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
GMW4

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: J0691

Sample wt/vol: 930 (g/mL) mL Lab File ID: >81317

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 09/20/89

Extraction: (SepF/Cont/Sonc) SepF Date Analyzed: 10/16/89

GPC Cleanup: (Y/N) N pH: — Dilution Factor: 10

Number TICs found: 1

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	16.30	270	J
2.					
3.					
4.					
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OBG LABORATORIES, INC.

Base/Neutral Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Soil S10S1

SAMPLE NO. J0695 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-26-89

	ppb		ppb
1,3-Dichlorobenzene	<4400.	Diethylphthalate	<4400.
1,4-Dichlorobenzene		N-nitrosodiphenylamine	
1,2-Dichlorobenzene		Hexachlorobenzene	
Hexachloroethane		4-Bromophenyl phenyl ether	
Bis (2-chloroethyl) ether		Phenanthrene	
Bis (2-chloroisopropyl) ether		Anthracene	
N-Nitrosodi-n-propylamine		Di-n-butyl phthalate	
Nitrobenzene		Fluoranthene	
Hexachlorobutadiene		Pyrene	
1,2,4-Trichlorobenzene		Benzidine	<21,000.
Isophorone		Butyl benzyl phthalate	<4400.
Naphthalene		Bis(2-ethylhexyl)phthalate	
Bis (2-chloroethoxy) methane		Chrysene	
Hexachlorocyclopentadiene		Benzo(a)anthracene	
2-Chloronaphthalene		3,3-Dichlorobenzidine	<8800.
Acenaphthylene		Di-n-octylphthalate	<4400.
Acenaphthene		Benzo(b)fluoranthene	
Dimethyl phthalate		Benzo(k)fluoranthene	
2,6-Dinitrotoluene		Benzo(a)pyrene	
Fluorene		Indeno(1,2,3-cd)pyrene	
4-Chlorophenyl phenyl ether		Dibenzo(a,h)anthracene	
2,4-Dinitrotoluene		Benzo(g,h,i)perylene	
1,2-Diphenylhydrazine		N-Nitrosodimethyl Amine	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Elevated detection limits due to matrix interferences.

Authorized: Michael R. Pettuelli

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Acid Priority Pollutants

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO. 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Soil
S10S1

SAMPLE NO. J0695 DATE COLLECTED 9-15-89 DATE REC'D. 9-18-89 DATE ANALYZED 9-26-89

	ppb		ppb
2-Chlorophenol	<4400.	2,4,6-Trichlorophenol	<4400.
2-Nitrophenol	↓	4-Chloro-3-methylphenol	<4400.
Phenol		2,4-Dinitrophenol	<21,000.
2,4-Dimethylphenol		2-Methyl-4,6-dinitrophenol	↓
2,4-Dichlorophenol		Pentachlorophenol	
		4-Nitrophenol	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984 UNITS: µg/kg dry weight

Comments:

Benzyl Alcohol	<4400.
2-Methylphenol	↓
4-Methylphenol	
Benzoic Acid	<21,000.
4-Chloroaniline	<4400.
2-Methylnaphthalene	<4400.
2,4,5-Trichlorophenol	<21,000.
2-Nitroaniline	↓
3-Nitroaniline	
Dibenzofuran	<4400.
4-Nitroaniline	<21,000.

Elevated detection limits due to matrix interferences.

Authorized: Michael O. Pettault

Date: October 24, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

S1DS1

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) SOIL Lab Sample ID: J0595

Sample wt/vol: 30.0 (g/mL) g Lab File ID: >B1316

Level: (low/med) LOW Date Received: 09/18/89

% Moisture: not dec. 25 dec. _____ Date Extracted: 09/26/89

Extraction: (SepF/Cont/Sonc) — Date Analyzed: 10/16/89

GPC Cleanup: (Y/N) N pH: 6.0 Dilution Factor: 10

Number TICs found: 6

CONCENTRATION UNITS:
(ug/L or ug/Kg) ~~ug/Kg~~

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	9.34	8800	J
2.	UNKNOWN C9H20	9.89	1900	
3.	UNKNOWN	11.08	3700	
4.	"	11.34	9400	
5.	"	12.10	3700	
6.	"	13.16	2500	
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SECTION 2

CHAIN OF CUSTODY

37 342

RESULTS TO:
O'BRIEN & GERE ENG
ATTN: A.J. RAMSEY
5000 CEDAR PLAZA PK
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: OBG LABS #1

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) Arnold J Ramsey / [illegible]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab.	Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
605	WATER SAMPLE	9/13/89	9 45		X			2-40ml	VOA (EPA 8240)
								2-1L	PAH (EPA 8270)
								1-1000ml	TOTAL METALS As (EPA 7060/6010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
610	TRAVEL BLANK				X			2-40ml	VOA (EPA 8240)

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Arnold J Ramsey		9/13/89 3:00
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		[illegible] Barnes	9-14-89 0800

Method of Shipment: UPS

O'Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover MD / New York, NY / St Louis, MO / White Plains NY

37 343

Results to:
O'Brien & Gere E
ATTN: A.J. Ramsey
5000 Cedar Plaza Pk
Suite 211
St. Louis, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: CRG LABS #1

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) [illegible]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Grab	Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
607	WATER SAMPLE	9/13/89	10.05 Am		X			2-40 ml	VOA (EPA 8240)
								2-1L	PAH (EPA 8270)
								1-1000 ml	TOTAL METALS As (EPA 7060/6010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
~~TRAVEL BLANK~~					X			2-40 ml	VOA (EPA 8240)

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
[illegible]		9/13/89 3:00 pm
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by: Ken Barnes	Date/Time 944-890800

Method of Shipment: UPS

O'Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St Louis, MO / White Plains, NY

37 344

RESULTS TO:
O'BRIEN & GERE ENG
ATTN: A.J. RAMSEY
5000 CEDAR PLAZA PK
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: CBG LABS #1

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) A.J. Ramsey

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	SAMPLE TYPE Water Grab	SAMPLE TYPE Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
6C05	WATER SAMPLE	9/13/89	10:00 AM		X			2-40 ml	VO4 (EPA 8240)
	DUPLICATE SITE 6							2-1L	PAH (EPA 8270)
								1-100 ml	TOTAL METALS AS (EPA 7060/6010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
	~~TRAVEL BLANK~~				X			~~2-40 ml~~	~~VO4 (EPA 8240)~~

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
A.J. Ramsey		9/13/89 3:00 PM
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by: Ken Barnes	Date/Time 9/14-89 0800
Method of Shipment: UPS		

O Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St Louis, MO / White Plains, NY

RESULTS TO:
O'BRIEN & GERE ENG
ATTN: A.J. RAMSEY
5000 CEDAR PLAZA PKWY
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: CBG LABS #3

SURVEY 3068.016.916
RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) Arnold J Ramsey / Brian S Knittel

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab	Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
1205	WATER SAMPLE	9/14/89	9:00 am		X			2-40 ml	VOA (EPA 8240)
								2-1L	PAH (EPA 8270)
								1-1000 ml	TOTAL METALS As (EPA 7060/6010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
1212	TRAVEL BLANK				X			2-40 ml	VOA (EPA 8240)

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Arnold J Ramsey		9/14/89 2:00pm
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		Ann Barnes	9-18-89 11:00

Method of Shipment: UPS

O'Brien & Gere Engineers Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St Louis, MO / White Plains, NY

37 346

RESULTS TO,
O'BRIEN & GERE EN
ATTN: A.J. RAMSEY
5000 CEDAR PLAZA PK
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: OBG LABS #4

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) Arnold J Ramsey / Lucia S Knitter

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab.	Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
1208	WATER SAMPLE	9/14/89	10:00am		X			2-40ml	VOA (EPA 8240)
								2-1L	PAH (EPA 8270)
								1-1000ml	TOTAL METALS As (EPA 7060/6010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
	TRAVEL BLANK				X			2-40ml	VOA (EPA 8240)

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Arnold J Ramsey		9/14/89 2:00pm
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		Ann Barnes	9-18-89 11:00

Method of Shipment: UPS

O'Brien & Gere Engineers Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St Louis, MO / White Plains, NY

37 347

RESULTS TO:
O'BRIEN & GERE EN
ATTN: A.J. RAMSEY
5000 CEDAR PLAZA PKW
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: OBG LABS #3

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) Arnold J Ramsey / Lucas Knitter

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab.	Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
1206	WATER SAMPLE	9/14/89	9:15 am		X			2-40 ml	VOA (EPA 8240)
~~[illegible]~~								2-1L	PAH (EPA 8270)
								1-1000 ml	TOTAL METALS As (EPA 7060/6010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
	~~TRAVEL BLANK~~				X			~~2-40 ml~~	~~VOA (EPA 8240)~~

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Arnold J Ramsey		9/14/89 2:00 pm
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		Ann Barnes	9-18-89 11:00

Method of Shipment: UPS

O'Brien & Gere Engineers Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover MD / New York, NY / St Louis, MO / White Plains, NY

37 348

Results to:
O'Brien & Gere Eng
Attn: A.J. Ramsey
5000 Cedar Plaza Pk
Suite 211
St. Louis, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: CBG LABS #4

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) Arnold J Ramsey [signature]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab.	Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
1210	WATER SAMPLE	9/14/89	10:10 am		X			2-40 ml	VOA (EPA 8240)
								2-1L	PAH (EPA 8270)
								1-1000 ml	TOTAL METALS As (EPA 7060/6010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
1213A	TRAVEL BLANK				X			2-40 ml	VOA (EPA 8240)

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Arnold J Ramsey		9/14/89 2:00 pm
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		[signature] Barnes	9-18-89 11:00

Method of Shipment: UPS

O'Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St Louis, MO / White Plains, NY

37 349

RESULTS TO:
O'BRIEN & GERE ENG
ATTN: A.J. RAMSEY
5000 CEDAR PLAZA PKW
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: CRG LABS #4

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) Arnold J. Ramsey / Brian S. Knotts

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	SAMPLE TYPE Water Grab	SAMPLE TYPE Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
1214x	WATER SAMPLE	10:15am	9/14/89		X			2-40ml	VOA (EPA 8240)
								2-1L	PAH (EPA 8270)
								1-1000ml	TOTAL METALS As (EPA 7060/6010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
	~~TRAVEL BLANK~~				X			~~2-40ml~~	~~VOA (EPA 8240)~~

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Arnold J. Ramsey		9/14/89 2.00pm
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) / Date/Time	Received for Laboratory by: Ann Barnes	Date/Time 9-18-89 11:00

Method of Shipment: UPS

O'Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St. Louis, MO / White Plains, NY

Results 37, 350
O'Brien & Gere Eng
Attn: A.J Ramsey
5000 Cedar Plaza Pk
Suite 211
St. Louis, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: OBG LABS #2

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) Arnold J Ramsey / [illegible]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab.	Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
609	WATER SAMPLE	9/14/89	10:10 am		X			2-40 ml	VOA (EPA 8240)
	(RINSATE SITE 6)							2-1L	PAH (EPA 8270)
								1-1000 ml	TOTAL METALS As (EPA 7060/6010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
[redacted]									

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Arnold J Ramsey		9/14/89 3:00 pm
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		Wendy Smith	9/18/89 12:00

Method of Shipment: UPS

O'Brien & Gere Engineers Inc
Box 4873 / 1304 Buckley Road / Syracuse NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St Louis MO / White Plains, NY

RESULTS TO:
O'BRIEN & GERE ENG
ATTN: A.J RAMSE
5000 CEDAR PLAZA PK
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: CBG LABS #2

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) Arnold J. Ramsey / Luis S. Kotte

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab	Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
1207	WATER SAMPLE	9/14/89	10:30 am		X			2-40ml	VOA (EPA 8240)
								2-1L	PAH (EPA 8270)
								1-1000ml	TOTAL METALS As (EPA 7060/7010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
1211	TRAVEL BLANK				X			2-40ml	VOA (EPA 8240)

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Arnold J. Ramsey		9/14/89 3:00 pm
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		Wendy Smith	9/18/89 12:00

Method of Shipment: UPS

O'Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St. Louis, MO / White Plains, NY

37 352

RESULTS TO:
O'BRIEN & GERE ENG
ATTN: A.J. RAMSEY
5000 CEDAR PLAZA PKY
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: CRG LABS #2

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) [illegible]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	SAMPLE TYPE Water Grab	SAMPLE TYPE Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
1209	WATER SAMPLE	9/14/89	10.35 AM		X			2-40 ml	VOA (EPA 8240)
	DUPLICATE SITE 12							2-1L	PAH (EPA 8270)
								1-1000 ml	TOTAL METALS As (EPA 7060/7010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
[redacted]									

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
[illegible]		9/14/89 3:00 pm
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) — Date/Time	Received for Laboratory by: Wendy Smith	Date/Time 9/18/89 12:00

Method of Shipment: UPS

O Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St Louis, MO / White Plains, NY

37 353

RESULTS TO:
A. J. RAMSEY
O'BRIEN & GERE ENGINEERS
5000 CORAL PLAZA PKWY
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: GRE LABS #5

SURVEY 30068.016

RICHLAND-GE BANK AFB

SAMPLERS: (Signature) April Ramsey / Julia Smith

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab	Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
604	WATER SAMPLE	9/15/89	9:00am		X			2-40ml	VOA (EPA 8240)
								2-1L	PAH (8270 EPA)
								1-1000ml	TOTAL METALS
									As (7060/7010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									PB (7420)
									Se (7740)
616	TRAVEL BLANK				X			2-40ml	VOA (8240)

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
April Ramsey		9/15/89 11:00am
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) / Date/Time	Received for Laboratory by: Wendy Smith	Date/Time 9/18/89 12:00

Method of Shipment: ~~UPS~~ FED EX

O'Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover, MD / New York, NY / St Louis, MO / White Plains, NY

RESULTS TO 37 354
A. J. RAMSEY
O'BRIEN & GERE ENGINEERS
5000 CEDAR PLAZA PKWY
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: ~~[illegible]~~ OBG LABS #5

SURVEY 3068.016

RICHARD-GEBAUR AFB

SAMPLERS: (Signature) Arnold J Ramsey / Livia S Knittel

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab.	Air	SEQ. NO	NO OF CONTAINERS	ANALYSIS REQUIRED
606	WATER SAMPLE	9/15/89	9:15AM		X			2-40mL	VOA (EPA 8240)
								2-1L	PAH (8270 EPA)
								1-1000ml	TOTAL METALS
									As (7060/6010)
									Ag (7760)
									Ba (7080
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Arnold J Ramsey		9/15/89 11:00AM
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		Wendy Smith	9/18/89 12:00

Method of Shipment: ~~[illegible]~~ FED EX

O Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover MD / New York, NY / St Louis, MO / White Plains, NY

37 355

RESULTS TO,
O'BRIEN & GERE EN
ATTN: A.J. RAMSE
5000 CEDAR PLAZA PK
SUITE 211
ST. LOUIS, MO 63128

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: CBG LABS # #6

SURVEY 3068.016.916

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) Arnold J. Ramsey / Brian S. Knotts

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	SAMPLE TYPE Water Grab	SAMPLE TYPE Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
GMW 4	WATER SAMPLE	9/15/89	8:45		X			2-40 ml	VOA (EPA 8240)
								2-1L	PAH (EPA 8270)
								1-100 ml	TOTAL METALS As (EPA 7060/7010)
									Ag (7760)
									Ba (7080)
									Cd (7130)
									Cr (7190)
									Hg (7471)
									Pb (7420)
									Se (7740)
[redacted]									

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Arnold J. Ramsey		9/15/89 12:00 pm
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) / Date/Time	Received for Laboratory by: Wendy Smith	Date/Time 9/18/89 12:00

Method of Shipment: [redacted] FEDERAL EXPRESS

O'Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover MD / New York, NY / St Louis, MO / White Plains, NY

O'BRIEN & GERE

CHAIN OF CUSTODY RECORD

TO: OBG LABS

SURVEY 3068.016

RICHARDS-GEBAUR AFB

SAMPLERS: (Signature) [illegible]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	Water Grab	Air	SEQ. NO	NO. OF CONTAINERS	ANALYSIS REQUIRED
S105I	SOIL SAMPLE	9/15/89	10:00 am	SOIL				2-4oz	VOA (EPA 8240)
								1-8oz	PAH (EPA 8270)
								1-8oz	TOTAL METALS
TB1	TRAVEL BLANK	9/15/89	10:05 am	WATER				2-40ml	VOA (EPA 8240)

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
[illegible]		9/15/89 11:00 am
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time

Dispatched by: (Signature)	Date/Time	Received for Laboratory by:	Date/Time
		Wendy Smith	9/18/89 12:00

Method of Shipment: ~~UPS~~ FED EX

O'Brien & Gere Engineers, Inc
Box 4873 / 1304 Buckley Road / Syracuse, NY 13221 / (315) 451-4700
Blue Bell, PA / Boston, MA / Landover MD / New York, NY / St Louis, MO / White Plains NY

CASE FILE

Survey: Richards Air Force Base Date Collected: 9-13-89

Sampler: Donald Ramsey Date Received: 9-14-89

Client Name and Ref. # : Corp of Engineers

Laboratory Number: 3068.016.517

Condition of Shipment: good

Archive? If so how long ? no

Signed: [illegible]

Sample Coordinator

****

Disposal Procedure*: Routine

Signed: M. N. Pettrell

Date: 10-11-89

* The routine disposal procedure for non-hazardous samples is to dispose of the samples 4 weeks after a typed report is signed and mailed to the client. Water samples are filtered through carbon to the sanitary sewer. Solid samples are sent to a sanitary landfill.

CASE FILE

Survey: Richards AFB. Date Collected: 9-14-89

Sampler: Dj. Ramsey Date Received: 9-18-89

Client Name and Ref. # : Corp of Engineers

Laboratory Number: 3068. 016.517

Condition of Shipment: Two vials were not received for site 1206. Although we received 2 vials not listed on Chain of Custody GMW-4. Contacted Dj. Ramsey GMW-4. Sample was missed labeled Should be 1206 per verbal conversation 9-18-89.

Archive? If so how long ? NO

Signed: [illegible]

Sample Coordinator

****

Disposal Procedure*: Routine

Signed: [illegible]

Date: 10-11-89

* The routine disposal procedure for non-hazardous samples is to dispose of the samples 4 weeks after a typed report is signed and mailed to the client. Water samples are filtered through carbon to the sanitary sewer. Solid samples are sent to a sanitary landfill.

37 359

CASE FILE

Survey: Richards AFB. Date Collected: 9-15-89

Sampler: M. Ramsey Date Received: 9-18-89

Client Name and Ref. # : Corp of Engineers

Laboratory Number: 3068.016.517.

Condition of Shipment: Sample GMW 006 One Liter Collected only WELL was DRY. Two vials for 1211, one was broken upon arrival.

Archive? If so how long ? No.

Signed: [illegible] Barnes

Sample Coordinator

****

Disposal Procedure*: Routine

Signed: [illegible]

Date: 10-11-89

* The routine disposal procedure for non-hazardous samples is to dispose of the samples 4 weeks after a typed report is signed and mailed to the client. Water samples are filtered through carbon to the sanitary sewer. Solid samples are sent to a sanitary landfill.

SAMPLE CONTROL RECORD

CLIENT: Corp of Eng. Richards. DATE REC'D: 9-14-89

JOB #: 3068.016.517 BIN NUMBER: 58.

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED
J0457 → J0459	C. Tran	9/18/89 13:30	BNA Extraction	Used all of the samples
J0457-J0459	K. Stan	09/18/89 1355	VOACP	09/18/89 1637
J0457 - J0459	AK	9/22/89 7:25.	Hg	9/22/89 8:00
J0457 - J0459	[illegible]	9/21/89 12:00	METALS	9/21/89 12:30

Sample Custodian Signature: Ann Barnes.

Date of Sample Login: 9-14-89

Airbill Number: _____

Client Name: Corp of Eng. (Richards)

Project No.: 3068.016.517

Bin Number : 58.

Circle The Appropriate Response:

1) Custody Seal — Present/Absent; Intact/Not Intact

2) Chain-of-Custody — Present/Absent

3) Sample Tags — Present/Absent

4) Sample Tag #'s — Listed/Not Listed

5) SMO Forms — Present/Absent

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks
9-14-89	0800	—	—	605	J0457	see Case File	—
↓	↓	↓	↓	607	J0458	↓	↓
				608	J0459		
				610	J0460		

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SAMPLE CONTROL RECORD

CLIENT: Corp of Eng Richards (AFB) DATE REC'D: 9-18-89.

JOB #: 30168.016.517 BIN NUMBER: 26

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED
J0644-J0646	K. Stone	09/18/89 1612	VOACP	09/18/89 1637
J0647-J0649	K. Stone	09/19/89 1044	VOACP	09/19/89 1356
J0650	K Stone	09/19/89 1356	VOACP	09/19/89 1537
J0644 → 48	C. Tran	9/20/89 11:30	BNA	Used all of the samples
J0644 → J0648	AK	9/21/89 7:25	Hg	9/21/89 8:00
J0644 → J0647	D Cassing	9/21/89 12:00	METALS	9/21/89 12:30

Sample Custodian Signature: Ann Barnes.

Date of Sample Login: 9-18-89.

Airbill Number: FEDERAL EXPRESS 835 7628 562

CUSTOMER PACKAGE TRACKING NUMBER — PULL UP PURPLE TAB

Client Name: Corp of Eng (Richards)

Project No.: 3068.016.517

Bin Number: 26.

Circle The Appropriate Response:

1) Custody Seal — Present/Absent; Intact/Not Intact

2) Chain-of-Custody — Present/Absent

3) Sample Tags — Present/Absent

4) Sample Tag #'s — Listed/Not Listed

5) SMO Forms — Present/Absent

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks
9-18-89	0800	—	—	1205	J06644	See Case File	—
↓	↓	↓	↓	1208	J06645	↓	↓
				1206	J06646		
				1210	J06647		
				1214A	J06648		
				GW 1212	J06649		
				1213A	J06650		

37 363

SAMPLE CONTROL RECORD

CLIENT: C.O.E.-Richards-Gebaur DATE REC'D: Sept. 18, 1989

JOB #: 3068.016.517 BIN NUMBER: 92 + 93 + 74

LABORATORY SAMPLE NUMBER	REMOVED BY	DATE AND TIME REMOVED	REASON	DATE AND TIME RETURNED
J0686 → J0690	K Stone	09/19/89 1357	VOACP	09/19/89 1537
J0686 → 91	C. Tran	9/20/89 11:30	BNA	Used all of the samples
J0691 → J0694 J0687	K. Stone	09/20/89 1246	VOACP	09/20/89/1351
J0686 - J0688	AK	9/22/89 7:25	Hg	9/22/89 8:00
J0695	K. Stone	09/21/89 1128	VOACP	09/27/89 1431
J0695	J. Koracera	9 21 · 89 10 · 30	PCTS	9 · 21 · 89 11 : 30
J0686 - J0691	D. Cuny	9/21/89 12:00	METALS	9/21/89 12:30
J0695	D. Cuny	9/23/89 13:00	METALS	9/23/89 13:15
J0695	C. Tran	9/26/89 8:10	BNA Extraction	9/26/89 10:00
J0695	AK.	9/27/89 7.30	Hg	9/27/89 8:00

37 364

11

Sample Custodian Signature: Wendy Smith

Date of Sample Login: Sept. 18, 1989

Airbill Number: 3881050235; 3881030075; 3881035196

Client Name: C.O.E.-Richards-Gebaur AFB

Project No.: 30168.0116.517

Bin Number : 92, 93 + 74

Circle The Appropriate Response:

1) Custody Seal — Present/Absent; Intact/Not Intact

2) Chain-of-Custody — Present/Absent

3) Sample Tags — Present/Absent

4) Sample Tag #'s — Listed/Not Listed

5) SMO Forms — Present/Absent

Date Rec'd.	Time Rec'd.	Chain-of Custody Record #	SMO Sample Numbers	CORRESPONDING Sample Tag Numbers	CORRESPONDING Assigned Lab Numbers	Does Information On Custody Forms Traffic Reports & Sample Tags Agree ?	Remarks
9-18-89	12:00	—	—	1609	J0686	See the attached case file.	
				1207	J0687		
				1209	J0688		
				1604	J0689		
				1606	J0690		
				GMW4	J0691		
				1616	J0692		
				TB#1	J0693		
				GW1211	J0694		
				S1051	J0695		

LABORATORIES, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
C.O.E.-Richards Air Force Base	1/3	WS	9-18-89	3068.016517

AIRBILL

FEDERAL EXPRESS

PACKAGE TRACKING NUMBER 3881050235

3881050235

MULTIPLE PACKAGE SERVICE

RECIPIENT'S COPY

Date 9/14/89

From (Your Name) Please Print	Your Phone Number (Very Important)	To (Recipient's Name) Please Print	Recipient's Phone Number (Very Important)
1 AJ RAMSEY	314 842 4558	2 MR. MIKE FERRELLI	(203) 161-1115
Company: COCKLEY & GERE ENG BS	Department/Floor No.	Company: OBG LABORATORIES	Department/Floor No.
Street Address: 5200 GET AR PLZA PKWY SUITE 211		Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 1304 BUCKLEY RD	
City: ST. LOUIS State: MO ZIP Required: 63128		City: SYRACUSE State: NY ZIP Required: 13221	

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE): 3068.016810

4 IF HOLD FOR PICK-UP, Print FEDEX Address Here: Street Address / City / State / ZIP Required

PAYMENT: ☒ Bill Sender ☐ Bill Recipient's FedEx Acct. No. ☐ Bill 3rd Party FedEx Acct. No. ☐ Bill Credit Card ☐ Cash

SERVICES	DELIVERY AND SPECIAL HANDLING	PACKAGES	WEIGHT IN POUNDS	TOTAL DECLARED VALUE	OVER SIZE
1 ☒ PRIORITY 1 Overnight Delivery; 6 ☐ OVERNIGHT LETTER*; 2 ☐ COURIER-PAK OVERNIGHT ENVELOPE*; 7 ☐; 3 ☐ OVERNIGHT BOX; 8 ☐; 4 ☐ OVERNIGHT TUBE; 9 ☐; 5 ☐ STANDARD AIR Delivery not later than second business day; 10 ☐	1 ☒ HOLD FOR PICK-UP; 2 ☒ DELIVER WEEKDAY; 3 DELIVER SATURDAY; 4 ☐ DANGEROUS GOODS; 5 ☐ CONSTANT SURVEILLANCE SERVICE (CSS); 6 ☐ DRY ICE; 7 ☐ OTHER SPECIAL SERVICE; 8 ☐; 9 ☐ SATURDAY PICK-UP; 10 ☐; 11 ☐; 12 ☐ MULTIPLE DELIVERY	1	41		
		1	33		
		1	40		
		Total 3	Total 114	Total	

Received At: 1 ☐ Regular Stop 2 ☐ On-Call Stop 3 ☐ Drop Box 4 ☐ B.S.C. 5 ☒ Station

FEDEX Corp. Employee No. 3802

Date/Time for FEDEX Use: 9/14 1649

Emp. No. / Date

☐ Cash Received ☐ Return Shipment ☐ Third Party ☐ Chg. To Diff. ☐ Chg. To Hold

Street Address

City / State / Zip

Received By: X

Date/Time Received / FedEx Employee Number

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature

Federal Express Use: Base Charges / Declared Value Charge / Other 1 / Other 2 / Total Charges

PART #2041738800 REVISION DATE 10/88 PRINTED IN U.S.A. SRCEF

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*Declared Value Limit $100

LABORATORIES, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
C.D.E.-Richards Air Force Base	2/3	WS	9-18-89	3068.016.517

FEDERAL EXPRESS

AIRBILL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII. USE THE INTERNATIONAL AIR BILL FOR SHIPMENTS TO PUERTO RICO. QUESTIONS? CALL 800-[illegible] TOLL FREE.

PACKAGE TRACKING NUMBER 3881030075

3881030075

Date 9/15/89

RECIPIENT'S COPY

1 From (Your Name) Please Print: [illegible]
Your Phone Number (Very Important): [illegible]
Company: [illegible]
Department/Floor No.:
Street Address: [illegible]
City: [illegible] State: [illegible] ZIP Required: [illegible]

2 To (Recipient's Name) Please Print: [illegible]
Recipient's Phone Number (Very Important): ( )
Company: [illegible]
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. * Zip Codes.): [illegible]
City: [illegible] State: [illegible] ZIP Required: [illegible]

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.): [illegible]

4 IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address:
City: State: ZIP Required:

PAYMENT: ☒ Bill Sender ☒ Bill Recipient's FedEx Acct. No. ☐ Bill 3rd Party FedEx Acct. No. ☐ Bill Credit Card ☐ Cash

5 SERVICES
1 ☒ PRIORITY 1 (Overnight) Delivery
2 ☐ COURIER-PAK OVERNIGHT ENVELOPE*
3 ☐ OVERNIGHT BOX
4 ☐ OVERNIGHT TUBE
5 ☐ STANDARD AIR Delivery not later than second business day
6 ☐ OVERNIGHT LETTER*
7 ☐
8 ☐
9 ☐
10 ☐
*Declared Value Limit $100

DELIVERY AND SPECIAL HANDLING
1 ☐ HOLD FOR PICK-UP (Fill in Box 4)
2 ☐ DELIVER WEEKDAY
3 DELIVER SATURDAY (Extra charge) ☒
4 ☐ DANGEROUS GOODS (Extra charge)
5 ☐ CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charge) (Release Signature Not Applicable)
6 ☐ DRY ICE ____ Lbs.
7 ☐ OTHER SPECIAL SERVICE
8 ☐
9 ☐ SATURDAY PICK-UP (Extra charge)
10 ☐
11 ☐
12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT IN POUNDS ONLY	YOUR DECLARED VALUE	OVER SIZE
1	29		
Total 1	Total 29	Total	

Received At: 1 ☐ Regular Stop 2 ☐ On-Call Stop 3 ☐ Drop Box 4 ☐ B.S.C. Station

FEDEX Corp. Employee No.: 104574

Date/Time for FEDEX Use: 9/15/89 14

Emp. No. Date
☐ Cash Received
☐ Return Shipment
☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold
Street Address
City State Zip
Received By: X
Date/Time Received FedEx Employee Number

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.
Release Signature:

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

PART #2041738800 REVISION DATE 10/88 PRINTED IN U.S.A. SRCEF

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OBG LABORATORIES, INC.

S	SHEET	BY	DATE	JOB NO
C.O.E. - Richards Air Force Base	3/3	WS	9-18-89	3068.016.517

FEDERAL EXPRESS

AIRBILL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII. USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO. QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER 3881035196

3881035196

RECIPIENT'S COPY

Date 9/15/89

1 From (Your Name) Please Print: N.J. KAMSEY
Your Phone Number (Very Important): 614-842-4550
Company: O'BRIEN & GERE ENGRS
Department/Floor No.:
Street Address: 5000 CEDAR PLAZA PKWY SUITE 211
City: ST. LOUIS State: MO ZIP Required: 63128

2 To (Recipient's Name) Please Print: MIKE PERRELLI
Recipient's Phone Number (Very Important): 303 161-7115
Company: OBG LABORATORIES
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 1304 BUCKLEY RD
City: SYRACUSE State: NY ZIP Required: 13221

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.): 3068.016.910

4 IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address:
City: State: ZIP Required:

PAYMENT: [X] Bill Sender [ ] Bill Recipient's FedEx Acct. No. [ ] Bill 3rd Party FedEx Acct. No. [ ] Bill Credit Card [ ] Cash

5 SERVICES
1 [X] PRIORITY Overnight Delivery
2 [ ] CORNER-PAK OVERNIGHT ENVELOPE*
3 [ ] OVERNIGHT BOX
4 [ ] OVERNIGHT TUBE
5 [ ] STANDARD AIR Delivery not later than second business day
6 [ ] OVERNIGHT LETTER*
7 [ ]
8 [ ]
9 [ ]
10 [ ]
*Declared Value Limit $100

DELIVERY AND SPECIAL HANDLING
1 [ ] HOLD FOR PICK-UP
2 [ ] DELIVER WEEKDAY
3 DELIVER SATURDAY [X]
4 [ ] DANGEROUS GOODS
5 [ ] CONSTANT SURVEILLANCE SERVICE (CSS)
6 [ ] DRY ICE
7 [ ] OTHER SPECIAL SERVICE
8 [ ]
9 [ ] SATURDAY PICK-UP
10 [ ]
11 [ ]
12 [ ] HOLIDAY DELIVERY

PACKAGES	WEIGHT IN POUNDS	YOUR DECLARED VALUE	OVER SIZE
1	29		
Total 1	Total 15	Total	

Received At: 1 [ ] Regular Stop 2 [ ] On-Call Stop 3 [ ] Drop Box 4 [ ] B.S.C. 5 [X] Station

FEDEX Corp. Employee No.: 1015 24

Date/Time for FEDEX Use: 9/15/89 14:

Emp. No. Date
[ ] Cash Received
[ ] Return Shipment
[ ] Third Party [ ] Chg. To Del. [ ] Chg. To Hold
Street Address
City State Zip
Received By: X
Date/Time Received FedEx Employee Number

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.
Signature

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

PART #2041738000 REVISION DATE 10/88 PRINTED IN U.S.A. SRCEF

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SECTION 3

QUALITY CONTROL

OBG LABORATORIES, INC.

Laboratory Report

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Waters Quality Control Summary

Trace Metals: Matrix Spike, Duplicate and Method Blank

DATE COLLECTED 9-14-89 DATE REC'D 9-18-89 DATE ANALYZED See Below

PARAMETER	DATE ANALYZED	LABORATORY NUMBER OF SPIKED SAMPLE	SPIKED SAMPLE RESULT (SSR)	SAMPLE RESULT (SR)	SPIKE ADDED (SA)	SPIKE (%R)	LABORATORY NUMBER OF DUPLICATE SAMPLE	SAMPLE RESULT (S)	DUPLICATE RESULT (D)	DUPLICATE RPD	METHOD BLANK
Total Metals:											
SILVER	10-4-89	J0687	0.031	<0.01	1.00	31	J0687	<0.01	<0.01	-	<0.01
ARSENIC	10-6-89		0.0226	0.006	0.04	42.		0.006	0.006	0.	<0.005
BARIUM	10-5-89		1.47	1.3	0.10	170.		1.3	1.3	0.	<0.2
CADMIUM			0.093	<0.01	0.10	93.		<0.01	<0.01	-	<0.01
CHROMIUM	10-5-89		0.340	0.24	0.10	100		0.24	0.24	0.	<0.05
MERCURY	9-21-89		0.00111	<0.0005	0.001	111.		<0.0005	<0.0005	-	<0.0005
LEAD	10-5-89		0.345	0.26	0.10	85		0.26	0.26	0.	<0.05
SELENIUM	10-6-89		<0.05	<0.05	0.01	-		<0.05	<0.05	-	<0.005

NOTES: 1) Spike Recovery = $\frac{(SSR - SR)}{SA} \times 100$

2) Duplicate RPD = $\frac{S - D}{(S+D)/2} \times 100\%$

UNITS: mg/l

Methodology: Federal Register — 40 CFR, Part 136 October 26 1984

Units mg/l (ppm) unless otherwise noted

Comments.

OBG Laboratories, Inc., an O Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd / Syracuse, NY / 13221 / (315) 457-1494

Authorized: Michael A. Pettitt

Date October 10, 1989

OBG LABORATORIES, INC.

Laboratory Report

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base - Water Quality Control Summary

Volatiles: Matrix Spike and Matrix Spike Duplicate

DATE COLLECTED 9-14-89 DATE REC'D 9-18-89 DATE ANALYZED 9-19,20-89

	UNITS	LAB # OF SPIKED SAMPLE	CONC. OF SPIKE	SAMPLE RESULT	CONC. MS	%RECOVERY	CONC. MSD	%RECOVERY	RPD %
1,1-DICHLOROETHENE	ug/l	J0687	50.0	<5	50.0	100.	71.1	142.	36.
TRICHLOROETHENE					48.6	97.	48.6	97.	0.
BENZENE					48.6	97.	48.6	97.	0.
TOLUENE					46.4	93.	50.8	102.	9.
CHLOROBENZENE					47.3	95.	48.0	96.	1.

Methodology. Federal Register — 40 CFR, Part 136, October 26 1984

Units mg/l (ppm) unless otherwise noted

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
RPD = RELATIVE PERCENT DIFFERENCE

Comments.

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd / Syracuse, NY / 13221 / (315) 457-1494

Authorized: Michael S Pettelli

Date October 10, 1989

2A
WATER VOLATILE SURROGATE RECOVERY

Lab Name: OBG LABORATORIES, INC. Contract: 3068.010.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

	EPA SAMPLE NO.	S1 (TOL) #	S2 (BFB) #	S3 (DCE) #	OTHER	TOT OUT
01	VBLK091801	105	100	97		0
02	J0457	102	104	99		0
03	J0458	106	103	100		0
04	J0459	100	98	101		0
05	J0460	102	100	102		0
06	J0644	98	103	100		0
07	J0645	108	103	98		0
08	J0646	106	100	102		0
09	VBLK091901	100	102	98		0
10	J0647	100	98	100		0
11	J0648	102	101	98		0
12	J0649	99	98	99		0
13	J0650	100	99	98		0
14	J0686	99	98	97		0
15	J0687	100	99	99		0
16	J0688	104	100	103		0
17	J0689	104	99	104		0
18	J0690	105	92	103		0
19	VBLK092001	104	101	99		0
20	J0691	102	100	102		0
21	J0692	104	102	98		0
22	J0693	103	101	97		0
23	J0694	103	97	98		0
24	J0687MS	104	102	98		0
25	J0687MSD	110	94	103		0
26						
27						
28						
29						
30						

		QC LIMITS
S1 (TOL)	= Toluene-d8	(88-110)
S2 (BFB)	= Bromofluorobenzene	(86-115)
S3 (DCE)	= 1,2-Dichloroethane-d4	(76-114)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

FORM II VOA-1

L/87 Rev.

2B
SOIL VOLATILE SURROGATE RECOVERY

37 373

Lab Name: OBG LABORATORIES, INC. Contract: 3068.010.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Level: (low/med) LOW

	EPA SAMPLE NO.	S1 (TOL) #	S2 (BFB) #	S3 (DCE) #	OTHER	TOT OUT
01	VBLK092101	98	98	94		0
02	J06695	105	92	95		0
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

		QC LIMITS
S1 (TOL)	= Toluene-d8	(81-117)
S2 (BFB)	= Bromofluorobenzene	(74-121)
S3 (DCE)	= 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

page 1 of 1

FORM II VOA-2

1/87 Rev.

OBG LABORATORIES, INC.

Laboratory Report

CLIENT U.S. ARMY CORPS OF ENGINEERS JOB NO 3068.016.517

DESCRIPTION Richards-Gebaur Air Force Base

QC Summary: Waters analyzed for Semivolatile Organics, Matrix Spike & Matrix Spike Duplicate

DATE COLLECTED 9-14-89 DATE REC'D 9-18-89 DATE ANALYZED 9-20-89

	UNITS	LAB # OF SPIKED SAMPLE	CONC. OF SPIKE ADDED	SAMPLE RESULT	CONC. MS	%RECOVERY	CONC. OF SPIKE ADDED	CONC. MSD	% RECOVERY	RPD %
PHENOL	µg/l	J0687	123.	<10.	64.9	53.	122.	60.8	50.	6.
2-CHLOROPHENOL			123.	<10.	103.	84.	122.	92.1	75.	11.
1,4-DICHLOROBENZENE			61.7	<10.	46.9	76.	61.0	43.7	72.	7.
N-NITROSO-DI-N-PROPYLAMINE			61.7	<10.	49.9	81.	61.0	46.4	76.	7.
1,2,4-TRICHLOROBENZENE			61.7	<10.	53.1	86.	61.0	47.4	78.	11.
4-CHLORO-3-METHYLPHENOL			123.	<10.	118.	96.	122.	106.	87.	11.
ACENAPHTHENE			61.7	<10.	53.7	87.	61.0	53.7	88.	0.
4-NITROPHENOL			123.	<50.	48.3	39.	122.	52.0	43.	7.
2,4-DINITROTOLUENE			61.7	<10.	51.3	83.	61.0	51.6	85.	1.
PENTACHLOROPHENOL			123.	<50.	88.1	72.	122.	89.6	73.	2.
DI-N-BUTYLPHTHALATE			61.7	<10.	41.7	68.	61.0	41.5	68.	0.
PYRENE			61.7	<10.	75.4	122.	61.0	82.1	135.	8.

Methodology: Federal Register — 40 CFR, Part 136 October 26, 1984

Units mg/l (ppm) unless otherwise noted

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
RPD = RELATIVE PERCENT DIFFERENCE

Comments.

OBG Laboratories Inc, an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd / Syracuse, NY / 13221 / (315) 457-1494

Authorized: Michael D. Pellicelli

Date: October 24, 1989

2C

WATER SEMIVOLATILE SURROGATE RECOVERY

37 375

Lab Name: OBG LABORATORIES, INC. Contract: 3068.016 517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01	SBLK092089W	92	78	96	49	72	82		0
02	SBLK091889W	80	84	100	40	59	107		0
03	J0457	96	82	110	17	27	92		0
04	J0458	86	80	112	37	51	64		0
05	J0459	84	74	102	12	18 *	81		1
06	J0644	98	92	126	31	46	64		0
07	J0645	86	84	114	43	60	92		0
08	J0646	92	90	126	23	32	26		0
09	J0647	74	70	96	50	75	106		0
10	J0686	94	86	116	43	68	93		0
11	J0687	94	92	108	49	66	96		0
12	J0688	94	78	96	46	65	82		0
13	J0689	90	80	124	42	63	93		0
14	J0690	48	68	74	50	41	54		0
15	J0691	74	82	88	35	49	59		0
16	J0687 MS	98	84	117	52	76	105		0
17	J0687 MSD	90	80	126	51	67	104		0
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

		QC LIMITS
S1 (NBZ)	= Nitrobenzene-d5	(35-114)
S2 (FBP)	= 2-Fluorobiphenyl	(43-116)
S3 (TPH)	= Terphenyl-d14	(33-141)
S4 (PHL)	= Phenol-d5	(10-94)
S5 (2FP)	= 2-Fluorophenol	(21-100)
S6 (TBP)	= 2,4,6-Tribromophenol	(10-123)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

FORM II SV-1

1/87 Rev.

2D
SOIL SEMIVOLATILE SURROGATE RECOVERY

Lab Name: OBG LABORATORIES, INC. Contract: 3065 016.5/7

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Level: (low/med) _____

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01	SB1509265915	94	90	102	94	79	67		0
02	J0695	100	106	113	103	94	96		0
03									
04									
05									
06									
07									
08									
09									
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12									
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27									
28									
29									
30									

		QC LIMITS
S1 (NBZ)	= Nitrobenzene-d5	(23-120)
S2 (FBP)	= 2-Fluorobiphenyl	(30-115)
S3 (TPH)	= Terphenyl-d14	(18-137)
S4 (PHL)	= Phenol-d5	(24-113)
S5 (2FP)	= 2-Fluorophenol	(25-121)
S6 (TBP)	= 2,4,6-Tribromophenol	(19-122)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

APPENDIX B

BORING LOGS, WELL CONSTRUCTION DIAGRAMS

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

N. Burn Pit

LOG OF BORING
BORING NO. GMW 604

37 378

DRAFT

PROJECT: Richards-Gebaur AFB		JOB NO: Z108-01	SHEET 1 OF 3
CLIENT: O'Brien and Gere		DRILLING AGENCY: Layne-Western T. Butler K. Santoyo	
SIZE AND TYPE OF BIT: 8" O.D. Hollowstem w/CME sampler		LOCATION (COORDINATES OR STATION): Site 6 North Burn Pit	
DIRECTION AND INCLINATION OF HOLE: Vertical		SOIL SAMPLING FOOTAGE: 9.5	CORING FOOTAGE: 23.5 / TOTAL DEPTH: 33.0
ELEVATION:	MFR DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES PENETRATION:	TUBES:
DEPTH TO WATER:	NO OF CORE BOXES:	DATE STARTED: 8/21/89	DATE COMPLETED: 8/22/89 / INSPECTOR(S): Scott Garbs

DEPTH IN FEET	LITHOLOGY	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % REQD	BOX NUMBER	REMARKS
			GRASS, ROOTS, DK. BROWN SILTY CLAY (TOPSOIL) .5 1.5 0.75 .75			PP=4.5	START: 1:25pm
			1.5				0.5 Run #1 = .5-3.0'
2			V. STIFF, ORANGE-BROWN AND TAN MOTTLED CLAY WITH ROOTLETS, FE/MN NODULES AND STAIN COMMON, SUB ANGULAR BLOCKY STRUCTURE	2.5 J-1 2.8	100%	PP=3.5	HNU=0 XPL=0 2 3.0
4			3.75			PP=3.0	Run #2 4 HNU=0
			V. STIFF, REDDISH-BROWN TO TAN MOTTLED CLAY WITH OCCASSIONAL FE/MN NODULES, HIGH PLASTIC, OCC. CHERT GRANULES (ROUNDED), BLOCKY	5.0 J-2 5.3	100%	PP=2.0	XPL=0
6			6.0				6
			V. STIFF, BROWN MOTTLED CLAY WITH WEATHERED ROCK FRAGMENTS, FE/MN NODULES COMMON, 45° WEAKLY PROMINENT FRACTURES, BLOCKY STRUCT. WEATHERED YELLOW-BROWN SILTSTONE FRAGMENTS BELOW 8.0 FT.			PP=2.0	8.0 8
8				8.5 J-3 8.8	100%	PP=1.0	Run #3
			9.5				9.5 Finish 1:45pm 8/21
10			10.0 REFUSAL CLEANED HOLE TO 10.0 FT.				START: 8:00am 8/22 WASH OUT 4-STEMS WITH ROCK BIT, REVERSED AUGERS TO PACK IN CUTTINGS 10
			LIMESTONE, LT. GRAY, NUMEROUS WEATHERED SEAMS (BEDDING PLANES), VUGS, STYLOLITES, MOD. WEATHERED, STRONG ROCK.		60/11	Box 1	USING 10.0' Nx BARREL WITH "N" RODS. START CORING AT 10.0' 12 HOLE DIA.: 2 7/8"
12							Run #4 START: 8:14AM FINISH: 8:21AM 13.5
14			SEE NEXT PAGE				LENGTH: 3.5' RECOVERY: 2.1' LOSS: 1.4' LOST -50 GALS. WATER 14 PIECES: 11 MAX: .4' MIN: 4-1.5 (FRAGS)

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

LOG OF BORING 37 379
BORING NO. GMW 604

DRAFT

PROJECT: RICHARDS-GEBAUR AFB		JOB NO: Z108-01	SHEET 2 OF 3
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE-WESTERN T. BUTLER K. SANTOYO		
SIZE AND TYPE OF BIT: NX CORE DIAMOND IMPREGNATED BIT	LOCATION (COORDINATES OR STATION): SITE 6 NORTH BURN PIT		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE: 9.5	CORING FOOTAGE: 23.5	TOTAL DEPTH: 33.0
ELEVATION	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES PENETRATION: 3 JARS ~~TUBES~~	
DEPTH TO WATER	NO OF CORE BOXES	DATE STARTED: 8/21/89 DATE COMPLETED: 8/22/89	INSPECTOR(S): SCOTT GAPES.

DEPTH IN FEET	LITHOLOGY	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % REQD	BOX NUMBER	REMARKS
			SEE PREVIOUS PAGE 13.5				13.5
14			LIMESTONE, LT. GRAY (AS ABOVE)	RUN #5	95/39	BOX #1	RUN #5 START: 8:34am FINISH: 8:56am LENGTH: 9.5 RECOVERY: 9.0 LOSS: 0.5' PIECES: NUMEROUS MAX: .8 MIN: <.1' (FRAGMENTS) LOCATION OF LOSS IS UNKNOWN LOST ~50 GALS. H_2O
16							
18							
20							
						21.3	
22						BOX #2	23.0 B/RUN #5 23.0'
24				RUN #6	65/33		TOP RUN #6 START: 9:11AM FINISH: 9:38am LENGTH: 10.0 RECOVERY: 6.5 LOSS: 3.5 PIECES: NUMEROUS MAX.: 1.5' MIN.: <.1' (FRAGS.) LOSS ESTIMATED IN CLAYSTONE BELOW 28.0' LOST ~200 GALS. DURING CORING OPER.
26			26.0 LIMESTONE, GRAY, ARGILLACEOUS, FOSSILIFEROUS, IRREGULAR BEDDING. 27.75				

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

DRAFT

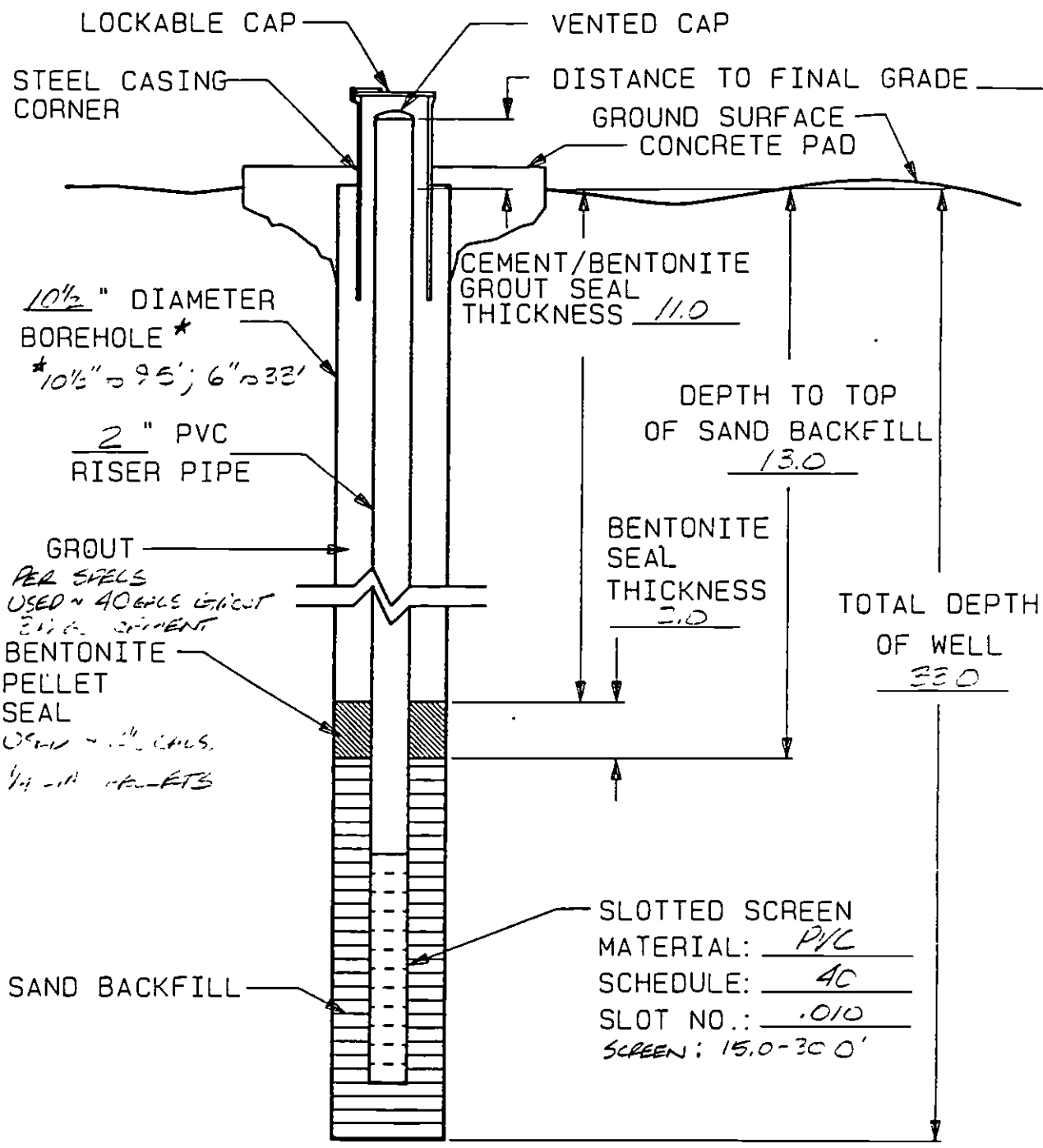
LOG OF BORING 37 380
BORING NO. GMW 604

PROJECT: RICHARDS-GEBAUR AFB		JOB NO: Z108.01	SHEET 3 OF 3
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE-WESTERN		
SIZE AND TYPE OF BIT: SAME	LOCATION (COORDINATES OR STATION): SITE 6 NORTH BURN PIT		
DIRECTION AND INCLINATION OF HOLE: SAME	SOIL SAMPLING FOOTAGE: 9.5	CORING FOOTAGE: 23.5	TOTAL DEPTH: 33.0
ELEVATION:	MFR DESIGNATION OF DRILL: CME55	NUMBER OF SOIL SAMPLES PENETRATION: 3 JARS ~~TUBES~~	
DEPTH TO WATER: UNKNOWN	NO OF CORE BOXES: 2	DATE STARTED: 8/21/89 DATE COMPLETED: 8/22/89	INSPECTOR(S): SCOTT GAFFEY

DEPTH IN FEET	LITHOLOGY	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % REQD	BOX NUMBER	REMARKS
30			CLAYSTONE, MED. GRAY, ARENACEOUS, MICACEOUS, OCC. CALCAREOUS BANDS.	RUN #6		BOX 2	RUN #6 LOSS 3.5' PROBABLY BELOW 28.0' IN CLAYSTONE LOST ~200 GALS. OF WATER INTO FM. DURING CORING OPERATION.
32			33.0 FT. B.O.H. 8/22/89				33.0 B.O.H.
34			SET 10½" AUGERS TO 9.5 FT. REAM HOLE TO 31.0' WITH 6" ROCK BIT				
36							
38							
40							

ACHTER>MISC.DETAILS>S.OVERBURDEN.GMW

WELL NO. 604



FINAL WATER LEVEL: _____ FEET BELOW TOP OF CASING.

INSPECTED BY: SCOTT GARRIS DATE: 8/23/89

OVERBURDEN MONITOR WELL FIELD LOG

OVERBURDEN.GMW

O'BRIEN & GERE ENGINEERS, INC.

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

DRAFT

LOG OF BORING 37 382
BORING NO. GMW 605

PROJECT: RICHARDS-GEBAUR AFB SITE 6		JOB NO. Z108-01	SHEET 1 OF 3
CLIENT: O'BRIEN + GERE	DRILLING AGENCY: LAYNE-WESTERN T. BUTLER K. SANTOYO		
SIZE AND TYPE OF BIT: 3¼" I.D. / 8" O.D. HOLLOWSTEM W/SAMPLER	LOCATION (COORDINATES OR STATION): SITE 6; INSIDE NW CORNER OF FENCE		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE 18.0	CORING FOOTAGE 19.9	TOTAL DEPTH 37.9
ELEVATION	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: PENETRATION 3 JARS ~~TUBES~~ 0	
DEPTH TO WATER: 8/17/89 24.0 7:00AM	NO. OF CORE BOXES: 2	DATE STARTED 8/15/89 DATE COMPLETED 8/17/89	INSPECTOR(S): SCOTT GARBS

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		0.75' GRASS, ROOTS, TOPSOIL				RUN #1 0.5-3.0' START 2:45PM
2		HARD, BROWN AND OLIVE MOTTLED SILTY CLAY, W/ROOTS, FE/MN STAIN AND NODULES COMMON, SUB-ANGULAR BLOCKY STRUCTURE	2.5 J-1 2.8	100%	PP=4.5	TIP II = 0 XPL = 0 3.0
4						RUN #2
		5.25' GRADATIONAL		100%	PP=2.5	TIP II = 0 XPL = 0
6		V. STIFF, LT. GRAY AND BROWN MOTTLED CLAY, FE/MN STAIN AND NODULES, OCC. CHERT GRAVEL (ANGULAR), FEW FRACTURE PLANES THAT ARE FILLED WITH SOFT, WET LT. GRAY CLAY POSSIBLY WATER BEARING (HIGH ϕ_r).	7.0 J-2 7.3		PP=2.0	
8					PP=2.75	RUN #3 TIP II = 0 XPL = 0
10	45°	10.25 GRADATIONAL		100%		
		V. STIFF, ORANGE-BROWN MOTTLED CLAY WITH TRACE SAND, FE/MN NODULES ABUNDANT, WEATHERED CHERT GRAVEL COMMON, GRAVELLY LAYER AT 10.5-11.0'. 45° PROMINENT, SLICKENSIDED FRACTURE AT 10.25'-10.5', HIGHLY WEATHERED ROCK FRAGMENTS BELOW 12.0'			PP=2.0	
12		12.75'	12.0 J-3 12.3		PP=2.5	12.75 REFUSAL
14		REFUSAL				STOP: 3:30AM 8/15/89 NO WATER ENCOUNTERED

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

LOG OF BORING 37 383
BORING NO. GMW 605

DRAFT

PROJECT: RICHARDS-GEBAUR AFB		JOB NO.: Z108-01	SHEET 2 OF 3
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE-WESTERN T. BUTLER K. SANTOYO		
SIZE AND TYPE OF BIT: NX CORE IMPREGNATED BIT 'N' ROOS	LOCATION (COORDINATES OR STATION): SITE 6 NW CORNER; INSIDE FENCE		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE	CORING FOOTAGE	TOTAL DEPTH
ELEVATION	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: PENETRATION ~~TUBES~~ 0	
DEPTH TO WATER	NO. OF CORE BOXES	DATE STARTED: 8/15/89 DATE COMPLETED	INSPECTOR(S): SCOTT GARBS

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		12.75 REFUSAL				DRILLED VIA HOLLOW STEMS 9" ⊖ HOLE
		SUSPECTED ROCK LEDGE 12.75-13.75'				12.75
		13.75				
14		SUSPECTED CLAY 13.75-18.0' NOT SAMPLED.	NOT SAMPLED			BROKE THROUGH LEDGE 12.75-13.75' USING ROCK BIT. ENCOUNTERED CLAY BELOW ROCK LAYER 14
16						START CORING AT 18.0' STARTED WITH 100 GALS. OF DRILLING WATER. SEALED HOLLOWSTEMS W/BENT. AND CUTTINGS. 16
18						18
		LIMESTONE, LT. GRAY, NUMEROUS HORIZONTAL BREAKS (WEATHERED), VUGGY, MOD. WEATHERED CORE STONES, STRONG ROCK ARGILACEOUS 20.25-20.75', TRACE CLAY REC'D AT 23.5-24.0'	RUN #1	83/0	BOX #1	18.0 RUN #1 START: 3:46pm FINISH: 4:10pm LENGTH: 6.0 REC'Y: 5.0 LOSS: 1.0 PIECES: NUMERIUS MAX: .28 ft MIN: <.1' (FRAGMENTS) DRILLER NOTED SLIGHT WATER LOSS
20						20
22						22
24						24
26						26

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

DRAFT

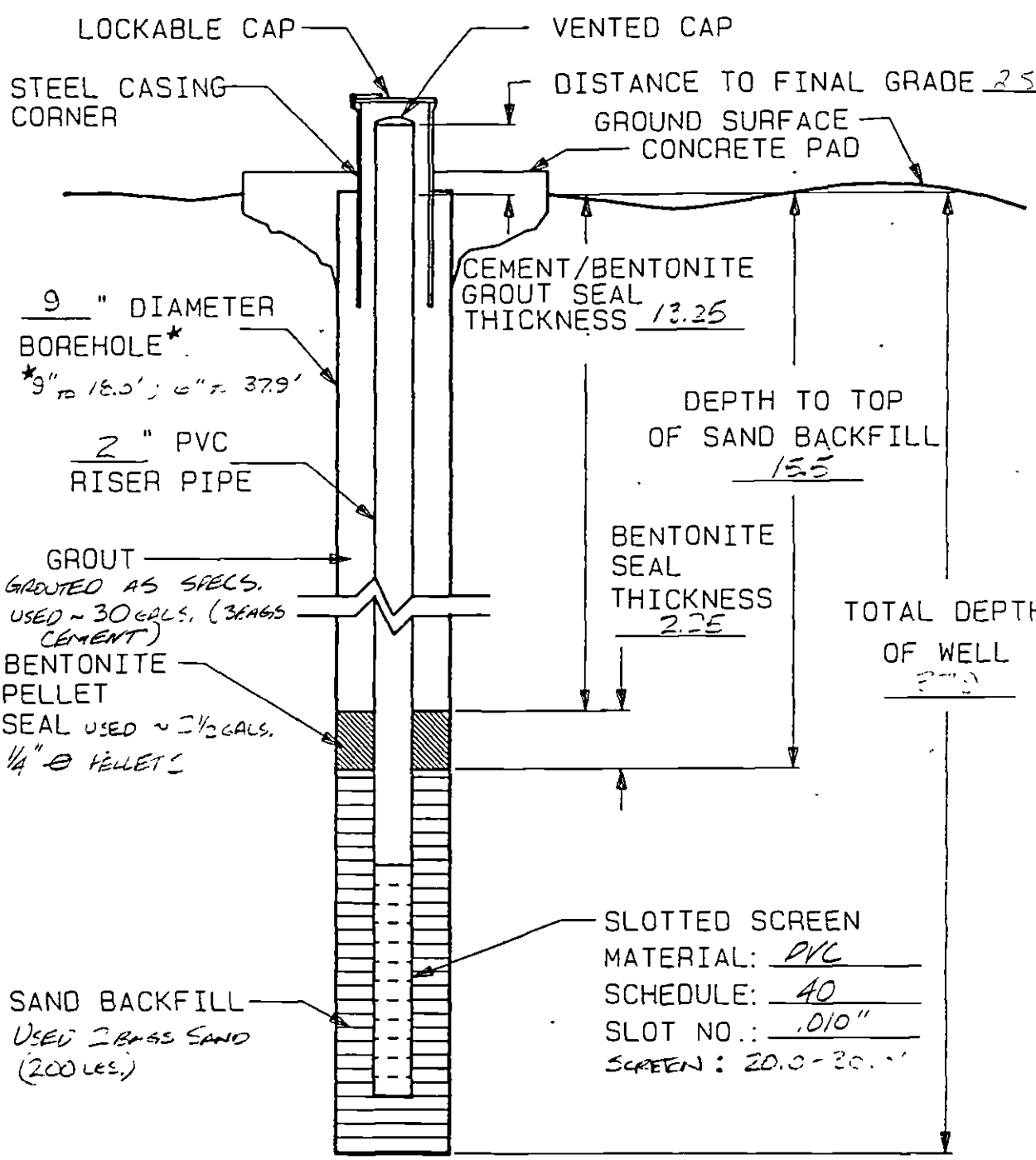
LOG OF BORING 37 384
BORING NO. GMW 605

PROJECT: RICHARDS-GEBAUR AFB		JOB NO.: Z108-01	SHEET 3 OF 3
CLIENT: O'BRIEN + GERE	DRILLING AGENCY: SAME		
SIZE AND TYPE OF BIT: NX CORE	LOCATION (COORDINATES OR STATION): SAME		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE: 18.0	CORING FOOTAGE: 19.9	TOTAL DEPTH: 37.9
ELEVATION	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: PENETRATION 3 JARS	TUBES 0
DEPTH TO WATER: 8/17/89 24.0' 7:00am	NO. OF CORE BOXES: 2	DATE STARTED: 8/15/89	DATE COMPLETED: 8/17/89
		INSPECTOR(S): SCOTT GARBS	

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
26		LIMESTONE, AS ABOVE	RUN #2	73 / 28	BOX #1	RUN #2 START: 4:40pm FINISH: 5:02 pm LENGTH: 8.5 REC'Y: 6.2 LOSS: 2.3 PIECES: NUMEROUS MAX: .7 FT. MIN: L.1' (FRAGMENTS) NO APPARENT WATER LOSS.
		27.0				
28		LIMESTONE, MED. GRAY, ARGILLACEOUS, FOSSILIFEROUS, BECOMING MORE ARGILLACEOUS W/DEPTH.				LOCATION OF LOSS IS UNKNOWN, PROBABLY IN CLAYSTONE BELOW 28.0 FT.
		28.0			28.5	
30		CLAYSTONE, DK. GRAY, CALCAREOUS, ARENACEOUS, MICA FLECKS, IRREGULAR LAMINATIONS, ~~VERY WEAK ROCK~~, RIP-UP CLASTS, V. WEAK ROCK.			BOX #2	5:30pm - HOLE IS DRY TOOK ~300 GALS. LOSS PROBABLY DUE TO BIT BLOCKING OFF IN THE CLAYSTONE.
32						32.5
34			RUN #3	91 / 52		STOP FOR 8/16/89 5:02pm RUN #3 START 8/17/89 10:20am START: 10:31am 11:05am FINISH: 10:37am* 11:09am LENGTH: 5.4 RECOVERY: 4.9 LOSS: 0.5 PIECES: 14 MAX: .6 FT. MIN: L.1FT. (FRAGMENTS) LOCATION OF LOSS IS UNKNOWN *RAN OUT OF WATER LOST WATER THROUGHOUT RUN
36						
		37.9' B.O.H.				37.9 B.O.H.
38		HOLE REAMED TO: 10½" TO 16.0', 6" TO 31.5'				LOST ~400 GALS. DURING CORING.

ACHTER>MISC.DETAILS>S.OVERBURDEN.GMW

WELL NO. 605



FINAL WATER LEVEL: _____ FEET BELOW TOP OF CASING.

INSPECTED BY: SCOTT GIVENS DATE: 8/18/89

OVERBURDEN MONITOR WELL FIELD LOG

OVERBURDEN GMW

O'BRIEN & GERE ENGINEERS, INC.

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

LOG OF BORING 37 386
BORING NO. GMW 606

PROJECT: RICHARDS - GEBAUR AFB		JOB NO: Z108-01	SHEET 1 OF 3
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE-WESTERN T. BUTLER K. SANTOYO		DRAFT
SIZE AND TYPE OF BIT: 8" O.D. HOLLOWSTEM W/CME SAMPLER	LOCATION (COORDINATES OR STATION): SITE 6 NORTH BURN PIT		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE 7.0	CORING FOOTAGE 26.0	TOTAL DEPTH 33.0
ELEVATION	MFR DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES PENETRATION 3 JARS	TUBES 0
DEPTH TO WATER	NO OF CORE BOXES	DATE STARTED 8/21/89	DATE COMPLETED 8/23/89	INSPECTOR(S): SCOTT GARRETT

DEPTH IN FEET	LITHOLOGY	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % REQD	BOX NUMBER	REMARKS
			GRASS, ROOTS, TOPSOIL 0.75				START: 10:15AM
2			V. STIFF, REDDISH-BROWN AND DARK GRAY MOTTLED CLAY WITH ROOTLETS, FE/MN STAIN AND NODULES COMMON. SUBANGULAR BLOCKY STRUCTURE (GRAD) 3.0	2.5 J-1 2.8	100%	PP=4.0 PP=2.5	RUN #1 .5-3.0' HNU=0 PPM XPL=0 3.0
4			V. STIFF, REDDISH-BROWN AND TAN MOTTLED CLAY WITH FE/MN STAIN AND NODULES PLASTICITY INCREASES W/DEPTH 5.5 (GRADATIONAL)	5.0 J-2 5.3 6.0 J-3 6.3	100%	PP=3.5	RUN #2 3.0-7.0 HNU=1 PPM. XPL=0
6							FINISH: 11:30AM.
8			V. STIFF BROWN MOTTLED CLAY WITH WEATHERED CHERT AND LIMESTONE FRAGMENTS, FE/MN NODULES COMMON THROUGHOUT 7.0 REFUSAL CLEANED OUT PROBABLY SAME AS ABOVE (5.5-7.0)			PP=2.75	7.0 REFUSAL HNU=0PPM START CORING USING NX 10' BARREL 10.0' HOLE DIA: 7 7/8 IN. CLEAN OUT BORING TO 10.0' WITH ROCKBIT 8" O.D. AUGERS ARE SEALED WITH CUTTINGS.
10							10.0
12			LIMESTONE, LT. GRAY, NUMEROUS WEATHERED SEAMS (BEDDING PLANES), OCCASSIONAL VUGS, STYLOLITES MOD. WEATHERED, STRONG ROCK. 13.0	RUN #3	75/11		RUN #3 START: 10:21AM FINISH: 10:26AM LENGTH: 3.0' RECOVERY: 2.25' LOSS: .75 PIECES: 13.0 MAX: .33' MIN: 2.1' (FRAGS.)
14			SEE NEXT PAGE FOR CONT. LOG.				STOP TO REPAIR RIG. LOST ~50 GALS. WATER

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

LOG OF BORING 37 387
BORING NO. GMW 606

PROJECT: RICHARDS - GEBAUR AFB		JOB NO.: Z108-01	SHEET 2 OF 3
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE-WESTERN T. BUTLER K. SANTOYO		
SIZE AND TYPE OF BIT: NX CORE 10' BARREL	LOCATION (COORDINATES OR STATION): SITE 6 NORTH BURN PIT	DRAFT	
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE: 7.0	CORING FOOTAGE: 26.0	TOTAL DEPTH: 33.0
ELEVATION	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES PENETRATION: 3 JARS	TUBES: 0
DEPTH TO WATER	NO. OF CORE BOXES	DATE STARTED: 8/21/89 DATE COMPLETED: 8/23/89	INSPECTOR(S): SCOTT GARBS

DEPTH IN FEET	LITHOLOGY / GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % REQD	BOX NUMBER	REMARKS
		LIMESTONE, LT. GRAY, (AS ABOVE)	RUN #4	93 / 48		13.0 RUN #4 START: 10:48 AM 11:49 AM FINISH: 10:57 AM 11:58 AM LENGTH: 10.0' RECOVERY: 9.25' LOSS: 0.75' PIECES: NUMEROUS MAX.: 0.75' MIN.: <.1' (FRAGMENTS) RAN OUT OF GAS 10:48 AM/7 LOST ~100 GALS. H_2O LOCATION OF LOSS IS UNKNOWN; IN WEATHERED ZONES THROUGH OUT RUN.
15						15
17						17
19						19
21						21
23		24.0				23.0
		LIMESTONE, GRAY, ARGILLACEOUS, FOSSILIFEROUS, DISTORTED BEDDING	RUN #5	73 / 28		RUN #5 START: 12:14 PM FINISH: 12:33 PM LENGTH: 10.0' REC'Y: 7.25' LOSS: 2.75' PIECES: NUMEROUS MAX: .45' MIN: <.1' (FRAGMENTS) LOST ~100 GALS. H_2O LOSS PROBABLY IN CLAYSTONE
25		25.1 CLAYSTONE, DK. GRAY, ARGILACEOUS, CALCAREOUS, FOSSILIFEROUS, DISTORTED BEDDING 26.1				23
		SANDSTONE, GRAY, VERY ARGILLACEOUS, V. FINE GRAINED, PYRITIFEROUS, OCC. RIP-UP CLASTS, DISTORTED BEDDING				25
27						27

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

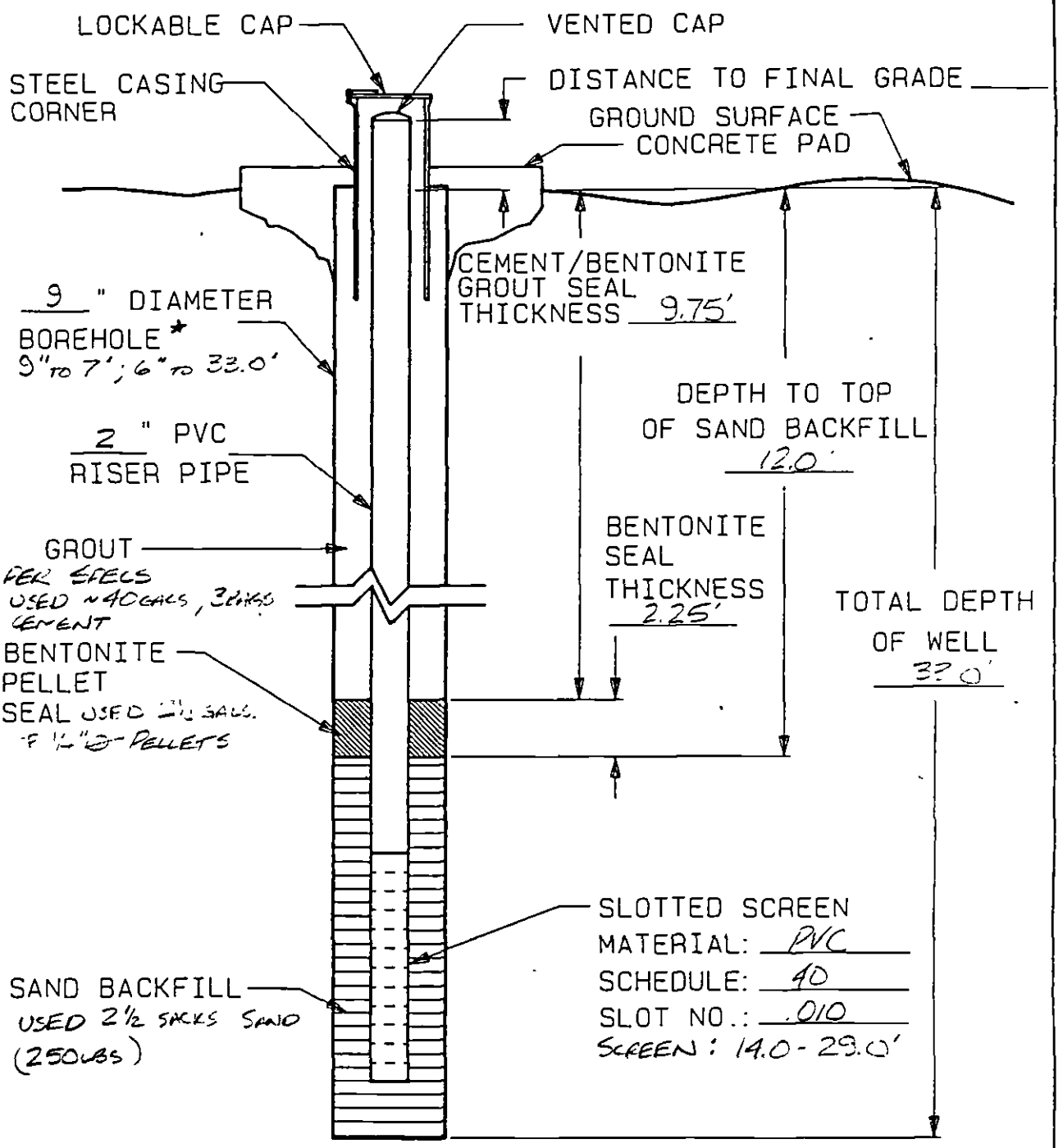
LOG OF BORING 37 388
BORING NO. GMW 606

PROJECT: RICHARDS - GEBAUR AFB		JOB NO: Z108-01	SHEET 3 OF 3
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE		
SIZE AND TYPE OF BIT: NX CORE	LOCATION (COORDINATES OR STATION): SITE 6 NORTH BURN PIT		DRAFT
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE: 7.0	CORING FOOTAGE: 26.0	TOTAL DEPTH: 33.0
ELEVATION	MFR DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES PENETRATION: 3 JARS ~~TUBES~~ 0	
DEPTH TO WATER	NO OF CORE BOXES	DATE STARTED: 8/2/89	DATE COMPLETED: 8/23/89 INSPECTOR(S): SCOTT GARCS

DEPTH IN FEET	LITHOLOGY	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % REQD	BOX NUMBER	REMARKS
			28.7 (GRADATIONAL)				
30			CLAYSTONE, GRAY, ARENACEOUS, MICACEOUS, SILTSTONE BANDING, DISTORTED BEDDING.	RUN #5			30
32							32
			33.0 BOTTOM OF HOLE				33.0 B.O.H.
							BORING TERMINATED
34			SET 10½" O.D. HOLLOWSTEMS TO 9.0'; REAM 6" HOLE TO 30.0 FT.				34

ACHTER>MISC.DETAILS>S.OVERBURDEN.GMW

WELL NO. 606



FINAL WATER LEVEL: _____ FEET BELOW TOP OF CASING.

INSPECTED BY: SCOTT GARRIS DATE: 8/23/89

OVERBURDEN MONITOR WELL FIELD LOG

OVERBURDEN.GMW

DAMES & GORE ENGINEERS, INC.

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

LOG OF BORING 37 390
BORING NO. GMW 607

PROJECT: RICHARDS-GEBAUR AFB		JOB NO. Z 108-01	SHEET 1 OF 4
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE-WESTERN T. BUTLER K. SANTOYO		DRAFT
SIZE AND TYPE OF BIT: 3¾" ID/8" O.D. HOLLOW STEMS W/CME SAMPLER	LOCATION (COORDINATES OR STATION): SITE 6 SE CORNER INSIDE FENCE		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE 12.5	CORING FOOTAGE 29.5	TOTAL DEPTH 42.0
ELEVATION	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: PENETRATION 3 JARS ~~TUBES~~ 0	
DEPTH TO WATER: 22.4' 7:00AM 8/18	NO. OF CORE BOXES	DATE STARTED 8/15/89 DATE COMPLETED 8/16/89	INSPECTOR(S): SCOTT GARBS

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		0.5' GRASS, LIMESTONE GRAVEL (CRUSHED)				RUN #1. START: 4:15PM
2		HARD, LT. GRAY AND BROWN MOTTLED SILTY CLAY WITH ABUNDANT FE/MN NODULES AND STAIN, SUBANGULAR BLOCKY STRUCTURE, ROOTS.	2.0 J-1 2.3	100%	PP=4.5	3.0
4					PP=3.5	RUN #2 TIP II=0 XPL=0
		5.0 GRADATIONAL				
6		V. STIFF, LT. GRAY AND BROWN MOTTLED CLAY WITH CHERT GRAVEL AND FE/MN NODULES COMMON, OCC. SLICKENSIDED FRACTURES, BECOMING LT. GRAY WITH DEPTH.	7.0 J-2 7.3	100%		
8					PP=2.5	8.0 RUN #3 TIP II=0 XPL=0
10		10.5 10.8 CHERT GRAVEL LAYER - TRACE H_2O 11.2 GRADATIONAL	11.2 J-3 11.5	100%		
12		V. STIFF, YELLOWISH-BROWN AND LT. GRAY MOTTLED CLAY WITH ABUNDANT FE/MN NODULES, WEATHERED LMST. FRAGMENTS. 12.5 REFUSAL			PP=2.25	12.5 REFUSAL
14						STOP: 4:55PM. 8/15/89 NO WATER ENCOUNTERED

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

LOG OF BORING 37 391
BORING NO. GMW 607

PROJECT: RICHARDS-GEBAUR AFB		JOB NO. Z108-01	SHEET 2 OF 4
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE-WESTERN		DRAFT
SIZE AND TYPE OF BIT: NX IMPREGNATED DIAMOND CORE	LOCATION (COORDINATES OR STATION): SAME		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE: 12.5	CORING FOOTAGE: 29.5	TOTAL DEPTH: 42.0
ELEVATION	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: ~~PENETRATION~~ 3 JARS ~~TUBES~~ 0	
DEPTH TO WATER	NO. OF CORE BOXES	DATE STARTED 8/15/89 DATE COMPLETED 8/16/89	INSPECTOR(S): SCOTT GARRISS

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		12.5' DRILLED VIA HOLLOWSTEMS 8" Ø HOLE				USING NX BARREL 2 7/8" Ø HOLE
14, 16, 18		LIMESTONE, MOD. WEATHERED, STRONG ROCK, NUMEROUS WEATHERED ZONES, PROBABLY CLAY FILLED SEAMS, OCC. VUGS, STYLOLITES, GRAY REC'D CLAY FILLED SEAM 12.6-12.7'	RUN #1	65 / 8	BOX #1	RUN #1 START: 8:16AM START: 8:16AM FINISH: 8:26 AM LENGTH: 5.75 RECOVERY: 3.75 LOSS: 2.0' PIECES: NUMEROUS MAX: 45' MIN: 0.1' (FRAGMENTS) STARTED DRILLING WITH 150 GALS. WATER POSSIBLE WATER LOSS FROM 17.5-18.25'; NOT DETECTABLE IN TANK. LOCATION OF LOSS IS UNKNOWN, THROUGHOUT 18.25
20, 22, 24		24.25	RUN #2	83 / 36		RUN #2 START: 8:44 AM FINISH: 9:05 AM LENGTH: 6.0' RECOVERY: 5.0 LOSS: 1.0 PIECES: NUMEROUS MAX: .55' MIN: 0.1' (FRAGMENTS) NO OBVIOUS WATER LOSS, LOSS OF CORE PROBABLY THROUGHOUT RUN AS ABOVE.
26		SEE NEXT PAGE FOR CONT. OF LOG.				

SHANNON & WILSON, INC.
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LOG OF BORING 37 392
BORING NO. GMW 607

PROJECT: RICHARDS-GEBAUR AFB		JOB NO. Z108-01	SHEET 3 OF 4
CLIENT: SAME	DRILLING AGENCY: SAME		
SIZE AND TYPE OF BIT: NX CORE	LOCATION (COORDINATES OR STATION): DRAFT		
DIRECTION AND INCLINATION OF HOLE	SOIL SAMPLING FOOTAGE 12.5	CORING FOOTAGE 29.5	TOTAL DEPTH 42.0
ELEVATION / MFR. DESIGNATION OF DRILL	NUMBER OF SOIL SAMPLES PENETRATION 3 JARS ~~TUBES~~ 0		
DEPTH TO WATER / NO. OF CORE BOXES	DATE STARTED 8/15/89	DATE COMPLETED 8/16/89	INSPECTOR(S) SCOTT GARBS

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		LOG CONT.				LOG CONT.
26		LIMESTONE, GRAY, ~~HIGHLY~~ MOD. ~~FRACTURED~~ (AS ABOVE) WEATHERED, VERTICAL FRACT. 27.0-27.5' 26.1				24.25' RUN #3 START: 9:25 AM FINISH: 10:13 AM LENGTH: 7.75 RECOVERY: 4.25 LOSS: 3.50 PIECES: NUMEROUS MAX: .5 MIN: <.1' (FRAGMENTS) 26
		LIMESTONE, DK. GRAY, ARGILLACEOUS, FOSSILIFEROUS. 27.5				
28	LOSS 3.50'	LOSS ESTIMATED AT 27.5-31.0'. POSSIBLE WASH OUT DUE TO WEATHERING IN UPPER PORTION OF CLAYSTONE. NO CHANGE NOTED IN DRILL ACTION OR WATER	RUN #3	55/13	BOX #2	LOCATION OF LOSS IS UNKNOWN PROBABLY BELOW 26.25' 28
30		31.0				NO APPARENT WATER LOSS 30
32		CLAYSTONE, DK. GRAY, COARSE SAND, V. WEAK ROCK, FRESH, FOSSILIFEROUS. 32.0				32.0 32
34		SANDSTONE, GRAY, MED. GRAINED, V. ARGILLACEOUS, DISTORTED BEDDING, SANDSTONE NODULES, MICACEOUS, LAMINATED. 35.0				RUN #4 START: 10:37 AM FINISH 11:08 AM LENGTH: 10.0 RECOVERY: 4.6 LOSS: 5.4 PIECES: NUMEROUS MAX: .6 FT. MIN: <.1 FT (FRAGMENTS) 34
36		CLAYSTONE, DK. GRAY, ARENACEOUS, V. WEAK ROCK, MICACEOUS, LAMINATED		46/17	BOX #2	NO APPARENT WATER LOSS; CORE LOSS LOCATION IS UNKNOWN 36
38		LOSS POSSIBLY IN CLAYSTONE				38
						11:30 AM. STOP DRILLING AT 42.0'

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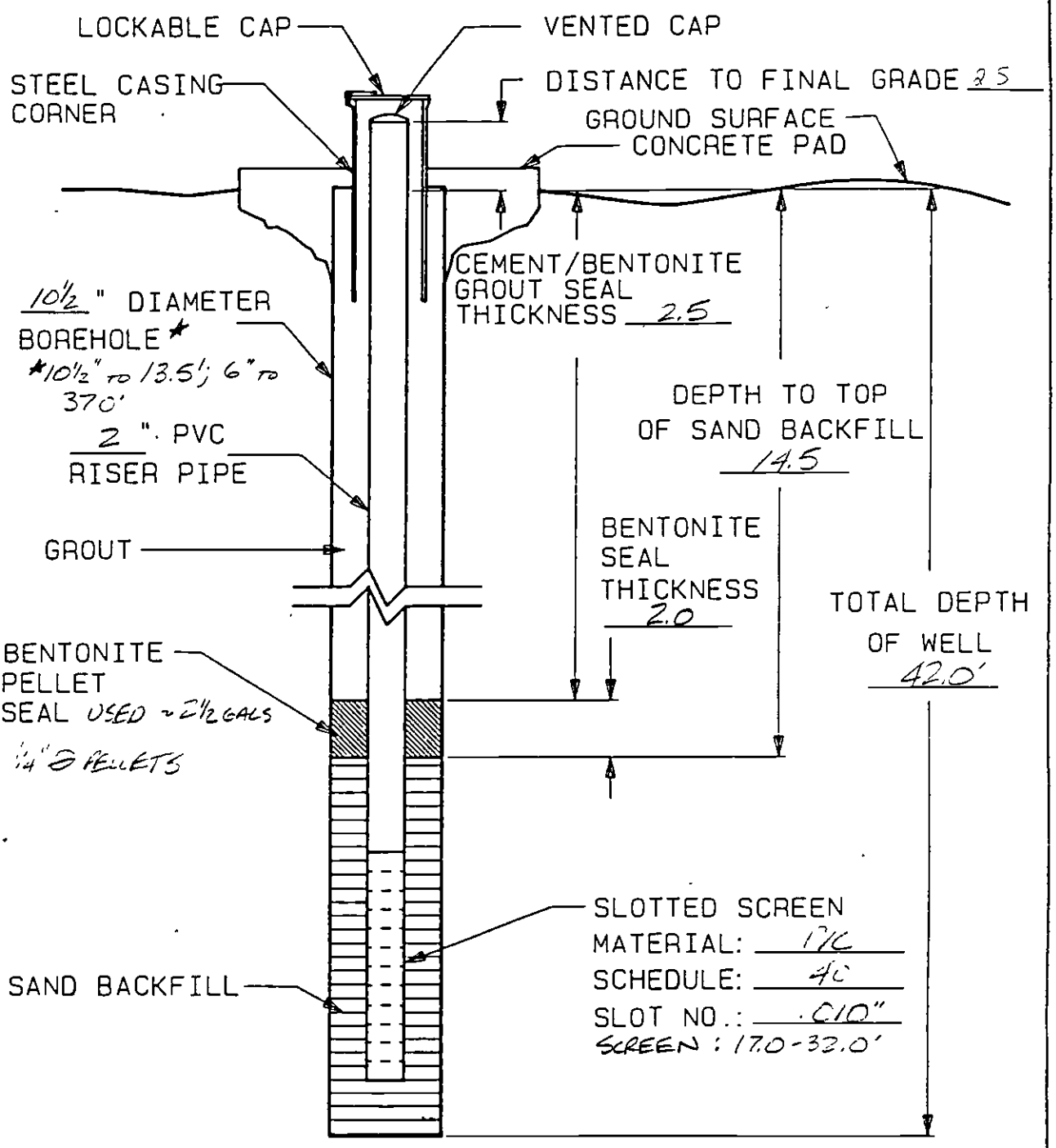
LOG OF BORING 37 393
BORING NO. GMW 607

PROJECT: RICHARDS-GEBAUR AFB		JOB NO: 2108-01	SHEET 4 OF 4
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE-WESTERN T. BUTLER K. SANTOYO		
SIZE AND TYPE OF BIT: NX CORE	LOCATION (COORDINATES OR STATION):		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE: 12.5	CORING FOOTAGE: 29.5	TOTAL DEPTH: 42.0'
ELEVATION:	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: PENETRATION 3 JARS	TUBES 0
DEPTH TO WATER: 8/18/89 7:00AM 22.4'	NO. OF CORE BOXES:	DATE STARTED: 8/15/89 DATE COMPLETED: 8/16/89	INSPECTOR(S): SCOTT GARBS

DEPTH IN FEET	LITHOLOGY	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % REQD	BOX NUMBER	REMARKS
			CLAYSTONE, ARENACEOUS, GRAY (AS ABOVE)				SEE PREVIOUS PAGE FOR REMARKS
42			42.0 B.O.H.				42.0 B.O.H. BORING TERMINATED 42
			8/18/89 WELL INSTALLATION DATA USE 10½" O.D. HOLLOWSTEMS TO 13.5'; REAM WITH 6" ROCKBIT TO 33.0' CONSTRUCT WELL AS FOLLOWS: BENT. SEAL: 13.5-15.5 SANDPACK: 15.5-42.0 SCREEN: 17.0-32.0 ACTUAL: BENT. SEAL: 14.5-12.5 SANDPACK: 14.5-42.0 SCREEN: 17.0-32.0				DRAFT

ACHTER>MISC.DETAILS>S.OVERBURDEN.GMW

WELL NO. 607



FINAL WATER LEVEL: _____ FEET BELOW TOP OF CASING.

INSPECTED BY: SCOTT GARBS DATE: 5/23/89

OVERBURDEN MONITOR WELL FIELD LOG

OVERBURDEN.GMW

OBERMEYER ENGINEERS, INC.

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

DRAFT

LOG OF BORING 37 395
BORING NO. GMW 1205

PROJECT: RICHARDS-GEBAUR SITE #12 POL YARD		JOB NO. Z108-01	SHEET 1 OF 2
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE/WESTERN — TOM BUTLER - DRILLER, KEVIN SANTYA - LABORER		
SIZE AND TYPE OF BIT: 3 1/4" I.D. / 8" O.D. HOLLOWSTEM	LOCATION (COORDINATES OR STATION)		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE: 13.5'	CORING FOOTAGE: 5.0	TOTAL DEPTH: 18.5'
ELEVATION	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: PENETRATION 4 JARS ~~TUBES~~ 0	
DEPTH TO WATER: DRY 8/9/89	NO. OF CORE BOXES: 1	DATE STARTED: 8/9/89 DATE COMPLETED: 8/11/89	INSPECTOR(S): SCOTT GARBS

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC % RQD	BOX NUMBER	REMARKS
		.5' GRASS, ROOTS, TOPSOIL				START: 1105PM
		V. STIFF, DK. GRAY SILTY CLAY WITH ROOTLETS, WEAK BLOCKY STRUCTURE (TOPSOIL)	1.0 J-1 1.3	100%	PP=3.0	RUN #1 .5-3.0' HNU = 3 PPM XPL = 0
2		2.5				2
		STIFF GRAY AND BROWN MOTTLED CLAY WITH OCCASSIONAL GRAVEL, FE/MN STAIN AND NODULES COMMON, ROOTLETS, ROUNDED GRANULES				3.0 RUN #2
4			4.0 J-2 4.3		PP=1.5	HNU = 0 PPM. XPL = 0 LOST 2' DOWN HOLE
6				100%	PP=2.25	REC'D IT BY REPUSHING TUBE; DID NOT PICK IT UP. MAKE RUN #3 TO 11.0 FT. TO ACC. LOSS.
8						8.0
					PP=3.25	RUN #3 HNU = 3 PPM XPL = 0 PICKED UP LOSS FROM RUN #2
10		9.25 CHERTY GRAVEL, SOIL APPEARS WETTER THAN ABOVE OR BELOW		110%		
		10.25 BE YELLOW BRN. AND LT. GRAY	10.3 J-3 10.6		PP=1.5	11.0
		11.0 STIFF, ~~GRAY AND GONE~~ MOTTLED CLAY WITH FE/MN NODULES AND STAIN COMMON, OCCASSIONAL ANGULAR GRANULES (POSSIBLE WEATHERED SHALE)				11.5 REFUSAL
12						1:51PM (STOP FOR DAY) NOTE: GROUND ON ROCK FROM 11.0-11.5' REFUSED AT 11.5'
		LIMESTONE, HARD, GRAY, CRYSTALLINE	13.0 J-4 13.3			
		13.5'				
14						NO WATER ENCOUNTERED. 8/10/89 2:15PM ADVANCED BORING TO 13.5' USING H-STEMS; START LOGING HOLE REAMED TO 9" DIA. TO 13.5 FT.

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

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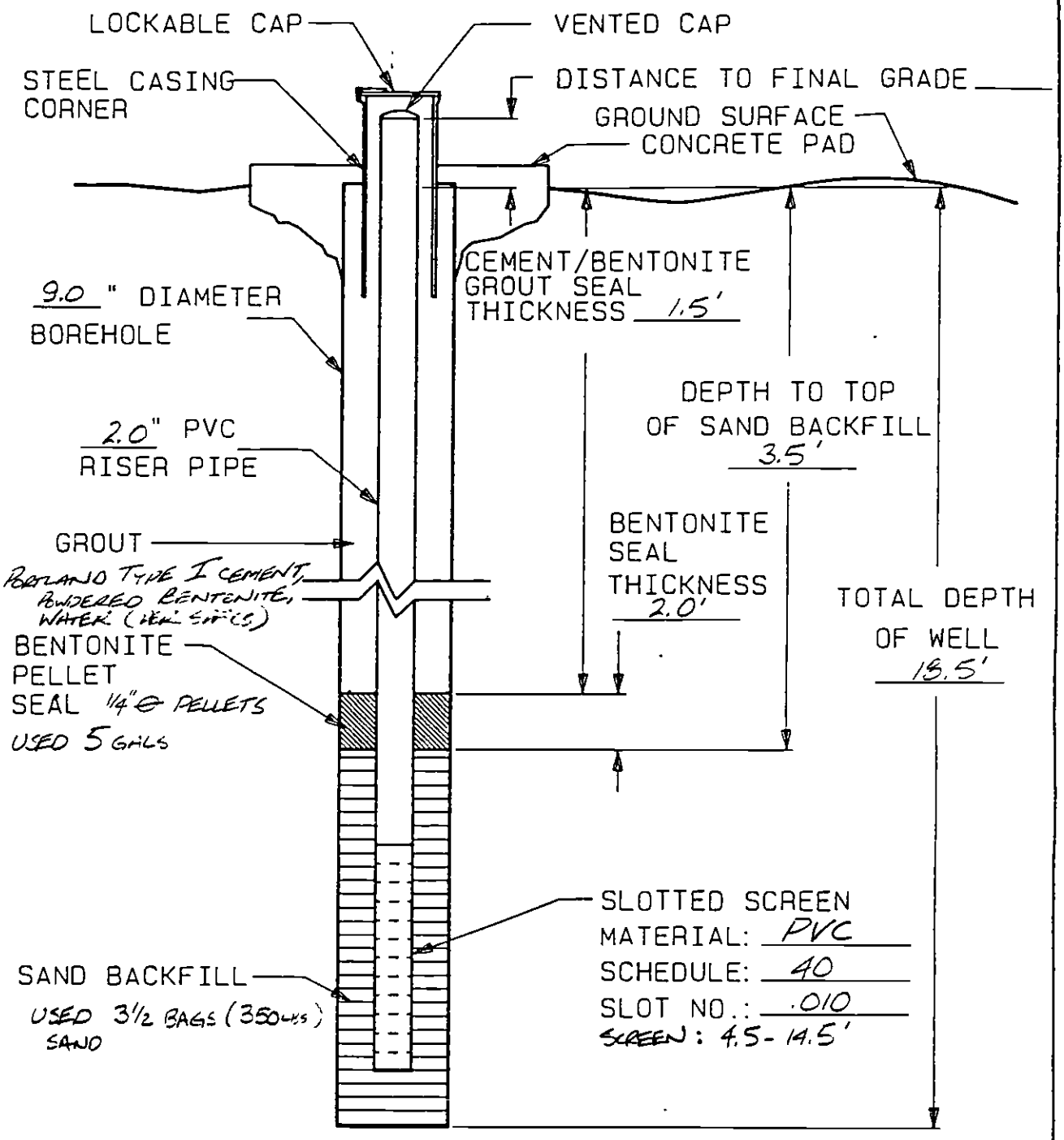
LOG OF BORING 37 396
BORING NO. GMW 1205

PROJECT: RICHARDS-GEBAUR SITE #12		JOB NO.: Z108-01	SHEET 2 OF 2
CLIENT:		DRILLING AGENCY: LAYNE-WESTERN T. BUTLER K. SANTOYO	
SIZE AND TYPE OF BIT: ~~3¾" I.D. MB" O.D. HOLLOWSTEMS W/ SAMPLER~~ Nx CORE W/ ~~2⅞" O.D.~~		LOCATION (COORDINATES OR STATION):	
DIRECTION AND INCLINATION OF HOLE:		SOIL SAMPLING FOOTAGE: 13.5	CORING FOOTAGE: 5.0 / TOTAL DEPTH: 18.5
ELEVATION: VERTICAL	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: ~~PENETRATION~~ 4 JARS. ~~TUBES~~	
DEPTH TO WATER: 8/10 2100PM 5.3'	NO. OF CORE BOXES: 1	DATE STARTED: 8/9/89 DATE COMPLETED: 8/11/89	INSPECTOR(S): SCOTT GARBS

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		DRILLED VIA HOLLOWSTEMS; SEE PAGE 1 FOR LOG. TOP OF ROCK AT 11.0' 13.5				CORE WITH Nx BARREL 2⅞" DIA. HOLE. 13.5
14		LIMESTONE, GRAY, STRONG, SLIGHTLY WEATHERED, OCC. VUGS, WEATHERED SEAMS THROUGHOUT CORE, STYLOLITES COMMON, 14.8-15.4' 75° HIGH ∡ FRACT. 2NDARY MINERALIZATION ON FACES.	RUN #1	95/48	BOX #1	RUN #1 START: 3:28PM FINISH: 3:37PM LENGTH: 5.0 RECOVERY: 4.7' LOSS: 0.3' PIECES: 14 MAX: 1.0' MIN: 0.1' NO APPARENT WATER LOSS
16						
18						
		B.O.H. 18.5' NOTE: "MB" ON CORE INDICATES MECHANICAL BREAK.				B.O.H 18.5'
20						
22						
24						
26						

ACHTER>MISC.DETAILS>S.OVERBURDEN.GMW

WELL NO. 1205



FINAL WATER LEVEL: _____ FEET BELOW TOP OF CASING.

INSPECTED BY: Scott Garrs DATE: 8/14/89

OVERBURDEN MONITOR WELL FIELD LOG

OVERBURDEN.GMW

O'BRIEN & GERE ENGINEERS, INC.

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

DRAFT

LOG OF BORING 37 398
BORING NO. GMW 1206

PROJECT: RICHARDS-GEBAUR AFB SITE #12		JOB NO.: Z108-01	SHEET 1 OF 2
CLIENT		DRILLING AGENCY	
SIZE AND TYPE OF BIT: 3¾" I.D. / 8" O.D. HOLLOWSTEM W/SAMPLER		LOCATION (COORDINATES OR STATION)	
DIRECTION AND INCLINATION OF HOLE		SOIL SAMPLING FOOTAGE / CORING FOOTAGE	TOTAL DEPTH
ELEVATION	MFR. DESIGNATION OF DRILL	NUMBER OF SOIL SAMPLES: PENETRATION / TUBES	
DEPTH TO WATER	NO. OF CORE BOXES	DATE STARTED / DATE COMPLETED	INSPECTOR(S): SCOTT GARRES

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		.5 GRASS, ROOTS, TOPSOIL				START: 10:40AM
		HARD, DK. BROWN CLAY WITH ROOTS, TRACE SILT, BLOCKY STRUCTURE, TRACE FE/MN STAIN	1.5 J-1 1.8	2.5'	PP=4.25	RUN #1 .5-3.0' HNU=0 XPL=0
2		2.25				HOLE DIA. 9.0 IN. 2
		V. STIFF, GRAY CLAY WITH FE/MN NOD. + MOTTLES COMMON, OCCASIONAL ROOTLETS, BLOCKY STRUCTURE	3.3 J-2 3.5		PP=3.0 PP=3.5	3.0 RUN #2
4		4.25		5.0'		HNU=0 XPL=0 4
		STIFF, BROWN AND GRAY MOTTLED CLAY WITH ROOTLETS FE/MN STAIN AND NODULES, ANG. ROCK FRAGMENTS, DK. GRAY FILMS ON SOME PED FACES. (ROCK FRAGS. GRAVEL SIZE)				
6					PP=1.75	6
8			7.7 J-3 8.0			8.0 8
						RUN #3 HNU=0 XPL=0
10		10.1 CHERTY GRAVEL (SOFT, WET, CLAY)			PP=3.25	10
		10.5 (ROCK TERMS) CLAYSTONE, OLIVE BROWN TO GRAY, MOD. WEATHERED, ~~VERY LAMINATIONS~~, SILTY, OCC. ANG. GRAVEL, TRACE FINE SAND, 12.5 (GRADATIONAL) & CLAY FILLED ROOT HOLES?	10.7 J-4 11.0		PP=1.0 PP=1.5	13.0
12						12
14						14

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

DRAFT

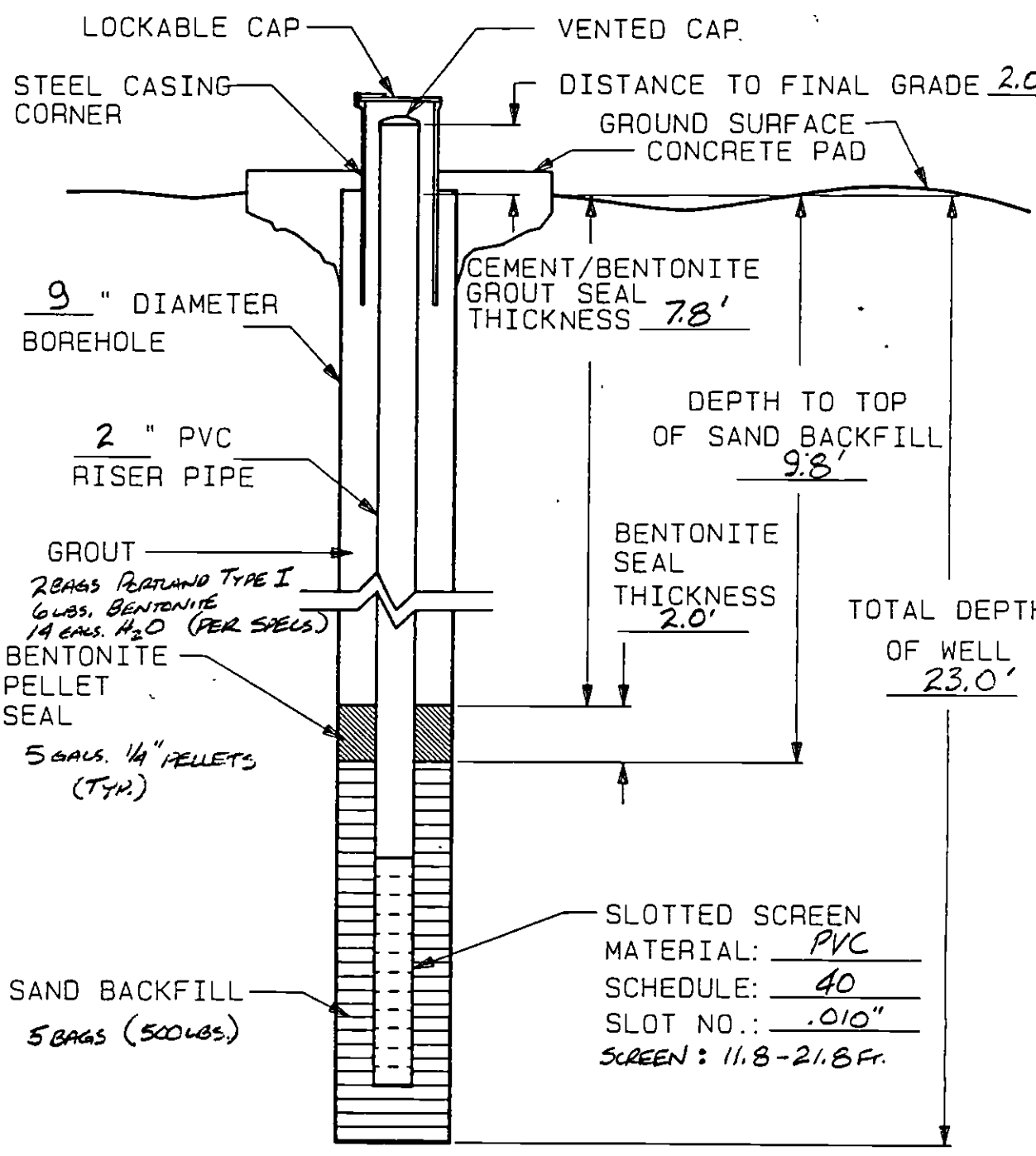
LOG OF BORING GMW-
BORING NO. 1206 37 39

PROJECT: RICHARDS-GEBAUR AFB SITE #12		JOB NO. 2108-01	SHEET 2 OF 2
CLIENT: O'BRIEN + GERE	DRILLING AGENCY: LAYNE-WESTERN		
SIZE AND TYPE OF BIT: SAME	LOCATION (COORDINATES OR STATION):		
DIRECTION AND INCLINATION OF HOLE: SAME	SOIL SAMPLING FOOTAGE: 23.0	CORING FOOTAGE: 0	TOTAL DEPTH: 23.0
ELEVATION:	MFR. DESIGNATION OF DRILL:	NUMBER OF SOIL SAMPLES: ~~PENETRATION~~ 6 JARS ~~TUBES~~	
DEPTH TO WATER: 8/10/89-0730AM 15.8'	NO. OF CORE BOXES:	DATE STARTED: 8/9/89 DATE COMPLETED: 8/10/89	INSPECTOR(S): SCOT GARBS.

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		VERY WEAK ROCK, ~~SLIGHTLY WEATH~~				13.0
14		SHALE, OLIVE, SILTY, V. FINE SAND, SLIGHTLY WEATHERED, 2NDARY MINERALIZATION ON SOME BEDDING PLANES, HIGH & FACT, AT 17.5' WITH 2NDARY MINERALIZATION				RUN #4 HNU=0 XPL=0 14
		15.25 SOFT, WET ZONE, FE STAINED. 15.5				
16						16
		∠ α = 60° FRACTURE				
		B.O.H. 18.0' (8/9/89)	17.7 J-5			B.O.H - 18.0' 11:20AM. 18
18			18.0			NO WATER ENCOUNTERED 8/10/89 0730 AM WL = 15.8' EXTEND BORING TO 23.0 FT TO ACCOMODATE SCREEN
20		20.0'				20
22		SHALE, GRAY, V. WEAK, FRESH, TRACE SILT, V. FINE SAND, LAMINATED, OCCASSIONAL THIN (~.05') OLIVE BANDS (WEATHERED)	22.0 J-6 22.3			RUN #5 START: 9:07 AM FINISH: 9:15 AM SAMPLER IS MUDDY. 22
						23.0' B.O.H
		NO WATER ENCOUNTERED				
24						24

ACHTER>MISC.DETAILS>S.OVERBURDEN.GMW

WELL NO. 1206



FINAL WATER LEVEL: _____ FEET BELOW TOP OF CASING.

INSPECTED BY: SCOTT GARBS DATE: 8/11/89

OVERBURDEN MONITOR WELL FIELD LOG

OVERBURDEN.GMW

O'BRIEN & GERE ENGINEERS, INC

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

37 401

LOG OF BORING
BORING NO. GMW 1207

DRAFT

PROJECT: RICHARDS-GEBAUR AFB SITE #1 (POL YARD)		JOB NO. Z108-01	SHEET 1 OF 2
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE-WESTERN T. BUTLER K. SANTONA		
SIZE AND TYPE OF BIT: 3¾" I.D. / 8" O.D. HOLLOW STEM W/ SAMPLER	LOCATION (COORDINATES OR STATION)		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE: 13.5	CORING FOOTAGE: 9.5	TOTAL DEPTH: 23.0
ELEVATION	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: ~~PENETRATION~~ 5 JARS ~~TUBES~~	
DEPTH TO WATER	NO. OF CORE BOXES: 1	DATE STARTED: 8/11/89 DATE COMPLETED: 8/11/89	INSPECTOR(S): SCOTT GARRS

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		0.25 ASPHALT CHUNKS, CRUSHED STONE (LIMESTONE)				
		V. STIFF, DK. GRAY MOTTLED CLAY TRACE SILT, FE/MN NOD. + STAIN COMMON WK. BLOCKY STRUCTURE 1.5	1.3 J-1 1.5	100%	PP=2.75	0.5 RUN #1 .5-3.0' HNU = 1 PPM XPL = 0 HOLE DIA. 8" TO 13.5'
2		V. STIFF GRAY AND BROWN MOTTLED CLAY WITH TRACE SILT, FE/MN STAIN + NODULES COMMON, OCCASSIONAL ~~PEBBLE~~ BLOCKY STRUCTURE				2
						3.0
4					PP=2.5	RUN #2 4
6				100%		HNU = 1 PPM XPL = 0 6
		7.5 (GRADATIONAL)	7.0 J-2			
8		7.8 V. STIFF LT. GRAY AND YELLOW BRN. MOTTLED CLAY WITH ~~LIMESTONE~~ CHERT 8.5 GRAVEL BELOW 7.8' TRACE H_2O	7.3 7.7 J-3 8.0		PP=2.5	8.0' 8
		STIFF, LT. GRAY AND YELLOW BROWN MOTTLED CLAY WITH DK. GRAY MOTTLES (ROOT HOLES?) OCCASSIONAL HIGH & FRACTS. WITH SLICKENSIDES, OCC. WEATHERED ROCK FRAGMENTS: (WEATHERED SHALE?) 11.75			PP=1.5	RUN #3 TRACE WATER AT 7.8'
10			10.0 J-4 10.3			HNU = 0 PPM XPL = 0 10
12		(ROCK TERMS) SHALE, OLIVE, MOD. WEATHERED, V. WEAK, FE/MN STAIN ON SOME BEDDING PLANES, FISSILE, TRACE SILT, V. FINE SAND 13.5 REFUSAL	12.5 J-5 12.8		PP=4.5	13.0 12
						13.5 REFUSAL
14						10:15AM SET UP TO CORE 14

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37 402

DRAFT

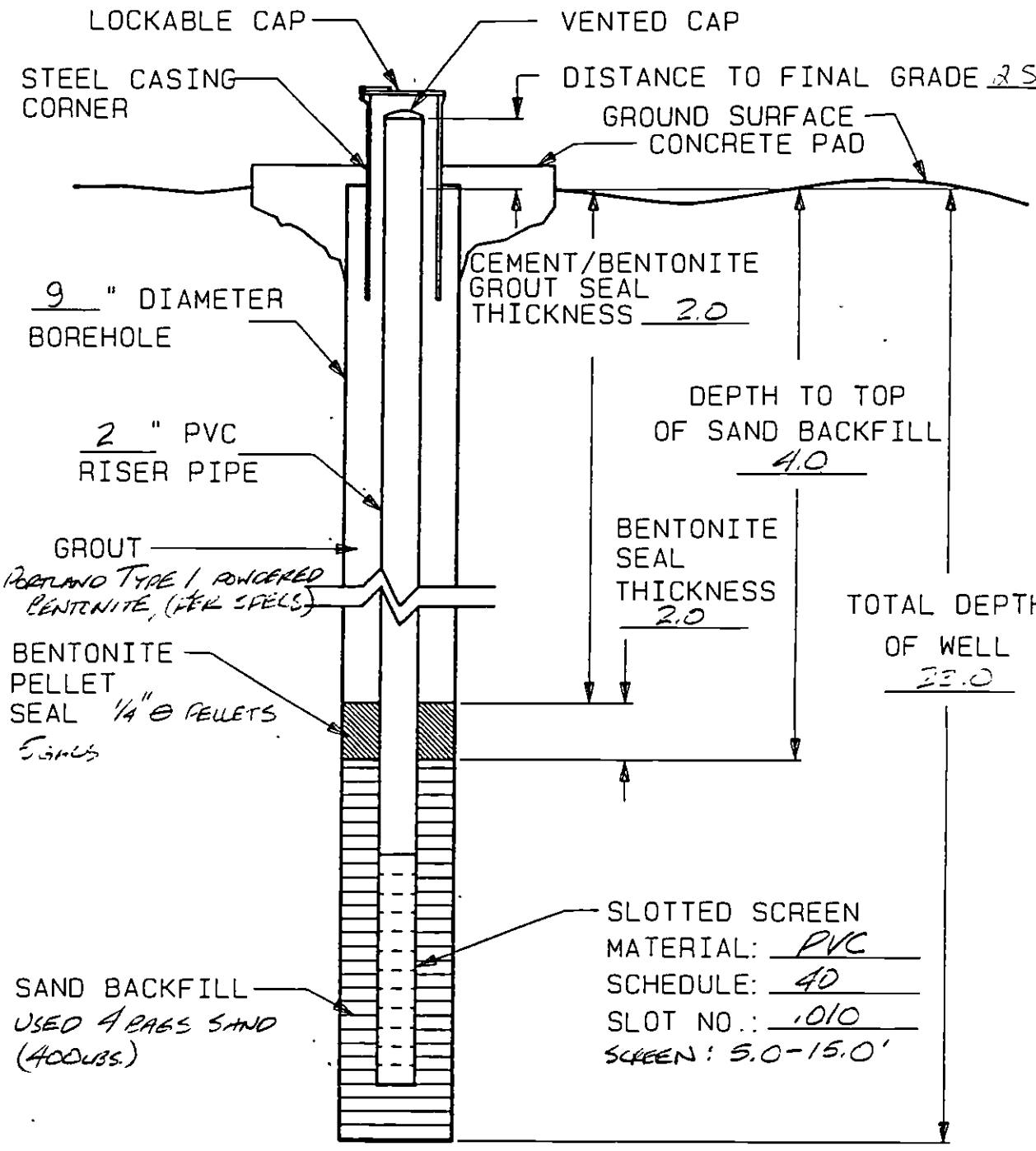
LOG OF BORING
BORING NO. GMW 1207

PROJECT: RICHARDS-GEBAUR AFB SITE #12		JOB NO. Z108-01	SHEET 2 OF 2
CLIENT: O'BRIEN AND GERE	DRILLING AGENCY: LAYNE / WESTERN		
SIZE AND TYPE OF BIT: 10' Nx CORE BARREL w/IMPREGNATED BIT	LOCATION (COORDINATES OR STATION)		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE 13.5'	CORING FOOTAGE 9.5	TOTAL DEPTH 23.0
ELEVATION	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: PENETRATION ~~TUBES~~	
DEPTH TO WATER	NO. OF CORE BOXES: 1	DATE STARTED / DATE COMPLETED: 8/11/89	INSPECTOR(S): SCOTT GARBS

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		DRILLED VIA HOLLOWSTEMS SEE PRIOR PAGE FOR LOG. 13.5				HOLE DIA. Nx 2 7/8"
14, 16, 18, 20, 22		LIMESTONE, LT. GRAY, STRONG, SLIGHTLY WEATHERED, ABUNDANT STYLOLITES, WEATHERED SEAMS AT 15.5, 16.6', 17.1', 17.5', 18.7', 20.4', 20.8', 21.6' (< .1' THICK), GRAY CLAY FILLED SEAM AT 22.5' (.1' THICK), FOSSILIFEROUS BELOW 22.4'	RUN #1	100 / 84	BOX #1 OF 1	13.5' RUN #1 START: 12:58PM (TOP 5'-16MIN) FINISH: 1:30PM (BOT 4.5'-16MIN) LENGTH: 9.5 RECOVERY: 9.5 PIECES: 16 MAX: 2.1FT MIN: 0.1FT NO APPARENT WATER LOSS ZONES.
		B.O.H 23.0 FT				B.O.H. 23.0 FT
24, 26		NOTE: "MB" ON CORE INDICATES MECHANICAL BREAK				1:30PM DRILLERS PUMPED DRILL WATER OUT TO ~13.0 FT. BARRELLED UP WATER.

ACHTER>MISC.DETAILS>S.OVERBURDEN.GMW

WELL NO. 1207



FINAL WATER LEVEL: _____ FEET BELOW TOP OF CASING.

INSPECTED BY: SCOTT GARCES DATE: 8/14/89

OVERBURDEN MONITOR WELL FIELD LOG

OVERBURDEN.GMW

O'BRIEN & GERE ENGINEERS, INC

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

37 404

DRAFT

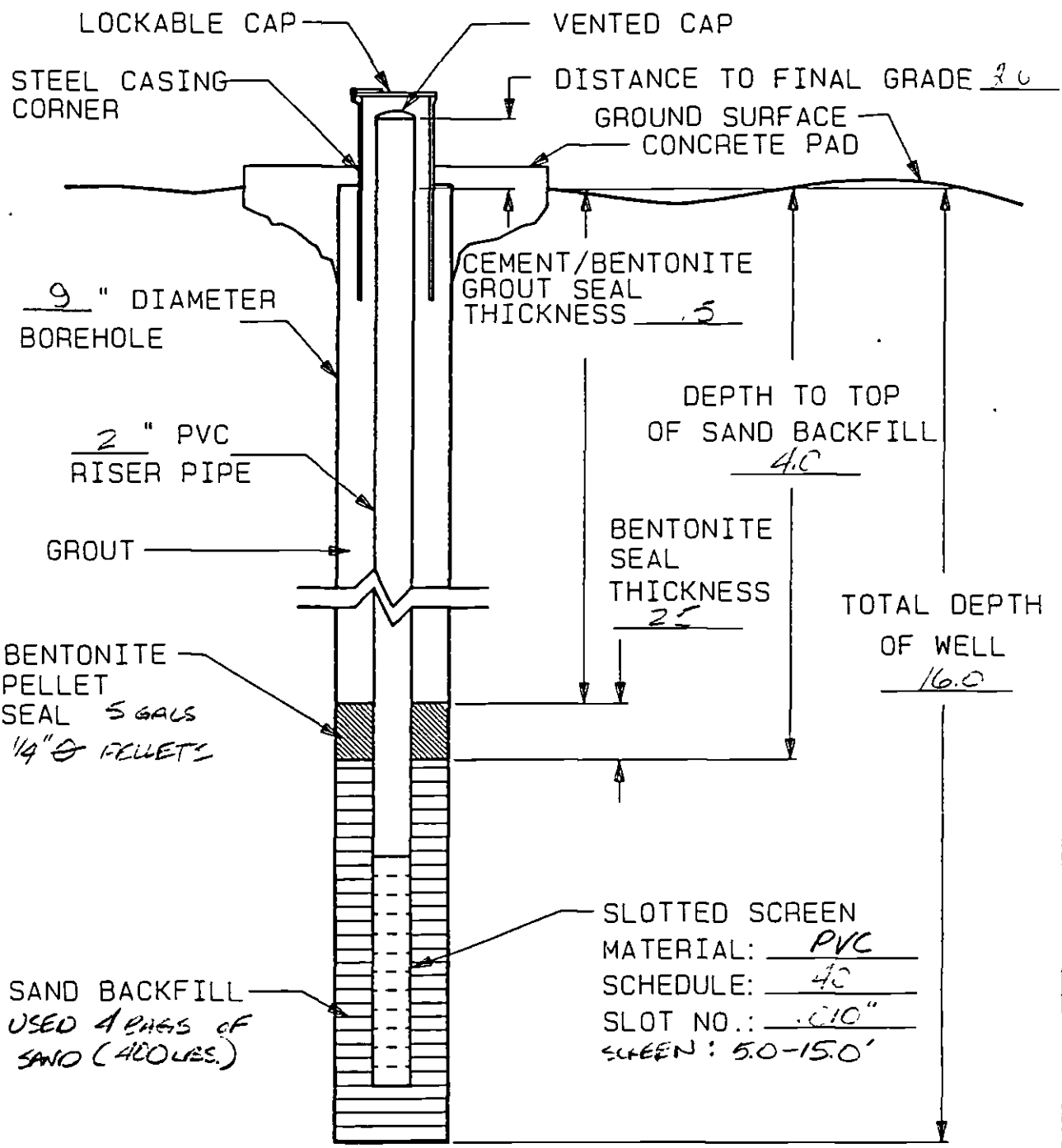
LOG OF BORING
BORING NO. GMW 1208

PROJECT: RICHARDS-GEBAUR AFB		JOB NO.: Z108-01	SHEET 1 OF 1
CLIENT: O'BRIEN AND GERE	ORILLING AGENCY: LAYNE-WESTERN T. BUTLER K. SANTOYO		
SIZE AND TYPE OF BIT: 3 3/4" I.D./8" O.D HOLLOWSTEM w/ 2'-2" SSA	LOCATION (COORDINATES OR STATION): POL YARD		
DIRECTION AND INCLINATION OF HOLE: VERTICAL	SOIL SAMPLING FOOTAGE: 16.0	CORING FOOTAGE: 0.0	TOTAL DEPTH: 16.0
ELEVATION:	MFR. DESIGNATION OF DRILL: CME 55	NUMBER OF SOIL SAMPLES: PENETRATION 4 JARS ~~TUBES~~	
DEPTH TO WATER:	NO. OF CORE BOXES: —	DATE STARTED: 8/14/89 DATE COMPLETED: 8/15/89	INSPECTOR(S): SCOTT SARBS

DEPTH IN FEET	GRAPHIC LOG	CLASSIFICATION OF MATERIALS (DESCRIPTION)	SAMPLE OR RUN NUMBER	% REC / % RQD	BOX NUMBER	REMARKS
		.25' CRUSHED LIMESTONE				
		STIFF, DK. GRAY AND BROWN SILTY CLAY w/ LMST. GRAVEL (POSSIBLE FILL)	1.0 J-1 1.5	6" PP=3.0	3/3/5/5	USING 2'-2" Ø SPOON TIP II = -2.2 XPL = 0 2:15PM - START DRILLING.
2		FILL		1.0'	4/3/4/5	TIP II = -2.4 XPL = 0
4		5.0		1.3'	6/8/14/14	TIP II = -0.7 XPL = 0
		V. STIFF, DK. GRAY CLAY WITH OLIVE MOTTLES, TRACE SILT. 6.4	5.5 J-2 6.0	PP=2.75		
6		V. STIFF GRAY AND OLIVE MOTTLED CLAY WITH TRACE SILT, FE/MN NODULES AND STAIN COMMON, OCCASSIONAL CHERT PEBBLES BECOMING MED. STIFF BELOW 12.5'.		2.0 PP=2.0	5/6/8/8	TIP II = -1.6 XPL = 0
8			9.0 J-3 9.5	2.0	5/6/6/14	TIP II = 2.2-4.9 XPL = 0
10				2.0 PP=2.0	4/5/8/9	
12		HIGH ANGLE FRACTURE 13.0-13.4', 13.8-14.0' FAILURE PLANE CONTAINS TRACE WATER.	13.0 J-4 13.5	PP=1.0	N.A.	
14	60° 60°	14.9' SPOON REFUSAL			3/50BLS. 4"	WATER ON SPOON 3:30PM.
16		LIMESTONE, LT. GRAY				B.O.H AT 16.0'

ACHTER>MISC.DETAILS>S.OVERBURDEN.GMW

WELL NO. 1208



FINAL WATER LEVEL: _____ FEET BELOW TOP OF CASING.

INSPECTED BY: Scott Gaffes DATE: 8/15/89

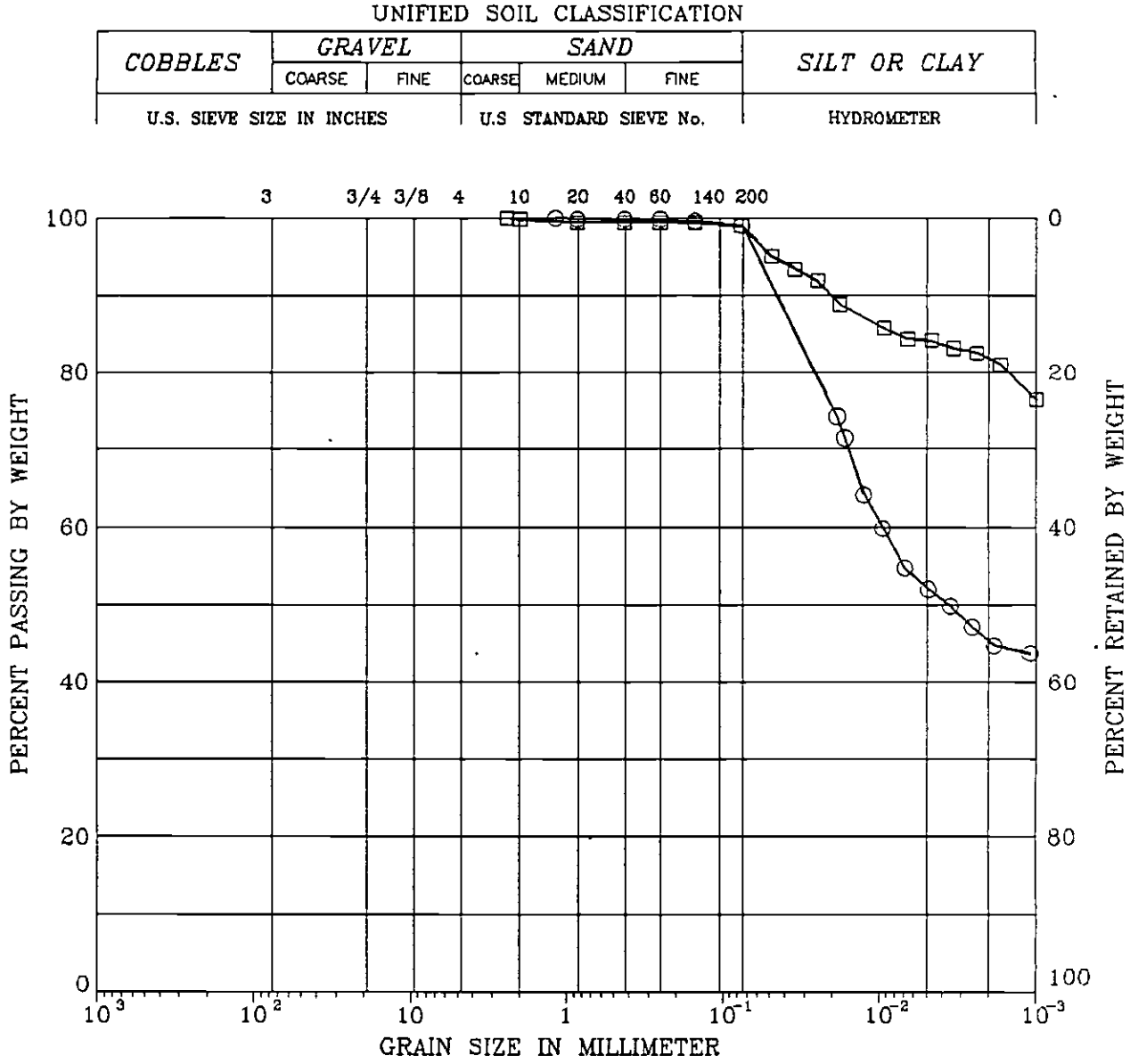
OVERBURDEN MONITOR WELL FIELD LOG

OVERBURDEN.GMW

O'BRIEN & GERE ENGINEERS, INC.

APPENDIX C

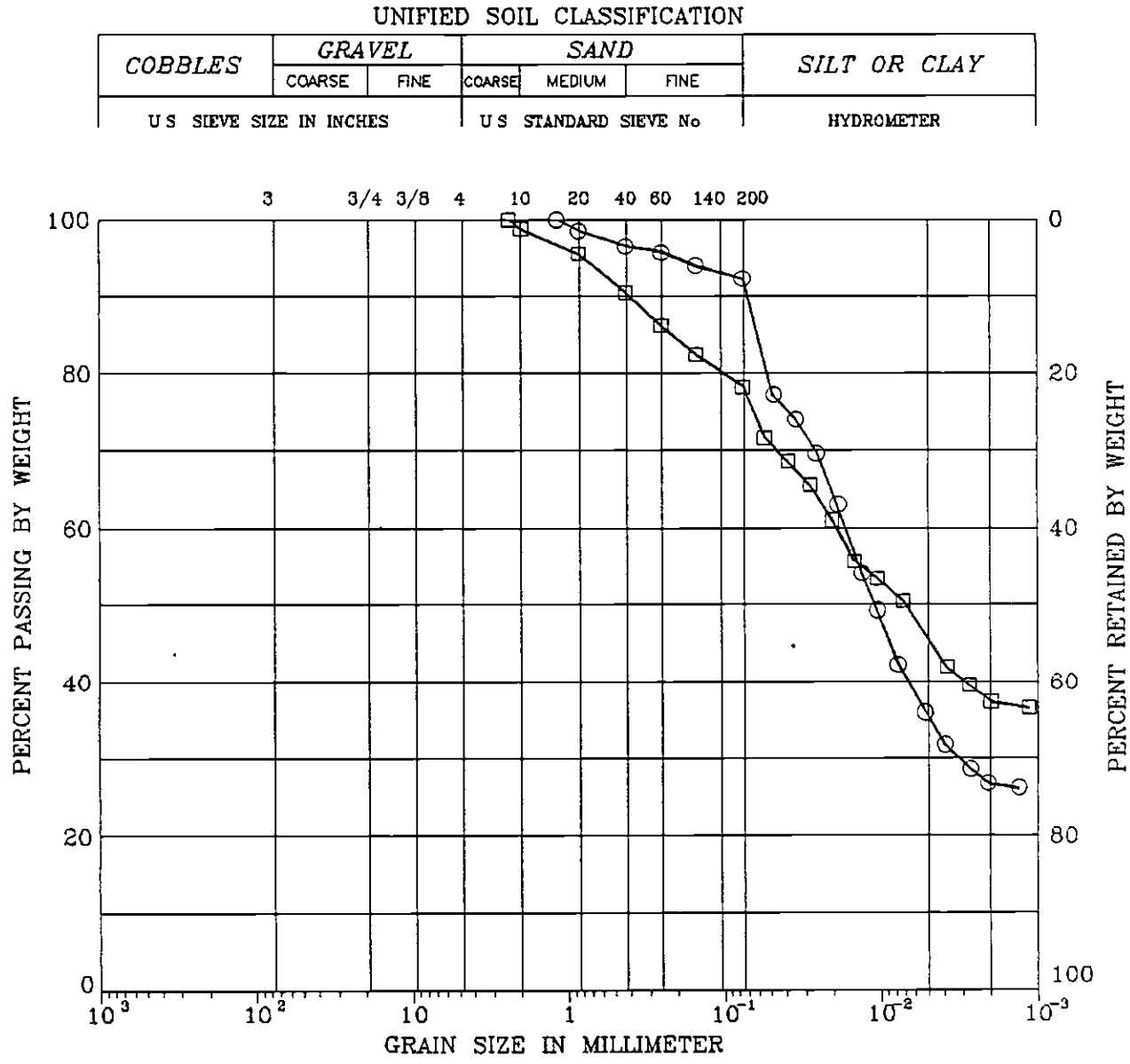
GRAIN SIZE DISTRIBUTION CURVES, ATTERBERG LIMITS



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	604/J-2	5.0-5.3	70	45	CLAY (CH)
□	604/J-3	8.5-8.8	111	67	CLAY (CH)

Remark : 9/19/89

Z-108-01	RICHARDS-GEBAUR AFB
Shannon & Wilson, Inc. Geotechnical Consultants	GRAIN SIZE DISTRIBUTION



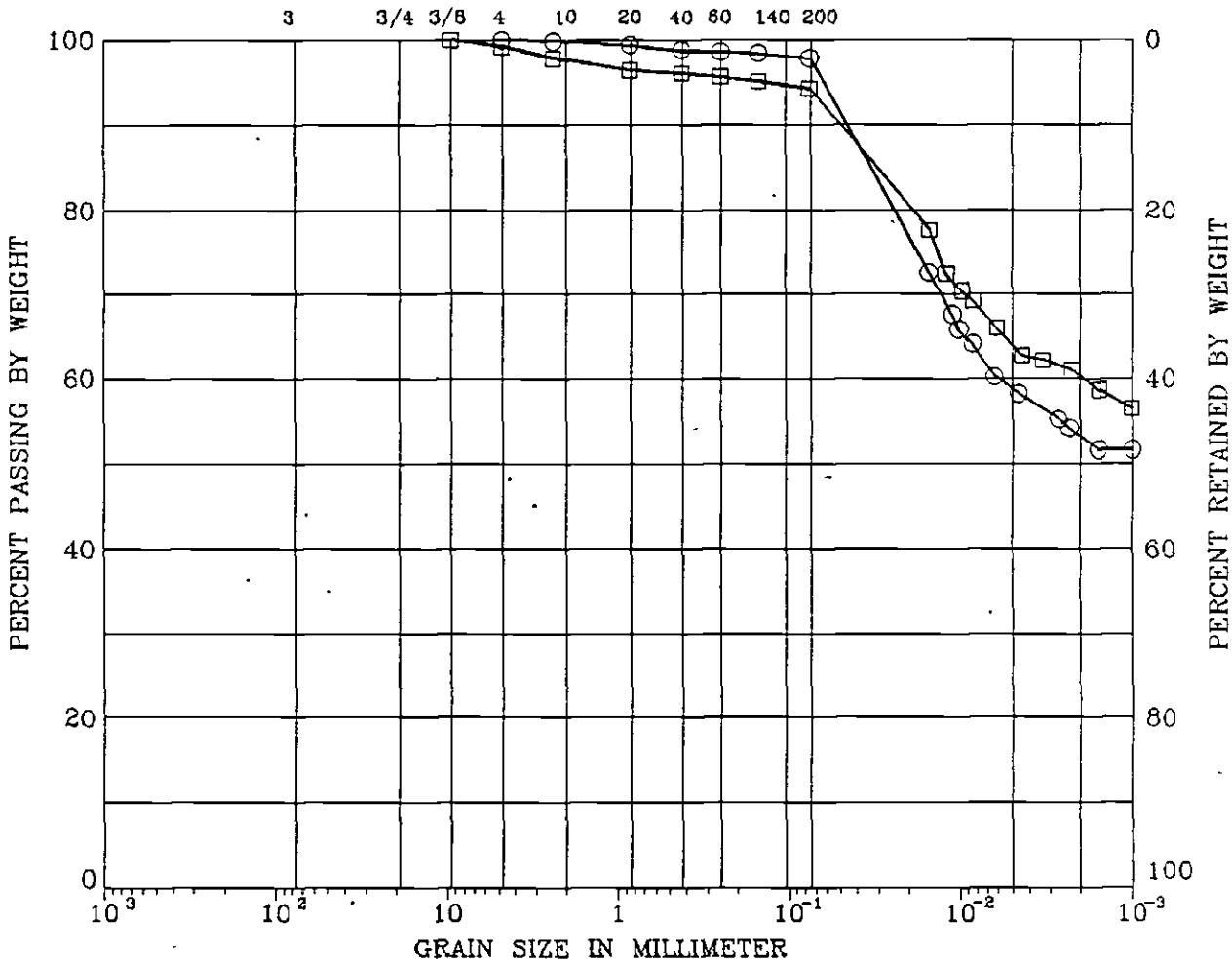
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	605/J-1	2.5-2 8	59	37	CLAY (CH)
□	605/J-2	7.0-7.3	80	52	CLAY (CH)

Remark : 9/19/89

Z-108-01	RICHARDS-GEBAUR AFB
Shannon & Wilson, Inc. Geotechnical Consultants	GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U.S. SIEVE SIZE IN INCHES			U.S STANDARD SIEVE No.			HYDROMETER



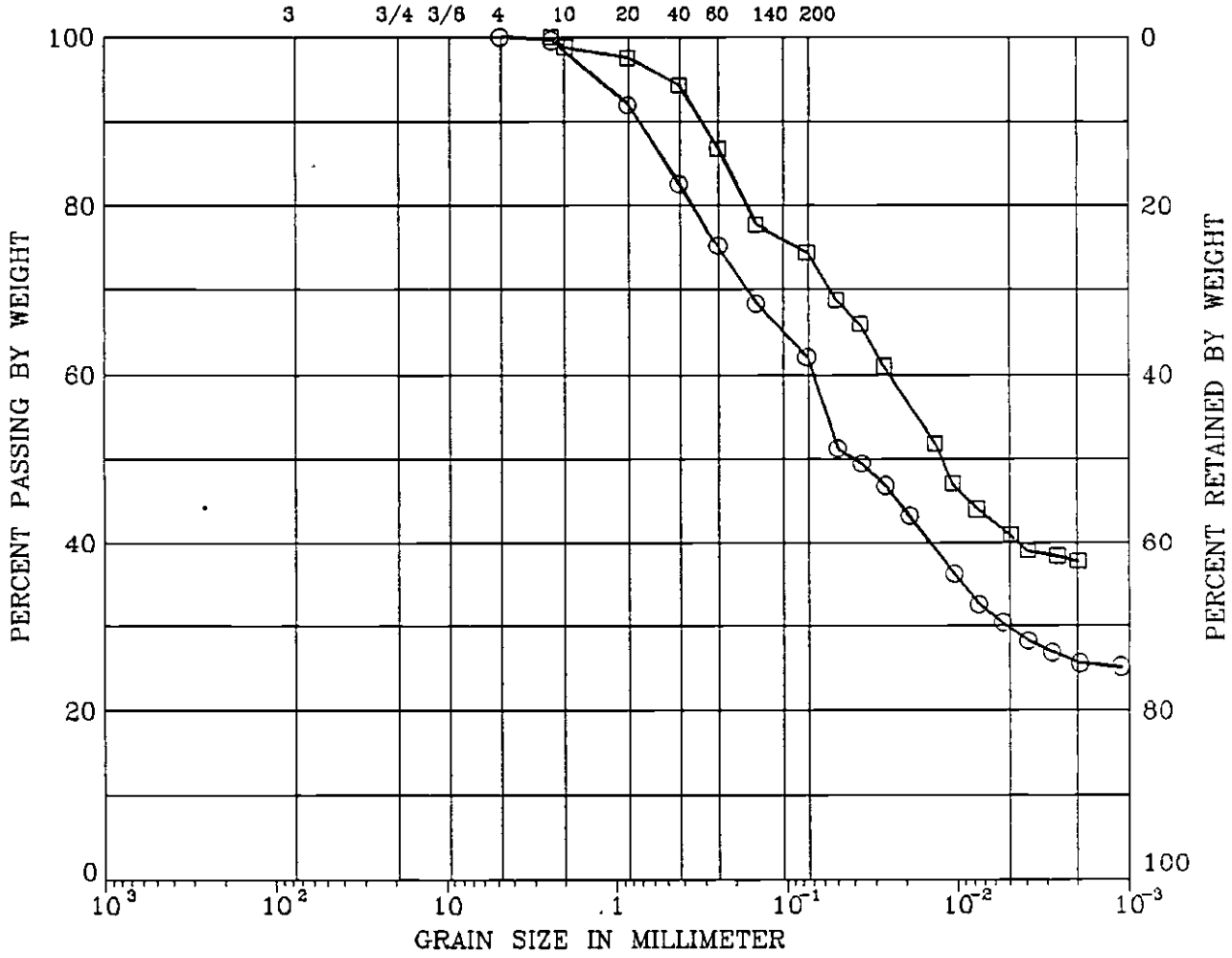
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	606/J-2	5.0-5.3	81	56	CLAY (CH)
□	606/J-3	6.0-6.3	83	57	CLAY (CH)

Remark : 9/19/89

Z-108-01	RICHARDS-GEBAUR AFB
Shannon & Wilson, Inc. Geotechnical Consultants	GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION

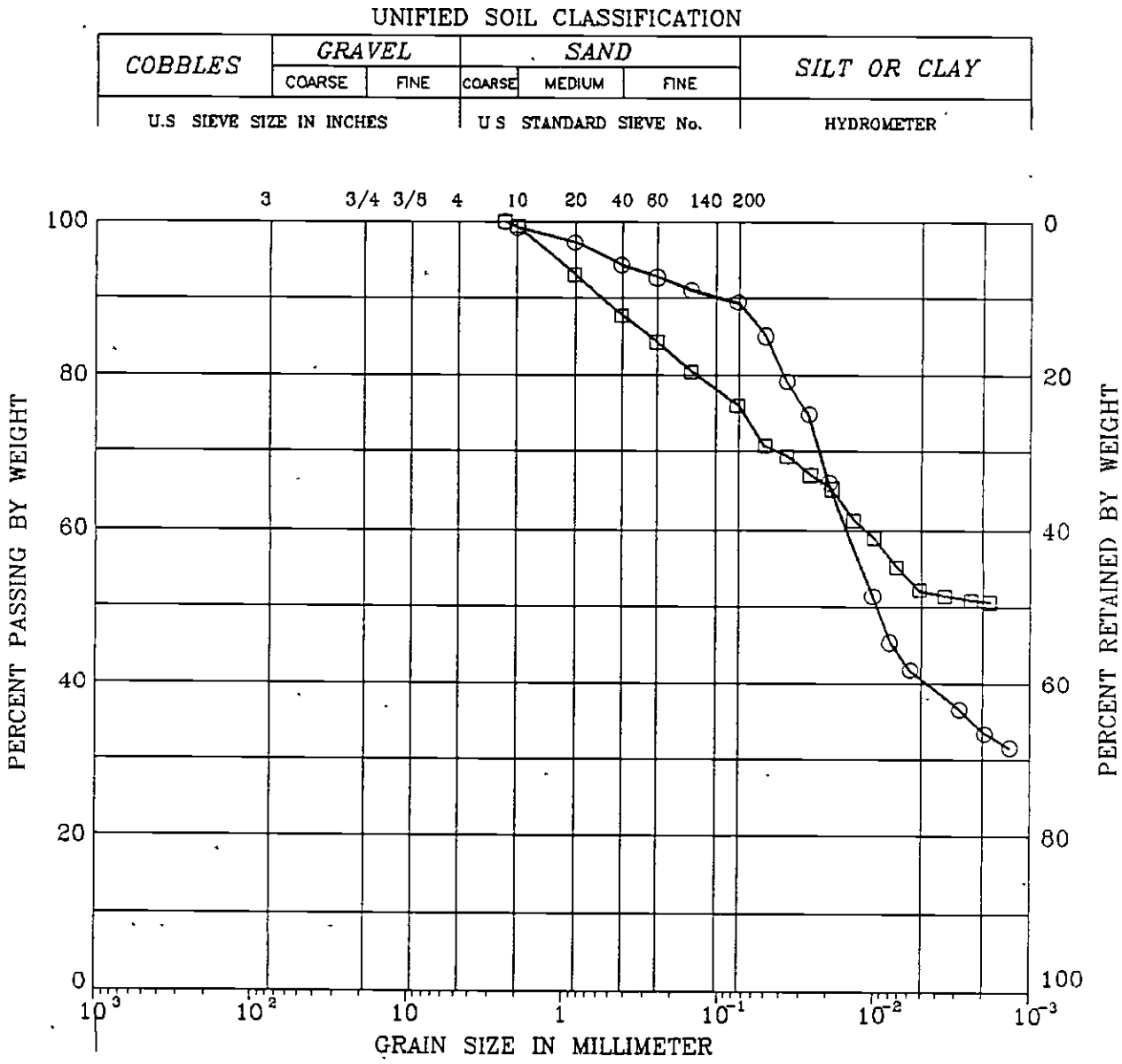
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U S. SIEVE SIZE IN INCHES			U S. STANDARD SIEVE No			HYDROMETER



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	607/J-2	7 0-7.3	74	51	
□	607/J-3	11-11.5	94	51	

Remark : 9/28/89

Z-108-01	RICHARDS-GEBAUR AFB
Shannon & Wilson, Inc. Geotechnical Consultants	GRAIN SIZE DISTRIBUTION



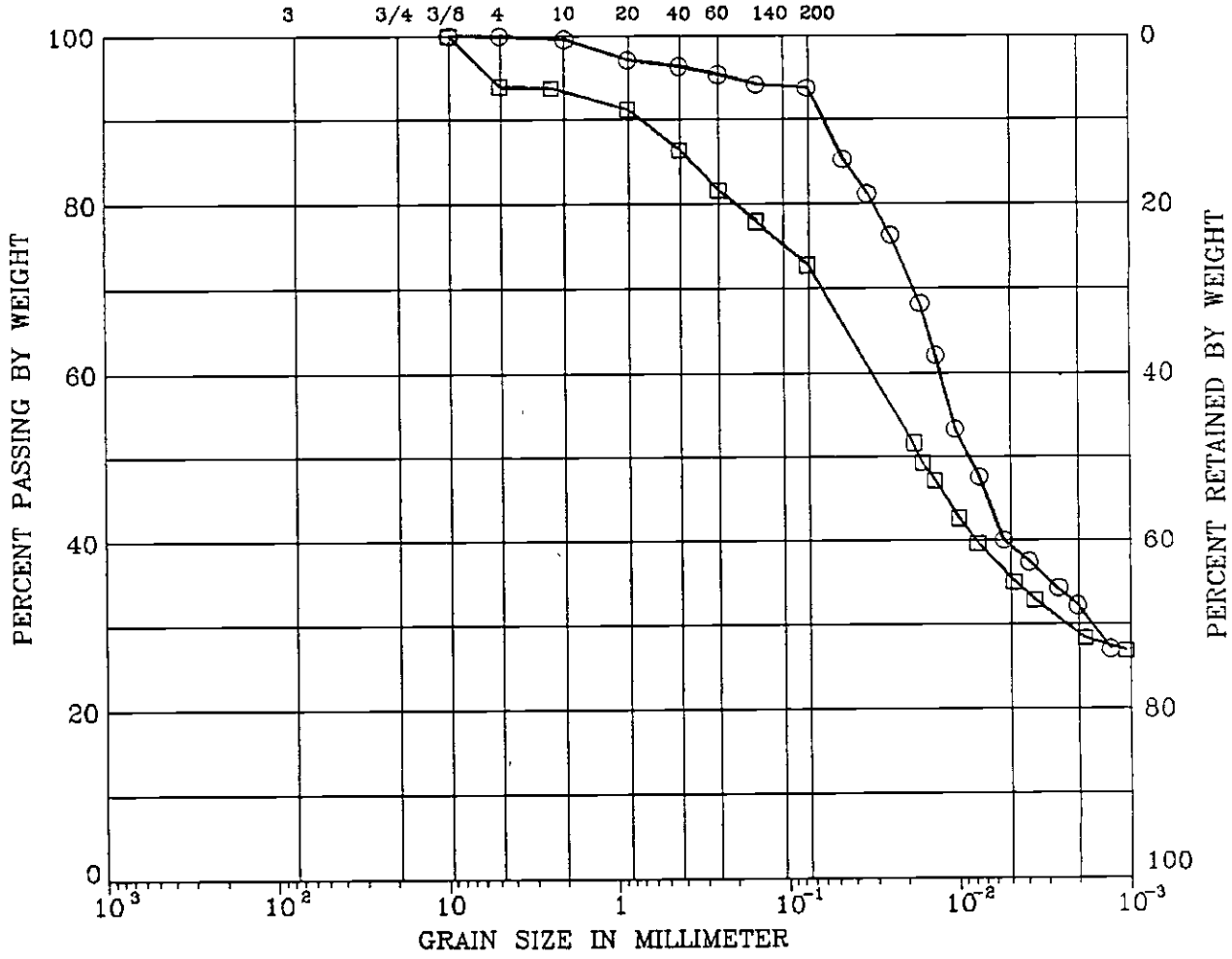
SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	1205/J-2	4.0-4 3	69	44	
□	1205/J-3	10-10 6	68	47	

Remark : 9/28/89

Z-108-01	RICHARDS-GEBAUR AFB
Shannon & Wilson, Inc. Geotechnical Consultants	GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION

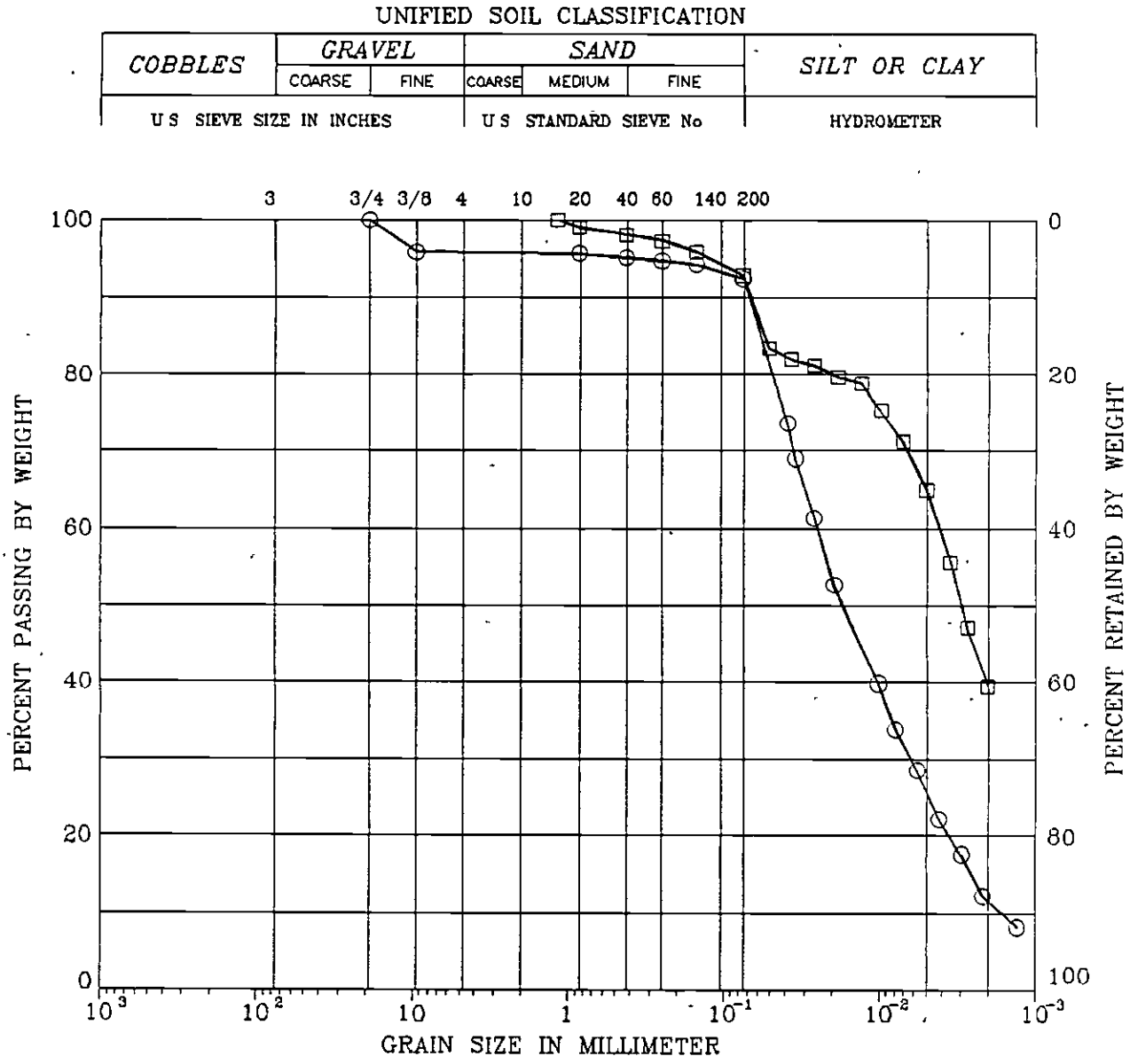
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
U.S. SIEVE SIZE IN INCHES			U S STANDARD SIEVE No			HYDROMETER



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	1206/J-2	3.3-3.5	57	33	CLAY (CH)
□	1206/J-3	7 7-8.0	58	35	CLAY (CH)

Remark : 9/19/89

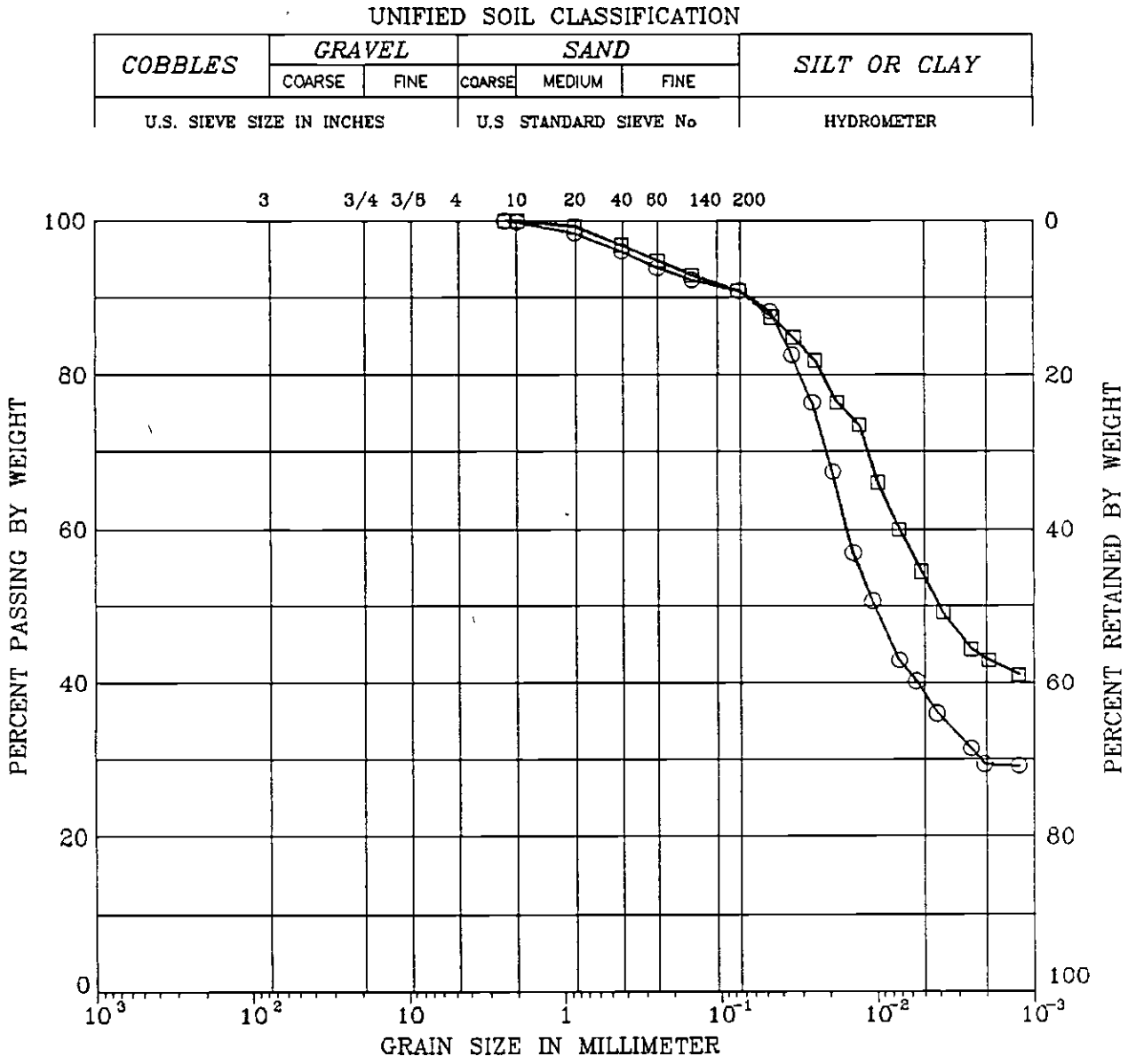
Z-108-01	RICHARDS-GEBAUR AFB
Shannon & Wilson, Inc. Geotechnical Consultants	GRAIN SIZE DISTRIBUTION



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	1207/J-2	7.0-7.3			
□	1207/J-5	12.5-13			

Remark : 9/28/89

Z-108-01	RICHARDS-GEBAUR AFB
Shannon & Wilson, Inc. Geotechnical Consultants	GRAIN SIZE DISTRIBUTION



SYMBOL	BORING	DEPTH (ft)	LL (%)	PI (%)	DESCRIPTION
○	1208/J-3	9 0-9 5	61	42	CLAY (CH)
□	1208/J-4	13-13.5	65	40	CLAY (CH)

Remark : 9/19/89

Z-108-01	RICHARDS-GEBAUR AFB
Shannon & Wilson, Inc. Geotechnical Consultants	GRAIN SIZE DISTRIBUTION

APPENDIX D

WELL DEVELOPMENT DATA, IN-SITU PERMEABILITY FORMS

O'BRIEN & GERE

37 416

O'BRIEN & GERE ENGINEERS, INC. JOB NAME RGAFB RI/FS JOB NO. 3-68 016

BY LSK/AJR DATE 9/12/89 SHEET 1 OF 1

WELL DEVELOPMENT DATA

1. Well No. GMW #604
2. Date of Installation 9/12/89
3. Date of Development 9/12/89
4. Static Water Level: Before Dev. 29.58 Ft.; 24 Hours After 31.05 Ft.
5. Quantity of Water Loss During Drilling, If Used N/A Gal.
6. Quantity of Standing Water in Well and Annulus Before Dev. 3.61 Gal.

	Start	During		End
7. Specific Conductance (unhos/cm)				
Temperature (c)				
PH (s.u.)				

8. Depth from Top of Well Casing to Bottom of Well 32.72 Ft.
9. Screen Length 10 Ft.
10. Depth to Top of Sediment: Before Dev. _____ Ft.; After Dev. _____ Ft.
11. Physical Character of Water: Clear @ start — [illegible]
12. Type and Size of Well Development Equipment: _____
13. Description of Surge Technique, If Used: _____
14. Height of Well Casing Above Ground Surface: 2.5 Ft.
15. Quantity of Water Removed: 2.5 Gal.
16. 1-Pint Water Sample Collected: _____ (Time)

* Development Conditions:

(1) Well Water is Reasonably Clear

(2) Sediment Thickness < 5% of Screen Length

(3) Removal of 5 Well Volumes, Including Saturated Filter Annulus

(4) Stabilization of Specific Conductance and Water Temperature

17. After Final Development of the well, water from each well will be placed into the 1 liter clear glass container and photographed as a 35 mm. color slide to be submitted as part of the well log.
18. QA/QC: Development Performed by: _____

Site Manager: _____

O'BRIEN & GERE

37 417

O'BRIEN & GERE ENGINEERS, INC. JOB NAME RICHARDS-GEFHUR AFB JOB NO. 3105-01

BY SCOTT GARRES DATE 8/23/89 SHEET 1 OF 1

WELL DEVELOPMENT DATA

1. Well No. GMW 605
2. Date of Installation 8/18/89
3. Date of Development 8/23/89
4. Static Water Level: Before Dev. 26.3 Ft.; 24 Hours After 26.1 Ft.
5. Quantity of Water Loss During Drilling, If Used 400 Gal.
6. Quantity of Standing Water in Well and Annulus Before Dev. 10 Gal.

	Start	During		End
7. Specific Conductance (unhos/cm)	16 497	16 [illegible]		17 [illegible]
Temperature (c)	7.52 16	7.57 16		7.60 [illegible]
PH (s.u.)	497 7.52	480 7.57		521 7.6

8. Depth from Top of Well Casing to Bottom of Well 32.9 Ft.
9. Screen Length 10.0 Ft.
10. Depth to Top of Sediment: Before Dev. 32.9 Ft.; After Dev. 32.9 Ft.
11. Physical Character of Water: CLOUDY BROWN
12. Type and Size of Well Development Equipment: 1½" O.D. STAINLESS BAILER
13. Description of Surge Technique, If Used: SINGLE SURGE BLOCK ; SURGED FOR 30 MINS
14. Height of Well Casing Above Ground Surface: 2.5 Ft.
15. Quantity of Water Removed: 46 Gal.
16. 1-Pint Water Sample Collected: 8:00AM 8/25 (Time)

* Development Conditions:

(1) Well Water is Reasonably Clear

(2) Sediment Thickness < 5% of Screen Length

(3) Removal of 5 Well Volumes, Including Saturated Filter Annulus

(4) Stabilization of Specific Conductance and Water Temperature

17. After Final Development of the well, water from each well will be placed into the 1 liter clear glass container and photographed as a 35 mm. color slide to be submitted as part of the well log.
18. QA/QC: Development Performed by: SCOTT GARRES

Site Manager: _____

O'BRIEN & GERE

37 418

O'BRIEN & GERE ENGINEERS, INC. JOB NAME Richards-Gebaur AFB JOB NO. 3068.016

BY LSK/AJR DATE 9/12/89 SHEET 1 OF 1

WELL DEVELOPMENT DATA

1. Well No. GMW # 606
2. Date of Installation 8/11/89
3. Date of Development 9/12/89
4. Static Water Level: Before Dev. 29.94 Ft.; 24 Hours After 31.0 Ft.
5. Quantity of Water Loss During Drilling, If Used N/A Gal.
6. Quantity of Standing Water in Well and Annulus Before Dev. 4.06 Gal.

	Start	During		End
7. Specific Conductance (unhos/cm)				
Temperature (c)				
PH (s.u.)				

8. Depth from Top of Well Casing to Bottom of Well 31.60 Ft.
9. Screen Length 10 Ft.
10. Depth to Top of Sediment: Before Dev. _____ Ft.; After Dev. _____ Ft.
11. Physical Character of Water: Cleared Start w/ [illegible]
12. Type and Size of Well Development Equipment: _____
13. Description of Surge Technique, If Used: _____
14. Height of Well Casing Above Ground Surface: _____ Ft.
15. Quantity of Water Removed: 23 Gal.
16. 1-Pint Water Sample Collected: _____ (Time)

* Development Conditions:

(1) Well Water is Reasonably Clear

(2) Sediment Thickness < 5% of Screen Length

(3) Removal of 5 Well Volumes, Including Saturated Filter Annulus

(4) Stabilization of Specific Conductance and Water Temperature

17. After Final Development of the well, water from each well will be placed into the 1 liter clear glass container and photographed as a 35 mm. color slide to be submitted as part of the well log.
18. QA/QC: Development Performed by: _____

Site Manager: _____

O'BRIEN & GERE

O'BRIEN & GERE ENGINEERS, INC. JOB NAME RICHARDS - GEPHUR JOB NO. Z108-01

BY SCOTT GARBS DATE 8/26/89 SHEET 1 OF 1

WELL DEVELOPMENT DATA

1. Well No. GMW 607
2. Date of Installation 8/21/89
3. Date of Development 8/24/89
4. Static Water Level: Before Dev. 22.93 Ft.; 24 Hours After 23.21 Ft.
5. Quantity of Water Loss During Drilling, If Used 50 Gal.
6. Quantity of Standing Water in Well and Annulus Before Dev. 5 Gal.

	Start	During		End
7. Specific Conductance (unhos/cm)	16 (5.0)	19 (5.1)	21 (5.2)	18 (5.3)
Temperature (c)	7.86 (16)	8.07 (19)	7.91 (21)	7.80 (18)
PH (s.u.)	500 (7.86)	584 (15.7)	590 (17.6)	595 (7.[illegible])

8. Depth from Top of Well Casing to Bottom of Well 34.9 Ft.
9. Screen Length 15.0 Ft.
10. Depth to Top of Sediment: Before Dev. 34.9 Ft.; After Dev. 34.9 Ft.
11. Physical Character of Water: CLOUDY BROWN
12. Type and Size of Well Development Equipment: 1½" O.D. STAINLESS DEDICATED BAILER
13. Description of Surge Technique, If Used: SINGLE SURGE BLOCK; SURGED 30 MINS
14. Height of Well Casing Above Ground Surface: 2.5 Ft.
15. Quantity of Water Removed: 24 Gal.
16. 1-Pint Water Sample Collected: 7:00PM 8/24 (Time)

* Development Conditions:

(1) Well Water is Reasonably Clear

(2) Sediment Thickness < 5% of Screen Length

(3) Removal of 5 Well Volumes, Including Saturated Filter Annulus

(4) Stabilization of Specific Conductance and Water Temperature

17. After Final Development of the well, water from each well will be placed into the 1 liter clear glass container and photographed as a 35 mm. color slide to be submitted as part of the well log.
18. QA/QC: Development Performed by: SCOTT GARBS

Site Manager: _____

O'BRIEN & GERE

37 420

O'BRIEN & GERE ENGINEERS, INC. JOB NAME Richmond - Gerhart AFB JOB NO. [illegible]

BY Scott Garbs DATE 8/26/89 SHEET 1 OF 1

WELL DEVELOPMENT DATA

1. Well No. [illegible] 1205
2. Date of Installation 8/14/89
3. Date of Development 8/20/89
4. Static Water Level: Before Dev. 5.94 Ft.; 24 Hours After 5.89 Ft.
5. Quantity of Water Loss During Drilling, If Used No Loss Apparent Gal.
6. Quantity of Standing Water in Well and Annulus Before Dev. 2.5 Gal.

	Start		During		End	
7. Specific Conductance (unhos/cm)	18		20	840	20	930
Temperature (c)	7.98		7.43	20	7.13	20
PH (s.u.)	615		840	7.43	930	7.13

8. Depth from Top of Well Casing to Bottom of Well 16.9 Ft.
9. Screen Length 10.0 Ft.
10. Depth to Top of Sediment: Before Dev. 16.9 Ft.; After Dev. [illegible] Ft.
11. Physical Character of Water: Milky Brown
12. Type and Size of Well Development Equipment: 1½" O.D. Stainless [illegible]
13. Description of Surge Technique, If Used: Single surge [illegible] Lowered through screen for 30 mins.
14. Height of Well Casing Above Ground Surface: 2.0 Ft.
15. Quantity of Water Removed: 40 Gal.
16. 1-Pint Water Sample Collected: 2:00pm 8/25 (Time)

* Development Conditions:

(1) Well Water is Reesonably Clear

(2) Sediment Thickness < 5% of Screen Length

(3) Removal of 5 Well Volumes, Including Saturated Filter Annulus

(4) Stabilization of Specific Conductance and Water Temperature

17. After Final Development of the well, water from each well will be placed into the 1 liter clear glass container and photographed as a 35 mm. color slide to be submitted as part of the well log.
18. QA/QC: Development Performed by: Scott Garbs

Site Manager: _____

O'BRIEN & GERE

37 421

O'BRIEN & GERE ENGINEERS, INC. JOB NAME RICHARDS-GERBUR AFB JOB NO. Z108-01

BY SCOTT GARBS DATE 8/26/89 SHEET 1 OF 1

WELL DEVELOPMENT DATA

1. Well No. 1206
2. Date of Installation 8/11/89
3. Date of Development 8/20/89
4. Static Water Level: Before Dev. 10.10 Ft.; 24 Hours After 10.00 Ft.
5. Quantity of Water Loss During Drilling, If Used NONE USED Gal.
6. Quantity of Standing Water in Well and Annulus Before Dev. 10 Gal.

	Start	During	End
7. Specific Conductance (unhos/cm)	15 430	120 590	17 635
Temperature (c)	7.67 18	7.14 18	[illegible] 17
PH (s.u.)	430 7.67	590 7.14	[illegible] 6.35

8. Depth from Top of Well Casing to Bottom of Well 24.2 Ft.
9. Screen Length 10.0 Ft.
10. Depth to Top of Sediment: Before Dev. 24.2 Ft.; After Dev. [illegible] Ft.
11. Physical Character of Water: CLOUDY BROWN
12. Type and Size of Well Development Equipment: 1½" O.D. STAINLESS [illegible]
13. Description of Surge Technique, If Used: SINGLE SURGE [illegible] FOR [illegible] MINUTES
14. Height of Well Casing Above Ground Surface: 2.0 Ft.
15. Quantity of Water Removed: 49 Gal.
16. 1-Pint Water Sample Collected: 8/25 1:00pm (Time)

* Development Conditions:

(1) Well Water is Reasonably Clear

(2) Sediment Thickness < 5% of Screen Length

(3) Removal of 5 Well Volumes, Including Saturated Filter Annulus

(4) Stabilization of Specific Conductance and Water Temperature

17. After Final Development of the well, water from each well will be placed into the 1 liter clear glass container and photographed as a 35 mm. color slide to be submitted as part of the well log.
18. QA/QC: Development Performed by: SCOTT GARBS

Site Manager: _____

O'BRIEN & GERE

37 422

O'BRIEN & GERE ENGINEERS, INC. JOB NAME RICHARDS-SEGAR/FB JOB NO. Z108-01

BY SCOTT GARBS DATE 8/26/89 SHEET 1 OF 1

WELL DEVELOPMENT DATA

1. Well No. GMW 1207
2. Date of Installation 8/14/89
3. Date of Development 8/21/89
4. Static Water Level: Before Dev. 6.90 Ft.; 24 Hours After 7.00 Ft.
5. Quantity of Water Loss During Drilling, If Used No Water Lost Gal.
6. Quantity of Standing Water in Well and Annulus Before Dev. 6 Gal.

	Start	During		End
7. Specific Conductance (unhos/cm)	22 740	21 815		[illegible] 786
Temperature (c)	7.54 22	7.70 21		[illegible] 23
PH (s.u.)	740 7.54	815 7.70		[illegible] 7.75

8. Depth from Top of Well Casing to Bottom of Well 17.9 Ft.
9. Screen Length 10.0 Ft.
10. Depth to Top of Sediment: Before Dev. 17.9 Ft.; After Dev. 17.9 Ft.
11. Physical Character of Water: [illegible]
12. Type and Size of Well Development Equipment: [illegible]
13. Description of Surge Technique, If Used: SINGLE SURGE BLOCK, SURGED FOR 30 MINS.
14. Height of Well Casing Above Ground Surface: 2.5 Ft.
15. Quantity of Water Removed: 16 Gal.
16. 1-Pint Water Sample Collected: 3:00pm 8/25 (Time)

* Development Conditions:

(1) Well Water is Reasonably Clear

(2) Sediment Thickness < 5% of Screen Length

(3) Removal of 5 Well Volumes, Including Saturated Filter Annulus

(4) Stabilization of Specific Conductance and Water Temperature

17. After Final Development of the well, water from each well will be placed into the 1 liter clear glass container and photographed as a 35 mm. color slide to be submitted as part of the well log.
18. QA/QC: Development Performed by: SCOTT GARBS

Site Manager: _____

O'BRIEN & GERE

37 423

O'BRIEN & GERE ENGINEERS, INC. JOB NAME RICHARDS-GEPHAR AFB JOB NO. Z108-01

BY SCOTT GARBS DATE 8/26/89 SHEET 1 OF 1

WELL DEVELOPMENT DATA

1. Well No. GMW 1208
2. Date of Installation 8/15/89
3. Date of Development 8/24/89
4. Static Water Level: Before Dev. 8.41 Ft.; 24 Hours After 8.44 Ft.
5. Quantity of Water Loss During Drilling, If Used NONE USED Gal.
6. Quantity of Standing Water in Well and Annulus Before Dev. 6.5 Gal.

	Start		During		End	
7. Specific Conductance (unhos/cm)	21	1081		21	1109	21 1122
Temperature (c)	6.98	21		7.05	21	6.88 21
PH (s.u.)	1081	6.98		1109	7.05	1122 6.88

8. Depth from Top of Well Casing to Bottom of Well 17.4 Ft.
9. Screen Length 10.0 Ft.
10. Depth to Top of Sediment: Before Dev. 17.4 Ft.; After Dev. 17.4 Ft.
11. Physical Character of Water: MILKY BROWN
12. Type and Size of Well Development Equipment: 1½" O.D. STAINLESS BAILER
13. Description of Surge Technique, If Used: SINGLE SURGE BLOCK; SURGED FOR 30 MIN
14. Height of Well Casing Above Ground Surface: 2.0 Ft.
15. Quantity of Water Removed: 24 Gal.
16. 1-Pint Water Sample Collected: 2:20 PM 8/25 (Time)

* Development Conditions:

(1) Well Water is Reasonably Clear

(2) Sediment Thickness < 5% of Screen Length

(3) Removal of 5 Well Volumes, Including Saturated Filter Annulus

(4) Stabilization of Specific Conductance and Water Temperature

17. After Final Development of the well, water from each well will be placed into the 1 liter clear glass container and photographed as a 35 mm. color slide to be submitted as part of the well log.
18. QA/QC: Development Performed by: SCOTT GARBS

Site Manager: _____

O'BRIEN & GERE

37 424

IN-SITU PERMEABILITY TEST
FIELD LOG

Z105-01

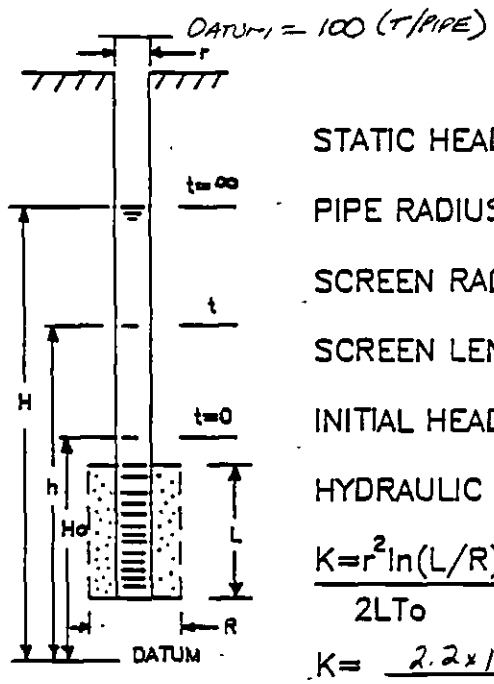
PROJECT Richards-Gebaur AFB

LOCATION Site 6

WELL NUMBER 605

ELEVATION

DATE 8/22/88



STATIC HEAD (H) 73.60

PIPE RADIUS (r) 1.0"

SCREEN RADIUS (R) 3.0"

SCREEN LENGTH (L) 43.2 .120"

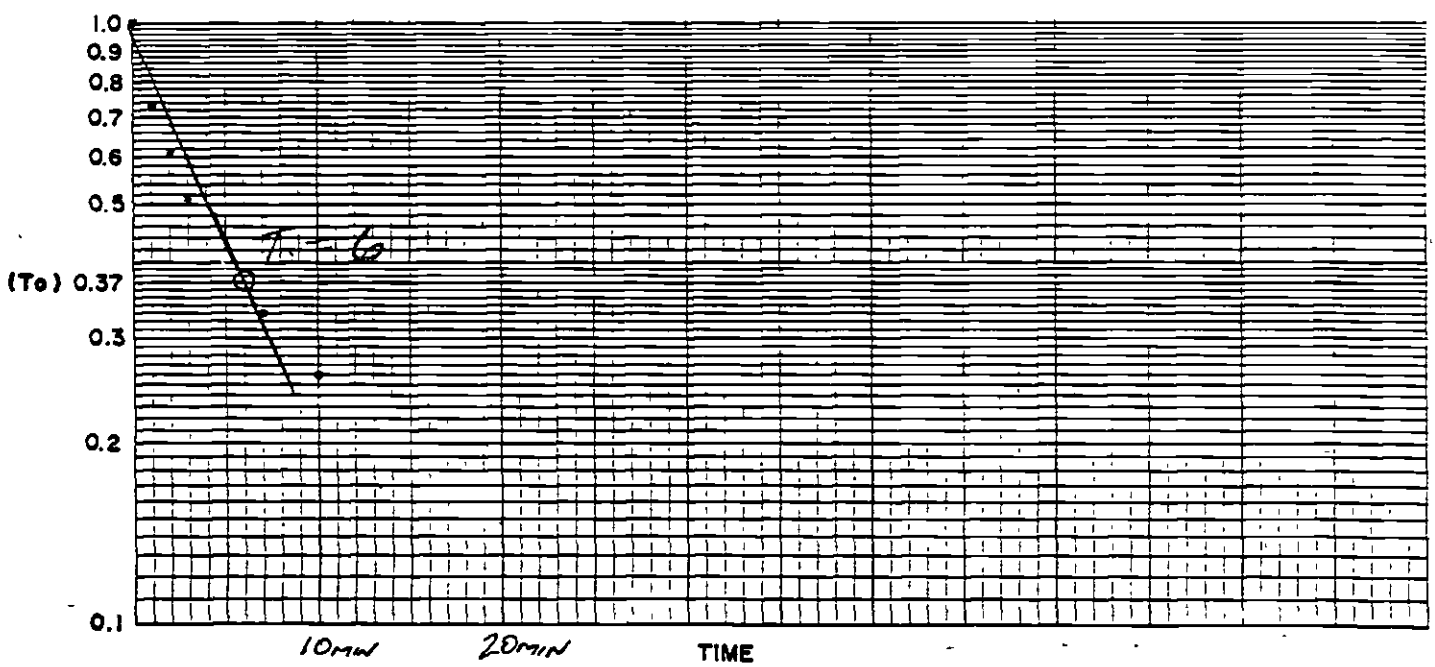
INITIAL HEAD (Ho) 70.18

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

K= 2.2×10^{-4} cm/sec

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
1443	29.82	0	70.18	1.0
	28.90	1 min	71.10	.73
	27.75	5 min	72.25	.39
	27.28	10 min	72.72	.26
	27.09	15 min	72.91	.20
	26.79	30 min	73.21	.11
	26.60	60 min	73.40	.06
	28.50	2 min	71.50	.61
	28.16	3 min	71.84	.51
	27.52	7 min	72.48	.33



IN-SITU PERMEABILITY TEST
FIELD LOG

Z108-01

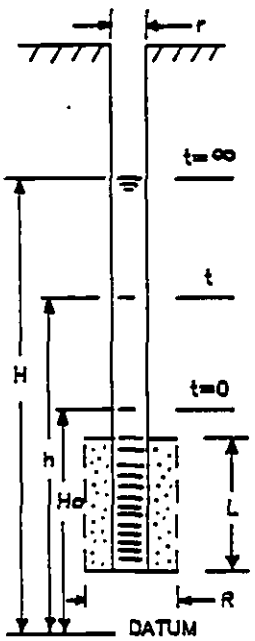
PROJECT Richards-Gebaur AFB

WELL NUMBER 607

DATE 8/24/89

LOCATION Site 6

ELEVATION



STATIC HEAD (H) 77.07

PIPE RADIUS (r) 1.0

SCREEN RADIUS (R) 3.0

SCREEN LENGTH (L) 108.64 /180

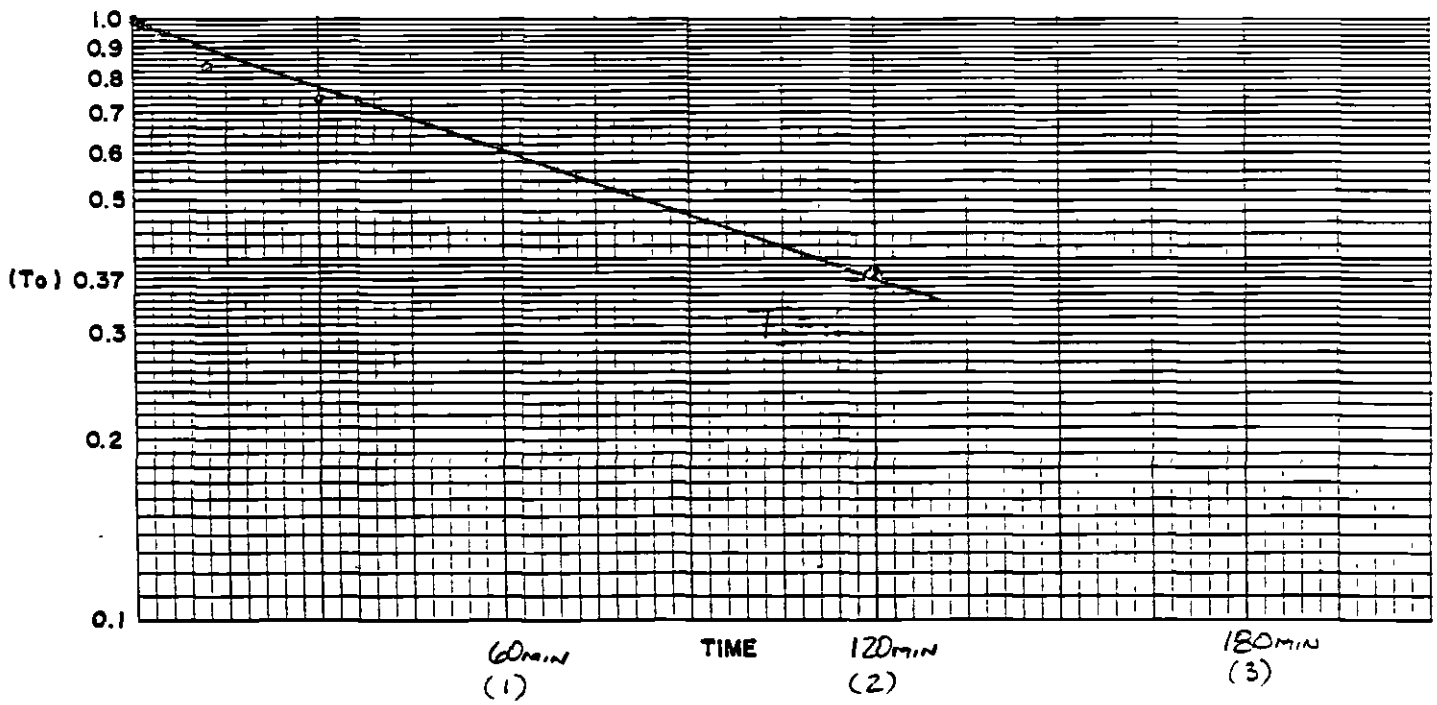
INITIAL HEAD (Ho) 66.62

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

K= 5.8×10^{-6} cm/sec

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
0935	33.38	0	66.62	1.0
	33.19	1 min	66.81	.98
	32.64	5 min	67.36	.93
	31.71	.25 hr	68.29	.84
	30.68	.5 hr	69.32	.74
	29.25	1.0 hr	70.75	.61
	26.99	2.0 hr	73.01	.39
	24.61	4.0 hr	75.39	.16



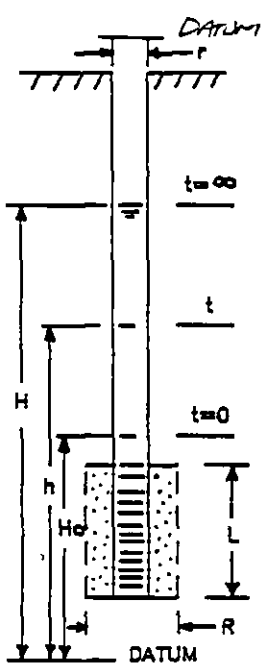
O'BRIEN & GERE

37 426

IN-SITU PERMEABILITY TEST
FIELD LOG

PROJECT Richards-Gebaur AFB
WELL NUMBER 1205
DATE 5/20/89

LOCATION Site 12
ELEVATION



STATIC HEAD (H) 94.06

PIPE RADIUS (r) 2"

SCREEN RADIUS (R) 4.5"

SCREEN LENGTH (L) 120"

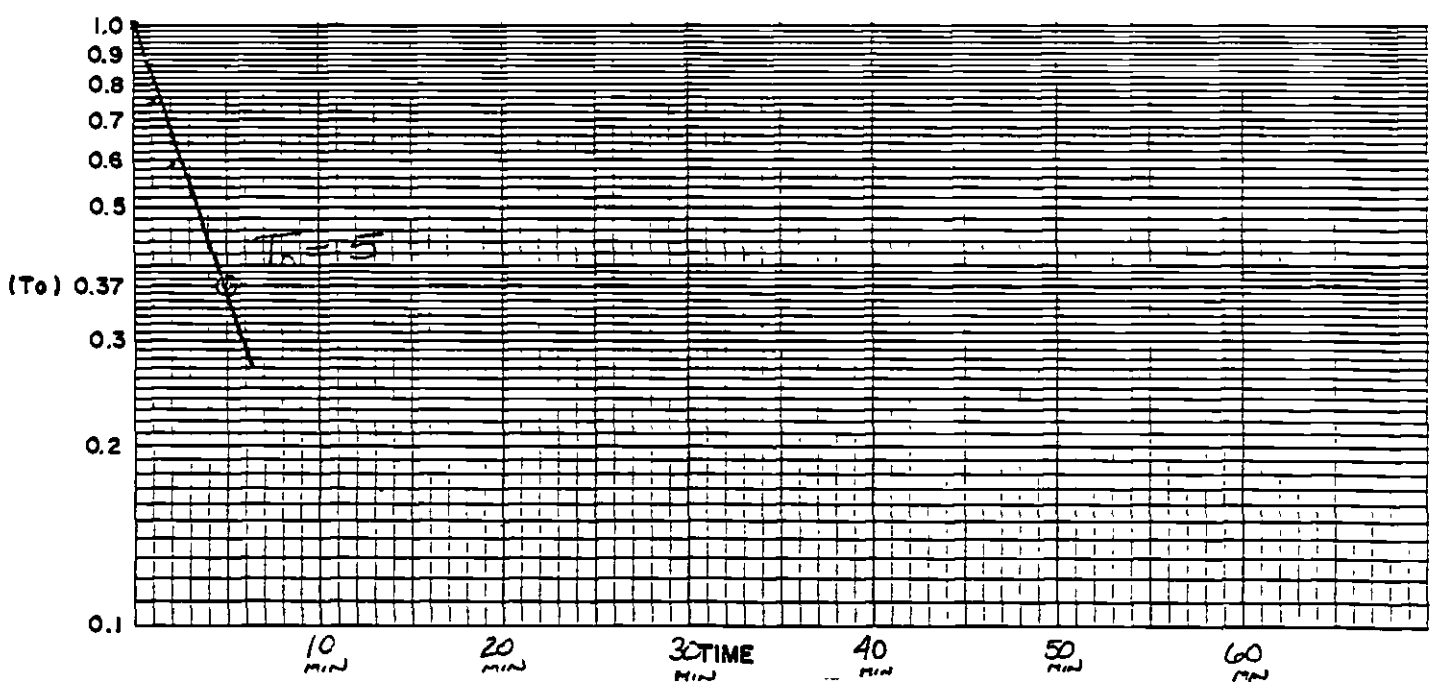
INITIAL HEAD (Ho) 85.86

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

K= 1.2×10^{-4} cm/sec

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
1418	14.14	0 min	85.86	1.0
	12.10	1 min	87.90	.75
	10.80	2 min	89.20	.59
	8.90	5 min	91.10	.36
	7.97	10 min	92.03	.25
	7.20	15 min	92.61	.18
	6.[illegible]	30 min	93.17	.11
	6.70	45 min	93.30	.09

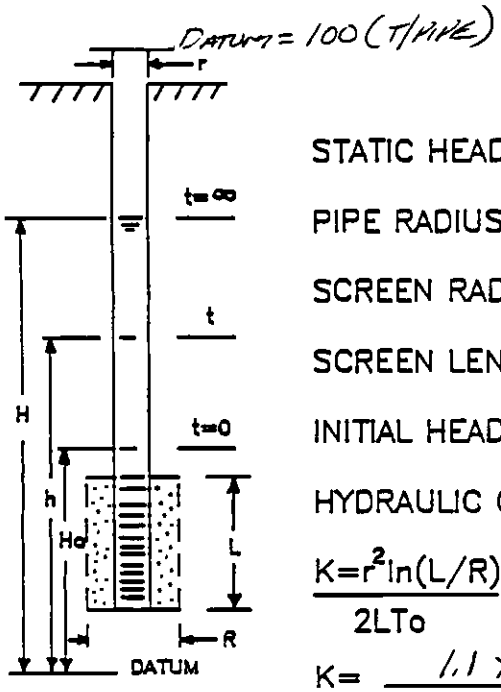


O'BRIEN & GERE

37 427

IN-SITU PERMEABILITY TEST
FIELD LOG

PROJECT Richards - Gerhur AFB LOCATION Site [illegible]
WELL NUMBER 1206 ELEVATION
DATE 5/20/89



STATIC HEAD (H) 89.90

PIPE RADIUS (r) 1.0 IN

SCREEN RADIUS (R) 4.5 IN.

SCREEN LENGTH (L) 120

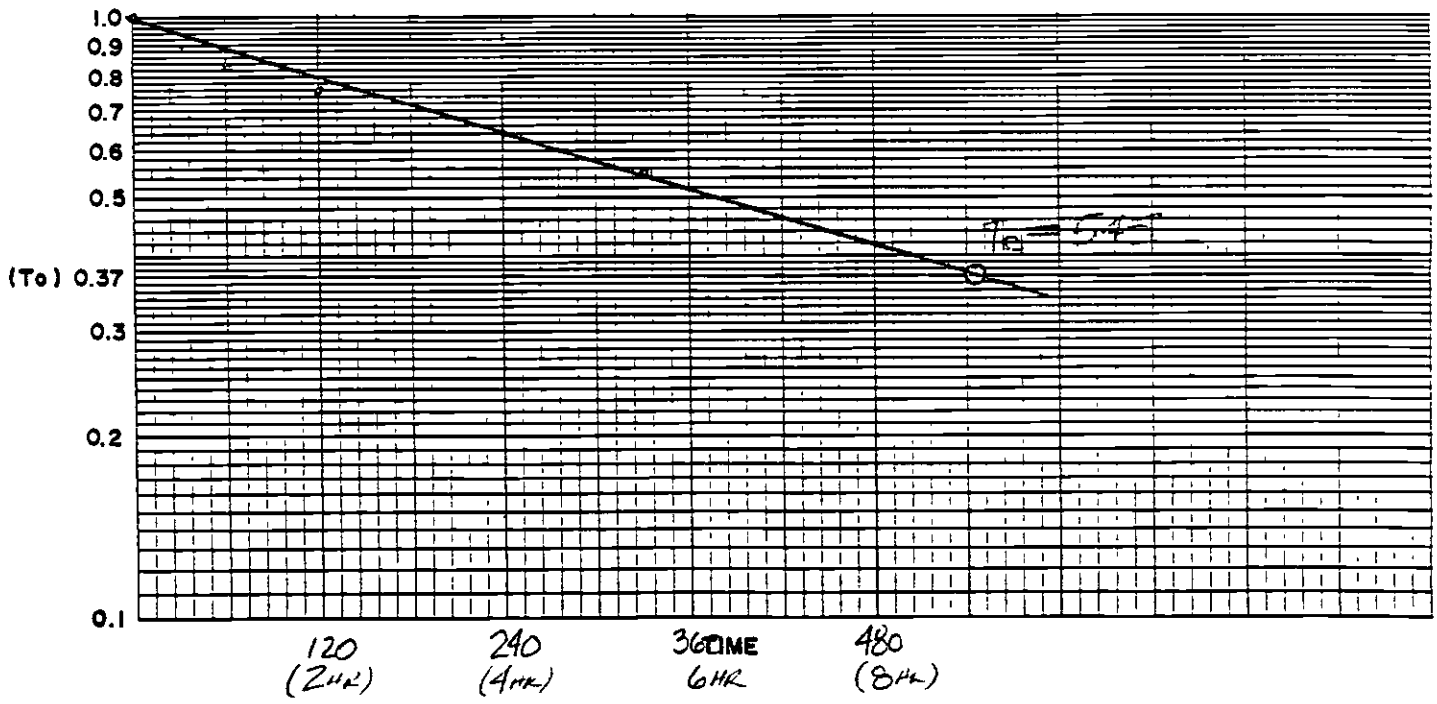
INITIAL HEAD (Ho) 77.68

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

K= 1.1×10^{-6} cm/sec

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
1528	[illegible]	[illegible]	77.68	1.0
	20.95	5 HR	79.05	.89
	[illegible]	1 HR	79.71	.83
	19.40	2 HR	80.60	.76
	17.33	4 HR	82.12	.64
	16.86	5.5 HR	83.14	.55
	11.20	15.5 HR	88.80	.09



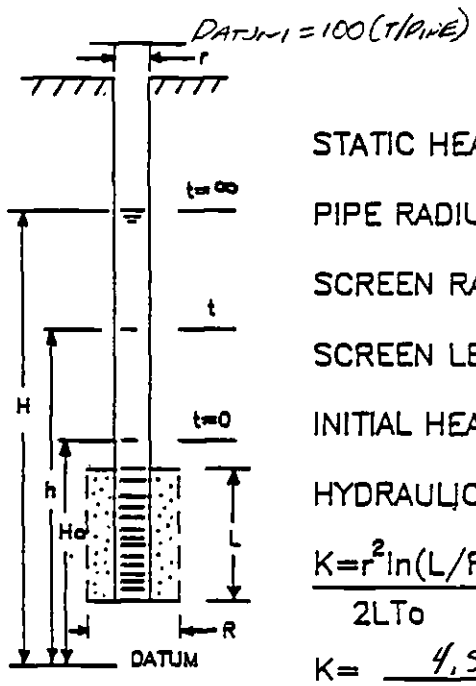
O'BRIEN & GERE

37 428

IN-SITU PERMEABILITY TEST
FIELD LOG

PROJECT Z1C8-01 RICHARDS-GEBAUR AFB
WELL NUMBER 1207
DATE 8/25/89

LOCATION SITE 12
ELEVATION



STATIC HEAD (H) 91.95

PIPE RADIUS (r) 1.0 2.0"

SCREEN RADIUS (R) 4.5"

SCREEN LENGTH (L) 83.4" 120"

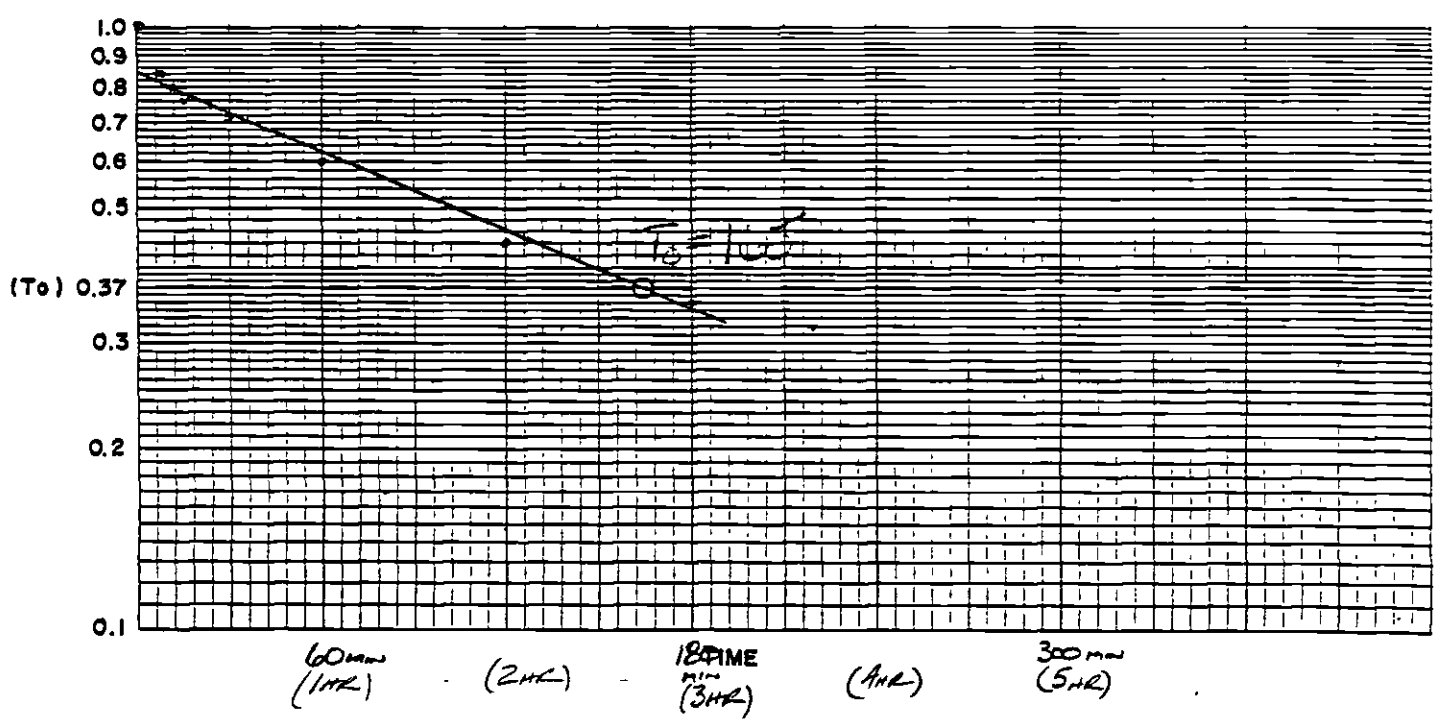
INITIAL HEAD (Ho) 83.50

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

K= 4.5×10^{-6} cm/sec

TIME	WATER DEPTH	t	h	H-h / H-Ho
1108	16.50	0	[illegible]	1.0
	15.15	5 MIN	84.95	.84
	14.83	10 MIN	85.17	.80
	14.56	15 MIN	85.44	.77
	14.21	30 MIN	[illegible]	.71
	13.15	1 HR	86.85	.60
	11.30	2 HR	88.20	.44
	10.93	[illegible]	89.02	.35
	10.72	[illegible]	89.23	.32



O'BRIEN & GERE

37 429

IN-SITU PERMEABILITY TEST
FIELD LOG

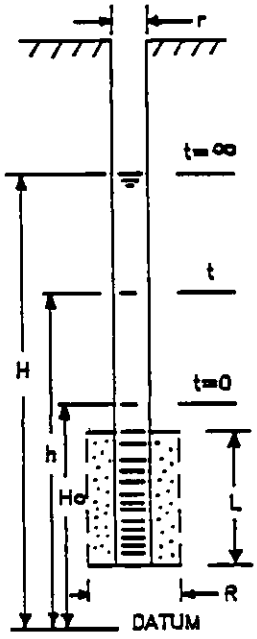
PROJECT 3108-01 RICHARDS - GEBAUR AFB

LOCATION SITE 12

WELL NUMBER 1208

ELEVATION

DATE 8/24/89



STATIC HEAD (H) 91.59

PIPE RADIUS (r) 1.0"

SCREEN RADIUS (R) 4.5

SCREEN LENGTH (L) 79.1 120"

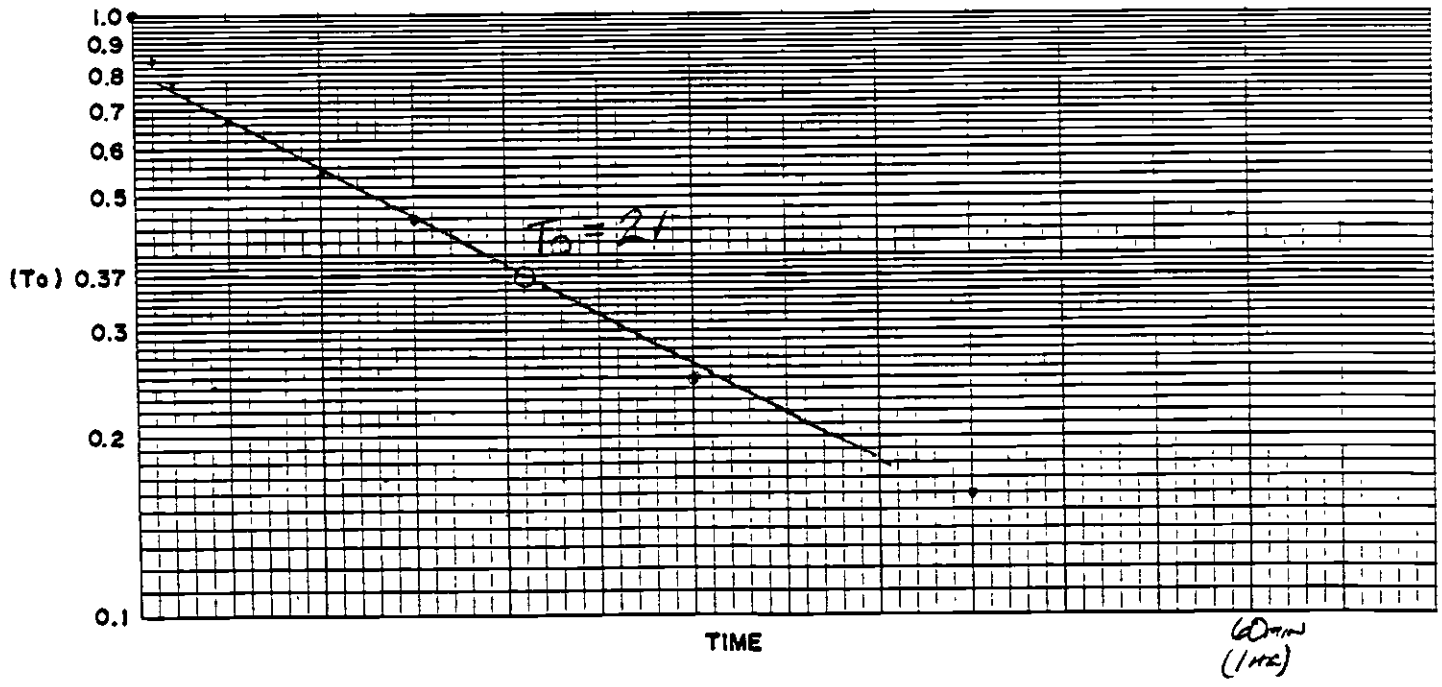
INITIAL HEAD (Ho) 83.68

HYDRAULIC CONDUCTIVITY :

$$K = \frac{r^2 \ln(L/R)}{2LT_o}$$

K= 3.7×10^{-6}

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-Ho}$
1410	[illegible]	0 min	83.68	1.0
	15.02	1 min	84.92	.84
	14.43	2 min	85.52	.77
	13.72	[illegible] min	86.23	.67
	12.73	10 min	87.27	.55
	12.01	15 min	87.99	.46
	[illegible]	30 min	89.62	.25
	[illegible]	45 min	90.35	.16



SHANNON & WILSON, INC.
Geotechnical Consultants

JOB NAME FIELD PERMEABILITY JOB NO. Z108-01
SUBJECT RICHARDS - GEBAUR DATE
BY S.G. CHK'D LCR SHEET of

GMW 605

$$K = \frac{(1)^2 \ln\left(\frac{\cancel{120}^{43.2}}{3}\right)}{2(\cancel{120}_{43.2})(6)(2.54)(60)} = \cancel{1.7\times10^{-5}}\ \text{cm/sec}$$

2.2×10^{-4} cm/sec LCR

GMW 607

$$K = \frac{(1)^2 \ln\left(\frac{\cancel{180}^{108.84}}{3}\right)}{2(\cancel{180}_{108.84})(120)(2.54)(60)} = \cancel{6.2\times10^{-7}}\ \text{cm/sec}$$

5.8×10^{-6} cm/sec LCR

GMW 1205

$$K = \frac{(1)^2 \ln\left(\frac{120}{4.5}\right)}{2(120)(5)\,2.54\,(60)} = \cancel{1.8\times10^{-5}}$$

1.2×10^{-4} cm/sec LCR

GMW 1206

$$K = \frac{(1)^2 \ln\left(\frac{120}{4.5}\right)}{2(120)(545)(2.54)(60)} = \cancel{1.6\times10^{-7}}$$

1.1×10^{-6} cm/sec LCR

GMW 1207

$$K = \frac{(1)^2 \ln\left(\frac{\cancel{120}^{83.4}}{4.5}\right)}{2(\cancel{120}_{83.4})(165)(2.54)(60)} = \cancel{5.4\times10^{-7}}$$

4.5×10^{-6} cm/sec LCR

GMW 1208

$$K = \frac{(1)^2 \ln\left(\frac{\cancel{120}^{79.1}}{4.5}\right)}{2(\cancel{120}_{79.1})(21)(2.54)(60)} = \cancel{4.3\times10^{-6}}$$

3.7×10^{-5} cm/sec LCR

SHANNON & WILSON, INC.
Geotechnical Consultants

JOB NAME RGATB JOB NO Z 108-01
SUBJECT Permeability Calculations DATE 9/27
BY LCK CHK'D SHEET 2 of 2

MW 604

$K = \frac{r^2 \ln(L/R)}{2LT_0} = ?$ No water, test not performed

MW-605

$K = \frac{r^2 \ln(L/R)}{2LT_0} = \frac{(1in)^2 \ln(43.2/3.0)}{2(43.2)(6)} = \frac{1in^2 \ln(14.4)}{518.4} = \frac{2.67 \times (2.54 cm/in)^2}{518.4 \times 2.54 cm/in \times 60 sec/min}$

$= \frac{17.23 cm^2}{7.90 \times 10^4 cm/sec} = 2.18 \times 10^{-4} cm/sec = 2.2 \times 10^{-4}$

MW 606

No water - test not performed

MW 607

$K = \frac{r^2 \ln(L/R)}{2LT_0} = \frac{(1in)^2 \ln(108.64/3")}{2(108.64)(120)} = \frac{1in^2 \ln(36.20)}{26121.6 in min} = \frac{3.59 \times (2.54 cm/in)^2}{26121.6 \times 2.54 cm/in \times 60 sec/min}$

$= \frac{23.16 cm^2}{3.98 \times 10^6 cm/sec} = 5.82 \times 10^{-6} = 5.8 \times 10^{-6}$

SHANNON & WILSON, INC.
Geotechnical Consultants

JOB NAME Richards Gebaur AFB JOB NO Z-108-01
SUBJECT Field Perm Calculations DATE 9/27/89
BY LCR CHK'D SHEET 1 of 2

MW 1205

$$K = \frac{r^2 \ln(L/R)}{2LT_0} = \frac{(1\,in)^2 \ln(120''/4.5'')}{2(120'')(5\,min)} = \frac{1\,in^2 \ln(26.67)}{1200\,in\,min} = \frac{3.28 \times (2.54\,cm/in)^2}{1200''\,min \times 2.54\,cm/in \times 60\,sec/min}$$

$$= \frac{21.16\,cm^2}{1.83 \times 10^5\,cm/sec} = 1.16 \times 10^{-4}\,cm/sec =$$

MW 1206

$$K = \frac{r^2 \ln(L/R)}{2LT_0} = \frac{(1\,in)^2 \ln(120''/4.5'')}{2(120'')(545\,min)} = \frac{1\,in^2 \ln(26.67)}{130{,}800\,in\,min} = \frac{3.28 \times (2.54\,cm/in)^2}{130{,}800\,in\,min \times 2.54\,cm/in \times 60\,sec/min}$$

$$= \frac{21.16\,cm^2}{1.99 \times 10^7\,cm/sec} = 1.06 \times 10^{-6}\,cm/sec = 1.1 \times 10^{-6}$$

MW 1207

$$K = \frac{r^2 \ln(L/R)}{2LT_0} = \frac{(1\,in)^2 \ln(83.4''/4.5'')}{2(83.4)(165)} = \frac{1\,in^2 \ln(18.53)}{2.75 \times 10^4\,in\,min} = \frac{2.93 \times (2.54\,cm/in)^2}{2.75 \times 10^4 \times 2.54\,cm/in \times 60\,sec/min}$$

$$= \frac{18.84\,cm^2}{4.19 \times 10^6\,cm/sec} = 4.50 \times 10^{-6}\,cm/sec$$

MW 1208

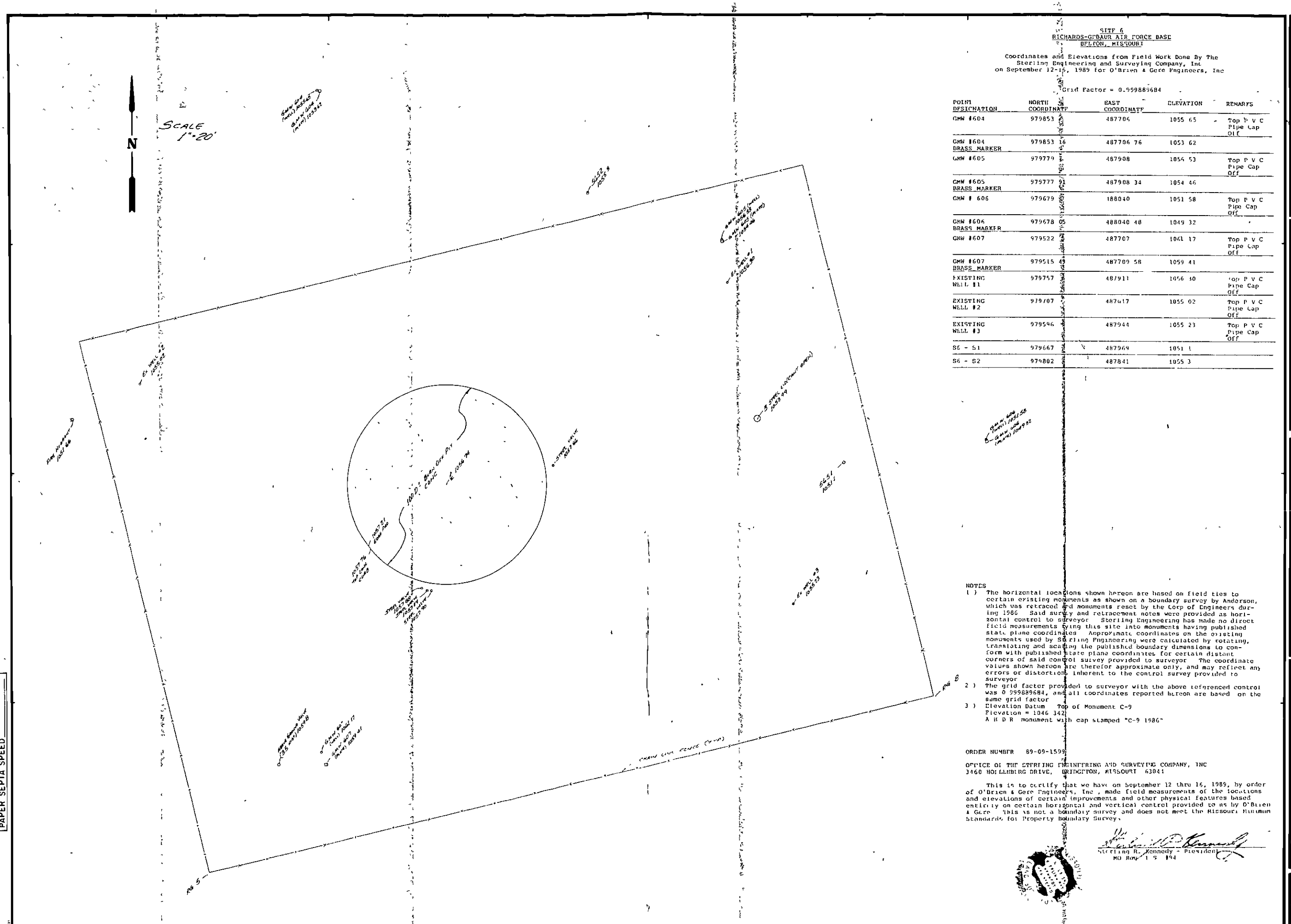
$$K = \frac{r^2 \ln(L/R)}{2T_0L} = \frac{(1\,in)^2 \ln(79.1/4.5)}{2(79.1)(21)} = \frac{1\,in^2 \ln(17.58)}{3322.2} = \frac{2.87 \times (2.54\,cm/in)^2}{3322.2 \times 2.54\,cm/in \times 60\,sec/min}$$

$$= \frac{18.52\,cm^2}{5.06 \times 10^5\,cm/sec} = 3.66 \times 10^{-5}\,cm/sec = 3.7 \times 10^{-5}\,cm/sec$$

APPENDIX E

SITE SURVEY

37 434



SITE 6
RICHARDS-GEBAUR AIR FORCE BASE
BELTON, MISSOURI

Coordinates and Elevations from Field Work Done By The Sterling Engineering and Surveying Company, Inc on September 12-16, 1989 for O'Brien & Gere Engineers, Inc

Grid Factor = 0.999889684

POINT DESIGNATION	NORTH COORDINATE	EAST COORDINATE	ELEVATION	REMARKS
GMW #604	979853	487706	1055 65	Top P V C Pipe Cap Off
GMW #604 BRASS MARKER	979853 16	487706 76	1053 62	
GMW #605	979779	487908	1054 53	Top P V C Pipe Cap Off
GMW #605 BRASS MARKER	979777 91	487908 34	1054 46	
GMW # 606	979679	488040	1051 58	Top P V C Pipe Cap Off
GMW #606 BRASS MARKER	979678 05	488040 48	1049 32	
GMW #607	979522	487707	1061 17	Top P V C Pipe Cap Off
GMW #607 BRASS MARKER	979515 49	487709 58	1059 41	
EXISTING WELL #1	979757	487911	1056 40	Top P V C Pipe Cap Off
EXISTING WELL #2	979707	487917	1055 02	Top P V C Pipe Cap Off
EXISTING WELL #3	979596	487944	1055 23	Top P V C Pipe Cap Off
S6 - S1	979667	487969	1051 1	
S6 - S2	979802	487841	1055 3	

NOTES

1) The horizontal locations shown hereon are based on field ties to certain existing monuments as shown on a boundary survey by Anderson, which was retraced and monuments reset by the Corp of Engineers during 1986 Said survey and retracement notes were provided as horizontal control to surveyor Sterling Engineering has made no direct field measurements tying this site into monuments having published state plane coordinates Approximate coordinates on the existing monuments used by Sterling Engineering were calculated by rotating, translating and scaling the published boundary dimensions to conform with published state plane coordinates for certain distant corners of said control survey provided to surveyor The coordinate values shown hereon are therefor approximate only, and may reflect any errors or distortions inherent to the control survey provided to surveyor

2) The grid factor provided to surveyor with the above referenced control was 0 999889684, and all coordinates reported hereon are based on the same grid factor

3) Elevation Datum Top of Monument C-9
Elevation = 1046 342
A H D R monument with cap stamped "C-9 1986"

ORDER NUMBER 89-09-1599

OFFICE OF THE STERLING ENGINEERING AND SURVEYING COMPANY, INC
3460 HOLLENBERG DRIVE, BRIDGETON, MISSOURI 63044

This is to certify that we have on September 12 thru 16, 1989, by order of O'Brien & Gere Engineers, Inc , made field measurements of the locations and elevations of certain improvements and other physical features based entirely on certain horizontal and vertical control provided to us by O'Brien & Gere This is not a boundary survey and does not meet the Missouri Minimum Standards for Property Boundary Surveys.

Sterling R. Kennedy - President
MO Reg L S 194

PRINT SPEED
MYLAR SEPIA SPEED
PAPER SEPIA SPEED

ISSUE	REMARKS/DATE	ISSUE	REMARKS/DATE

PREPARED FOR
O'BRIEN & GERE
5000 CEDAR PLAZA PKWY
SUITE 211
ST LOUIS, MISSOURI 63128
(314) 842-4550

PREPARED BY
the STERLING
ENGINEERS, SURVEYORS AND PLANNERS CO.
3460 HOLLENBERG DRIVE
BRIDGETON, MISSOURI 63044
(314) 739-0440

SIGNED
STERLING R KENNEDY E-943 LS-94

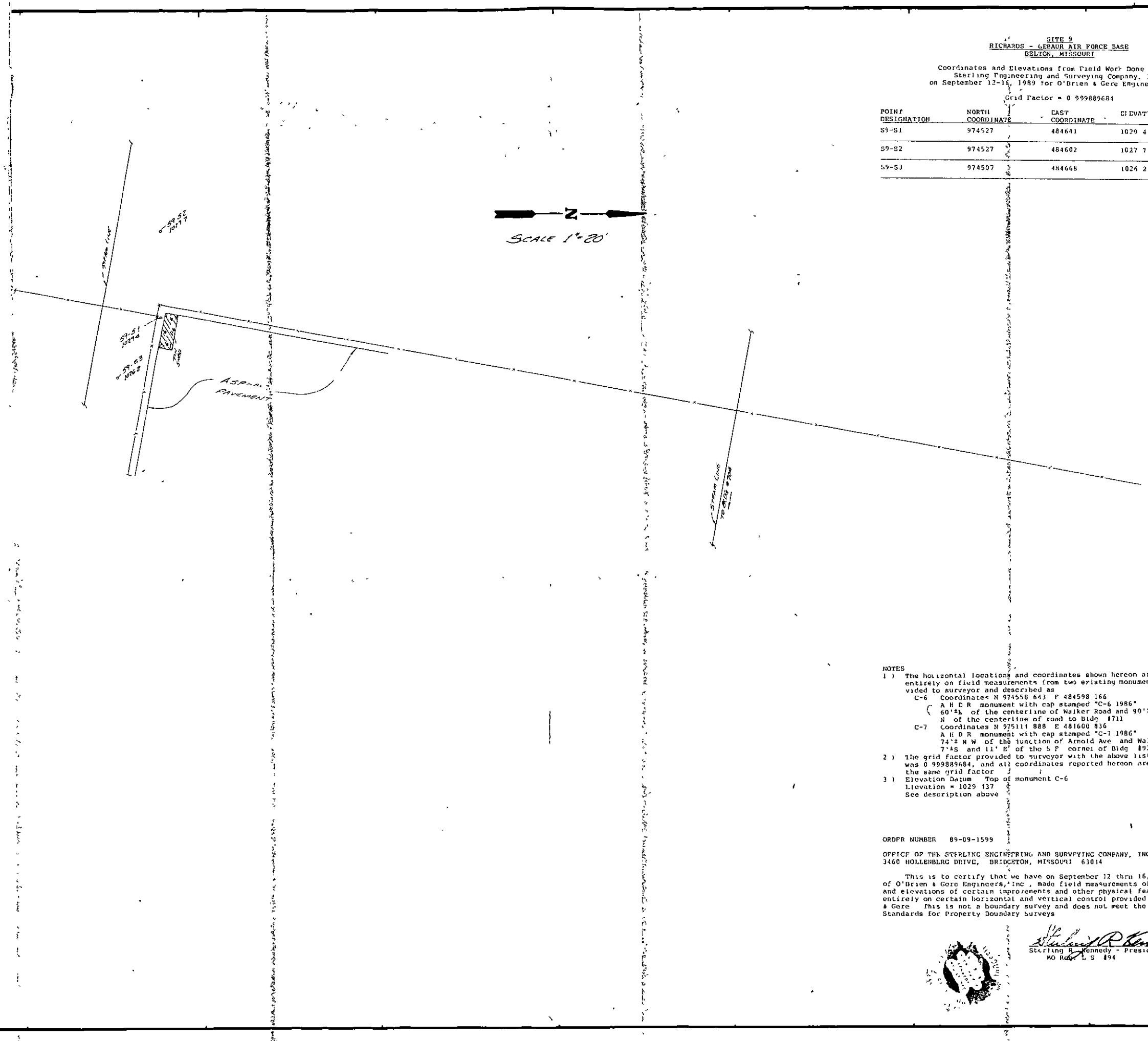
MSD P-

DRAWN TT
DESIGNED
CHECKED JKC

PROJECT
SITE 6
RICHARDS-GEBAUR
AIR FORCE BASE
BELTON, MISSOURI

SHEET TITLE
WELL & SURVEY LOCATIONS

NO 89 09 1599
ISSUE
SHEET 1 OF 1



SITE 9
RICHARDS - GEBAUR AIR FORCE BASE
BELTON, MISSOURI

Coordinates and Elevations from Field Work Done By The Sterling Engineering and Surveying Company, Inc on September 12-16, 1989 for O'Brien & Gere Engineers, Inc

Grid Factor = 0.999889684

POINT DESIGNATION	NORTH COORDINATE	EAST COORDINATE	ELEVATION	REMARKS
S9-S1	974527	484641	1029.4	
S9-S2	974527	484602	1027.7	
S9-S3	974507	484668	1026.2	

NOTES

1) The horizontal locations and coordinates shown hereon are based entirely on field measurements from two existing monuments provided to surveyor and described as
   C-6 Coordinates N 974558.643 E 484598.166
   A.H.D.R. monument with cap stamped "C-6 1986"
   60'±W of the centerline of Walker Road and 90'± N of the centerline of road to Bldg. #711
   C-7 Coordinates N 975111.888 E 481600.836
   A.H.D.R. monument with cap stamped "C-7 1986"
   74'± N.W. of the junction of Arnold Ave. and Walker Road, 7'±S and 11' E' of the S.E. corner of Bldg. #925
2) The grid factor provided to surveyor with the above listed control was 0.999889684, and all coordinates reported hereon are based on the same grid factor.
3) Elevation Datum Top of monument C-6
   Elevation = 1029.137
   See description above

ORDER NUMBER 89-09-1599

OFFICE OF THE STERLING ENGINEERING AND SURVEYING COMPANY, INC
3460 HOLLENBERG DRIVE, BRIDGETON, MISSOURI 63044

This is to certify that we have on September 12 thru 16, 1989, by order of O'Brien & Gere Engineers, Inc., made field measurements of the locations and elevations of certain improvements and other physical features based entirely on certain horizontal and vertical control provided to us by O'Brien & Gere. This is not a boundary survey and does not meet the Missouri Minimum Standards for Property Boundary Surveys.

Sterling R. Kennedy - President
MO Reg. L.S. #94

PREPARED FOR
O'BRIEN & GERE
5000 CEDAR PLAZA PKWY
SUITE 211
ST LOUIS, MO 63128
(314) 842-4550

SIGNED

PREPARED BY
the STERLING
ENGINEERS, SURVEYORS AND PLANNERS CO.
3460 HOLLENBERG DRIVE
BRIDGETON, MISSOURI 63044
(314) 739-0440

MSD P-

STERLING R. KENNEDY L.S. 94

ISSUE	REMARKS/DATE

ISSUE	REMARKS/DATE

DRAWN: TT
DESIGNED
CHECKED: PRC

PROJECT: SITE 9 RICHARDS-GEBAUR AIR FORCE BASE BELTON, MISSOURI

SHEET TITLE: SAMPLE LOCATIONS

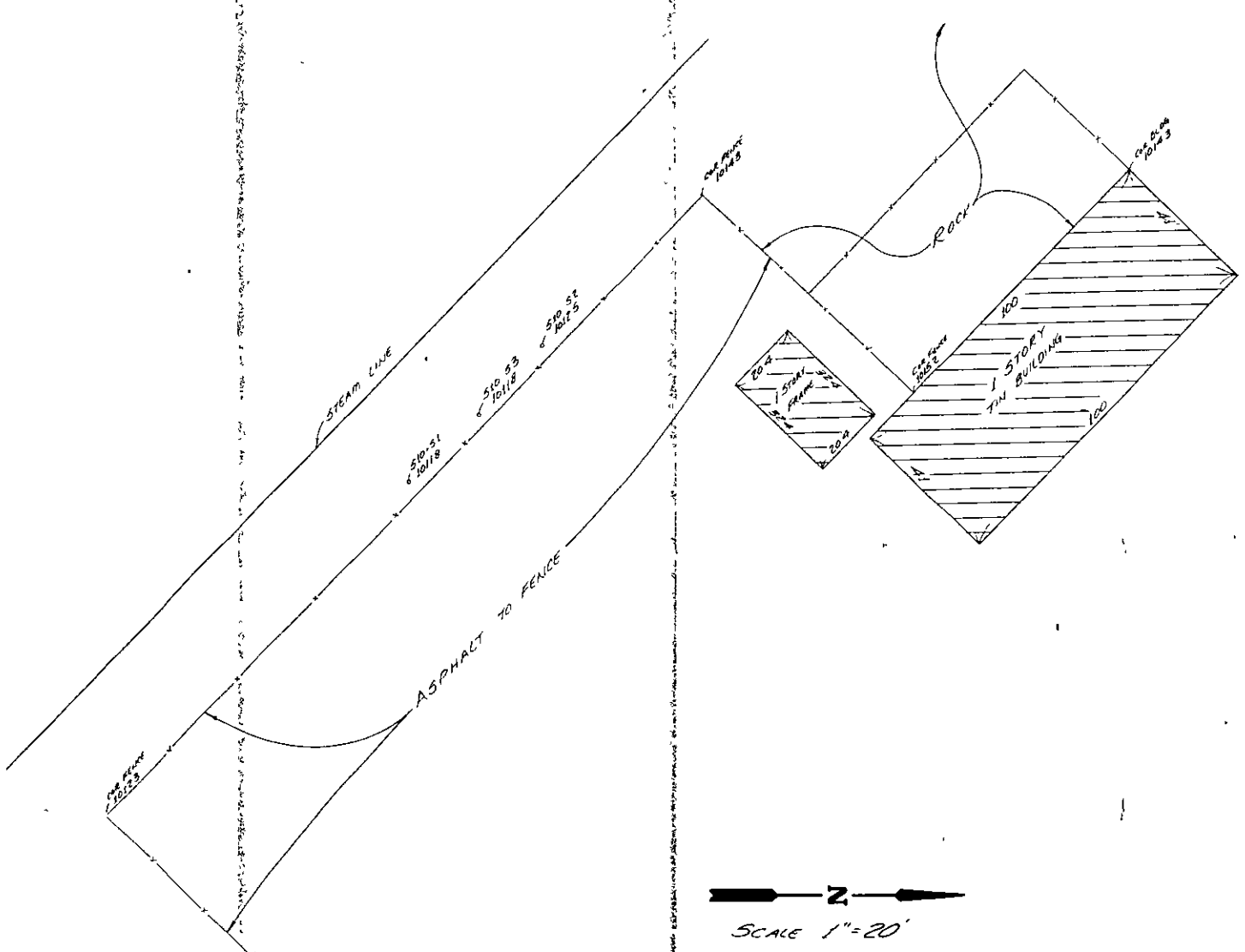
NO. 89 09 1599

ISSUE

SHEET 1 OF 1

PRINT SPEED
MYLAR SEPIA SPEED
PAPER SEPIA SPEED

37 435



SITE 10
RICHARDS - GEBAUR AIR FORCE BASE
BELTON, MISSOURI

Coordinates and Elevations from Field Work Done By The Sterling Engineering and Surveying Company, Inc on September 12-16, 1989 for O'Brien & Gere Engineers, Inc

Grid Factor = 0 999889684

POINT DESIGNATION	NORTH COORDINATE	EAST COORDINATE	ELEVATION	REMARKS
S10-S1	975291	485631	1011 8	
S10-S2	975327	485595	1012 5	
S10-S3	975309	485613	1011 8	

NOTES

1) The horizontal locations and coordinates shown hereon are based entirely on field measurements from two existing monuments provided to surveyor and described as:
   C-6 Coordinates N 974558 643 E 484598 166
   A H D R monument with cap stamped "C-6 1986"
   60'±E of the centerline of Walker Road and 90'± N of the centerline of road to Bldg #711
   C-7 Coordinates N 975115 888 E 484600 836
   A H D R monument with cap stamped "C-7 1986"
   74'± N W of the junction of Arnold Ave and Walker Road, 7'±S and 11' E of the S E corner of Bldg #925
2) The grid factor provided to surveyor with the above listed control was 0 999889684, and all coordinates reported hereon are based on the same grid factor
3) Elevation Datum Top of monument C-7
   Elevation = 1045 895
   See description above

ORDER NUMBER 89-09-1599

OFFICE OF THE STERLING ENGINEERING AND SURVEYING COMPANY, INC
3460 HOLLENBERG DRIVE, BRIDGETON, MISSOURI 63044

This is to certify that we have on September 12 thru 16, 1989, by order of O'Brien & Gere Engineers, Inc , made field measurements of the locations and elevations of certain improvements and other physical features based entirely on certain horizontal and vertical control provided to us by O'Brien & Gere This is not a boundary survey and does not meet the Missouri Minimum Standards for Property Boundary Surveys

Sterling R Kennedy - President
MO Reg L S 494

PRINT SPEED
MYLAR SEPIA SPEED
PAPER SEPIA SPEED

ISSUE	REMARKS	DATE

PREPARED FOR
O'BRIEN & GERE
5000 CEDAR PLAZA PKWY
SUITE 211
ST LOUIS, MO 63128
(314) 842-4550

SIGNED
STERLING R KENNEDY E-943 LS-94

PREPARED BY
the STERLING CO.
3460 HOLLENBERG DRIVE
BRIDGETON, MISSOURI 63044
ENGINEERS, SURVEYORS AND PLANNERS
(314) 739-0440
MSD P-

DRAWN TT
DESIGNED
CHECKED DAC

PROJECT: SITE 10 RICHARDS-GEBAUR AIR FORCE BASE BELTON, MISSOURI

SHEET TITLE: SAMPLE LOCATIONS

NO 89 09 1599
ISSUE
SHEET 1 OF 1

37 436

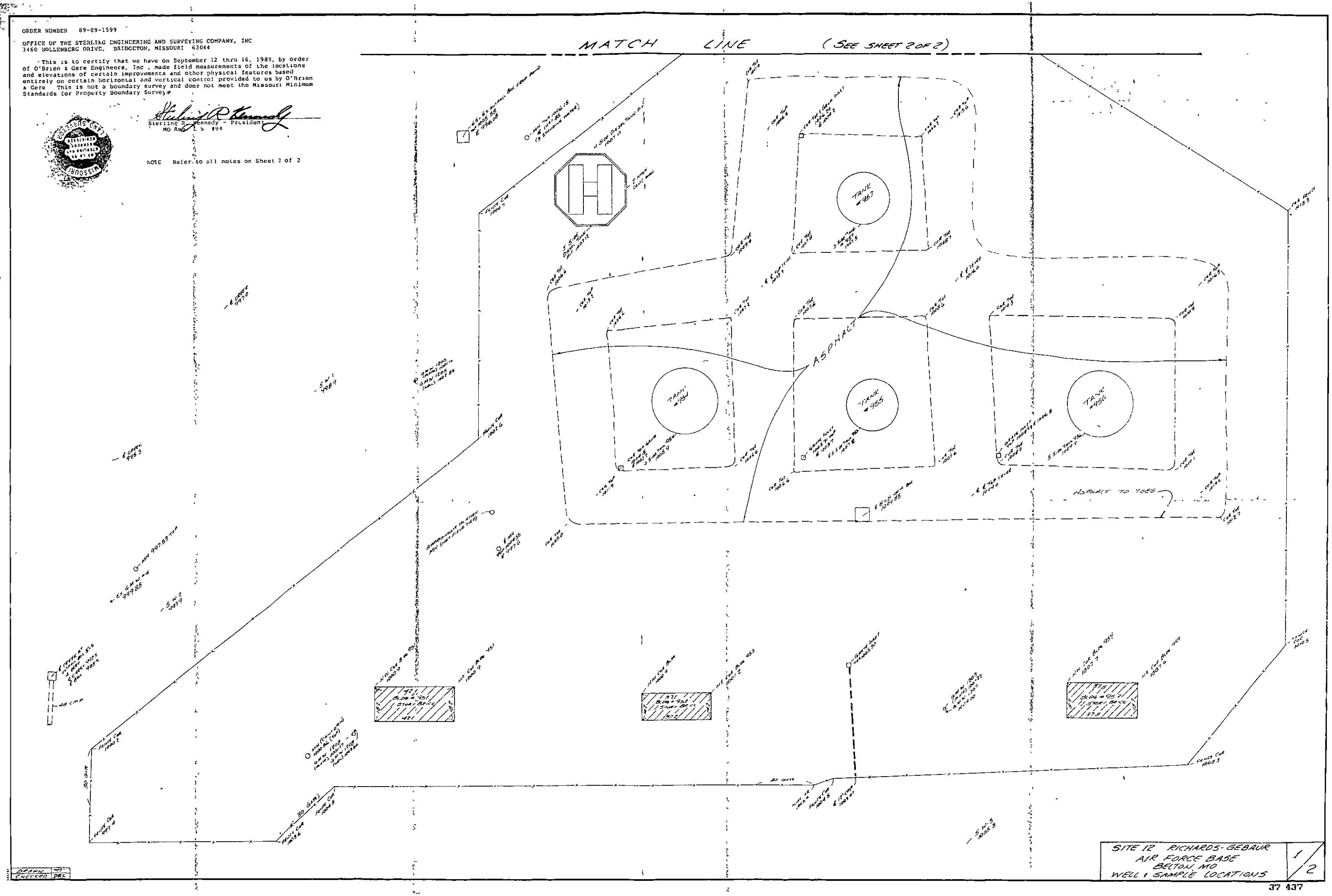
ORDER NUMBER 89-09-1599

OFFICE OF THE STERLING ENGINEERING AND SURVEYING COMPANY, INC
3460 HOLLENBERG DRIVE, BRIDGETON, MISSOURI 63044

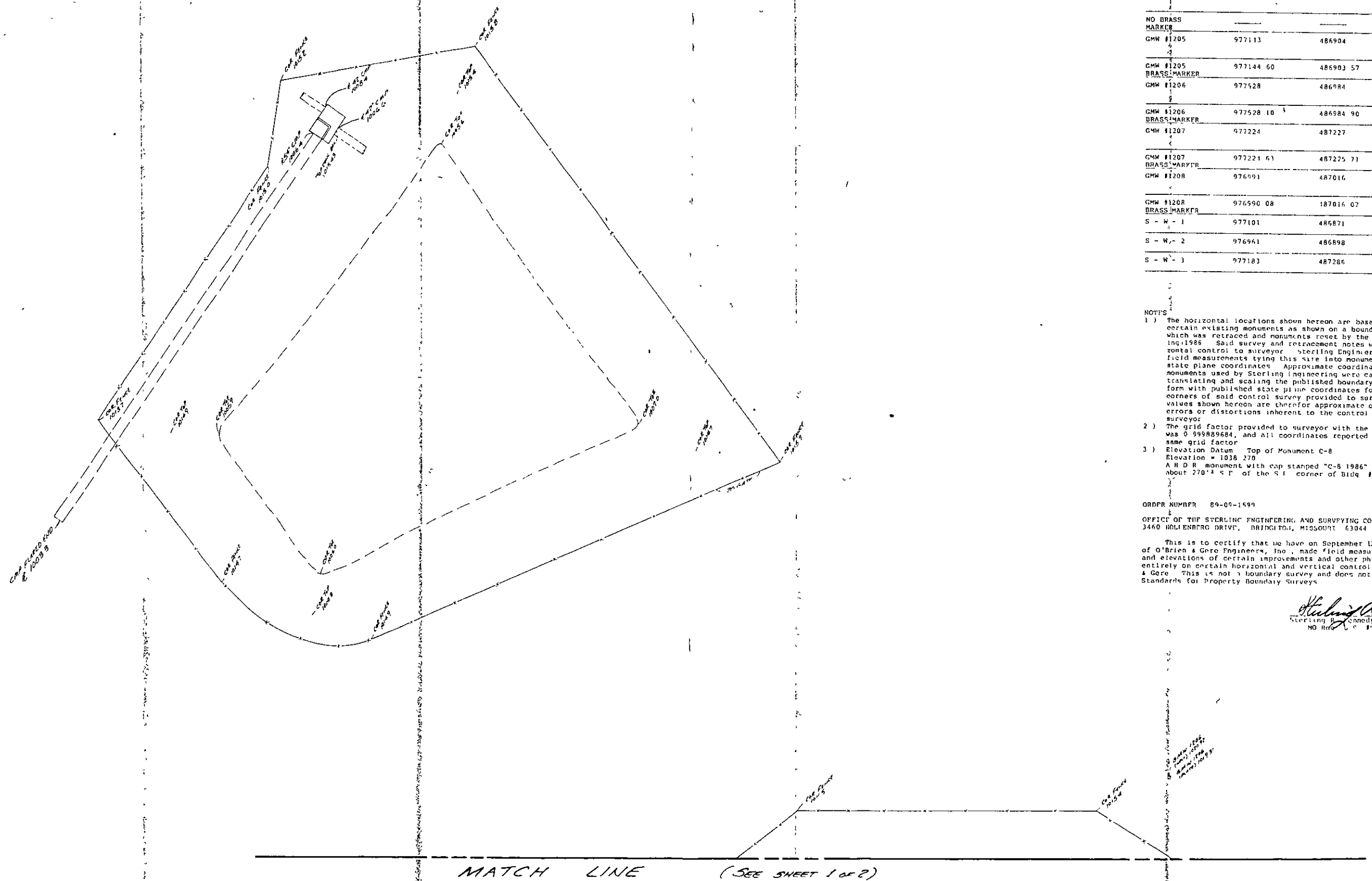
This is to certify that we have on September 12 thru 16, 1989, by order of O'Brien & Gere Engineers, Inc , made field measurements of the locations and elevations of certain improvements and other physical features based entirely on certain horizontal and vertical control provided to us by O'hrien & Gere This is not a boundary survey and does not meet the Missouri Minimum Standards for Property Boundary Surveys

Sterling R. Kennedy - President
MO Reg. L.S. 894

NOTE Refer to all notes on Sheet 2 of 2



37 437



SITE 12
RICHARDS - GEBAUR AIR FORCE BASE
BELTON, MISSOURI

Coordinates and Elevations from Field Work Done By The Sterling Engineering and Surveying Company, Inc on September 12-16, 1989 for O Brien & Gere Engineers, Inc

Grid Factor = 0 999889684

POINT DESIGNATION	NORTH COORDINATE	EAST COORDINATE	ELEVATION	REMARKS
GMW #4	976946	486876	999 85	Top P V C Pipe Cap Off
NO BRASS MARKER	———	———	———	
GMW #1205	977113	486904	1002 85	Top P V C Pipe Cap Off
GMW #1205 BRASS MARKER	977144 60	486903 57	1001 16	
GMW #1206	977528	486984	1020 92	Top P V C Pipe Cap Off
GMW #1206 BRASS MARKER	977528 10	486984 90	1019 31	
GMW #1207	977224	487227	1009 00	Top P V C Pipe Cap Off
GMW #1207 BRASS MARKER	977221 63	487225 71	1007 22	
GMW #1208	976991	487016	1003 01	Top P V C Pipe Cap Off
GMW #1208 BRASS MARKER	976990 08	487016 07	1001 17	
S - W - 1	977101	486871	998 9	
S - W - 2	976961	486898	997 9	
S - W - 3	977183	487286	1005 3	

NOTES

1) The horizontal locations shown hereon are based on field ties to certain existing monuments as shown on a boundary survey by Anderson, which was retraced and monuments reset by the Corp of Engineers during 1986 Said survey and retracement notes were provided as horizontal control to surveyor Sterling Engineering has made no direct field measurements tying this site into monuments having published state plane coordinates Approximate coordinates on the existing monuments used by Sterling Engineering were calculated by rotating, translating and scaling the published boundary dimensions to conform with published state plane coordinates for certain distant corners of said control survey provided to surveyor The coordinate values shown hereon are therefor approximate only, and may reflect any errors or distortions inherent to the control survey provided to surveyor

2) The grid factor provided to surveyor with the above referenced control was 0 999889684, and all coordinates reported hereon are based on the same grid factor

3) Elevation Datum Top of Monument C-8
Elevation = 1038 270
A H D R monument with cap stamped "C-8 1986"
about 270'± S E of the S E corner of Bldg #947

ORDER NUMBER 89-09-1599

OFFICE OF THE STERLING ENGINEERING AND SURVEYING COMPANY, INC
3460 HOLLENBERG DRIVE, BRIDGETON, MISSOURI 63044

This is to certify that we have on September 12 thru 16, 1989, by order of O'Brien & Gere Engineers, Inc , made field measurements of the locations and elevations of certain improvements and other physical features based entirely on certain horizontal and vertical control provided to us by O'Brien & Gere This is not a boundary survey and does not meet the Missouri Minimum Standards for Property Boundary Surveys

Sterling R Kennedy - President
MO Reg L S #94

MISSOURI
NO LS 94
STERLING RAY
KENNEDY
REGISTERED
LAND SURVEYOR

DRAWN	TT
CHECKED	RRC

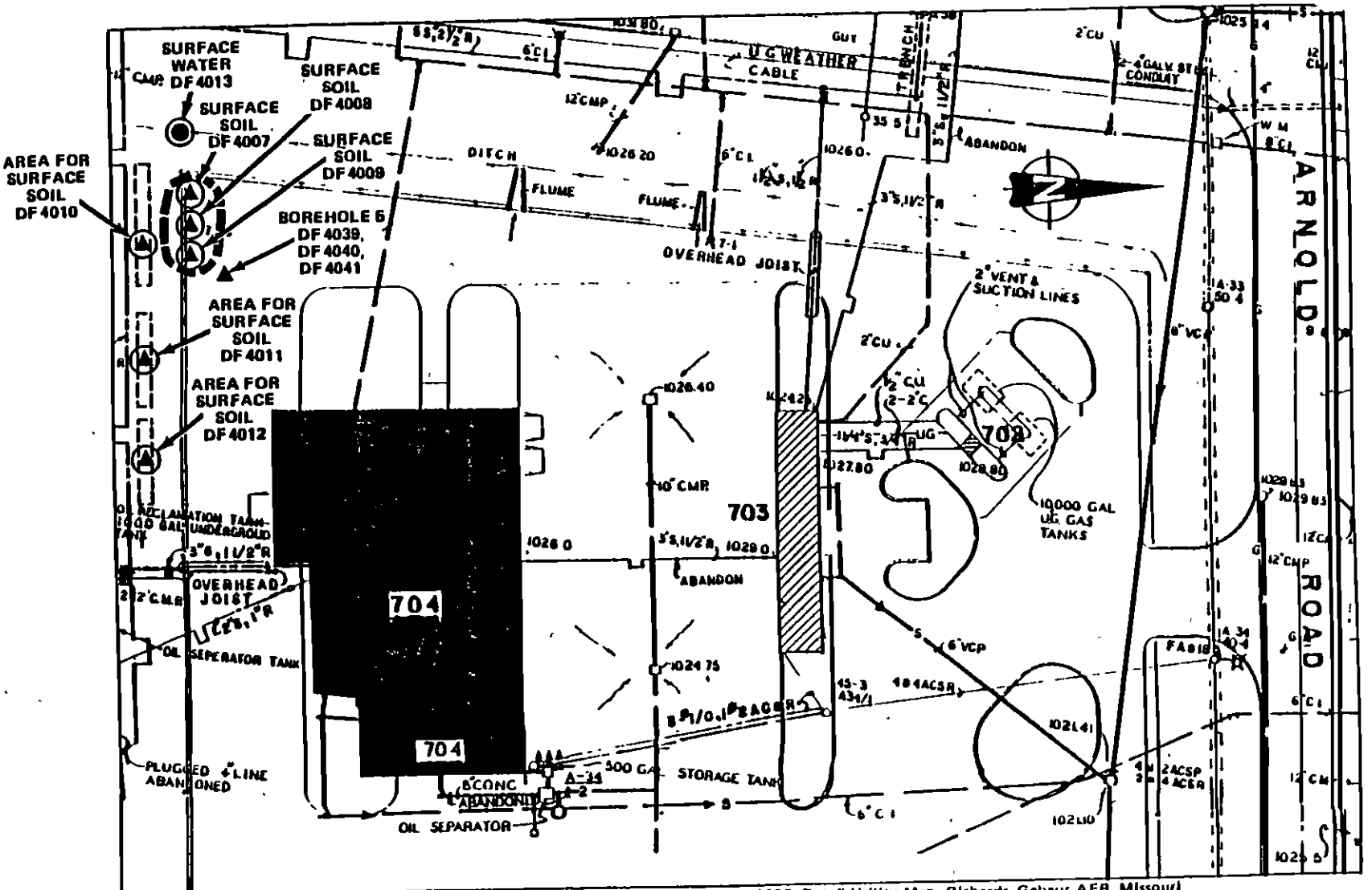
SITE 12 RICHARDS-GEBAUR AIR FORCE BASE BELTON, MISSOURI WELL & SAMPLE LOCATIONS

2/2

37 438

EXHIBIT A

PREVIOUS ANALYTICAL DATA

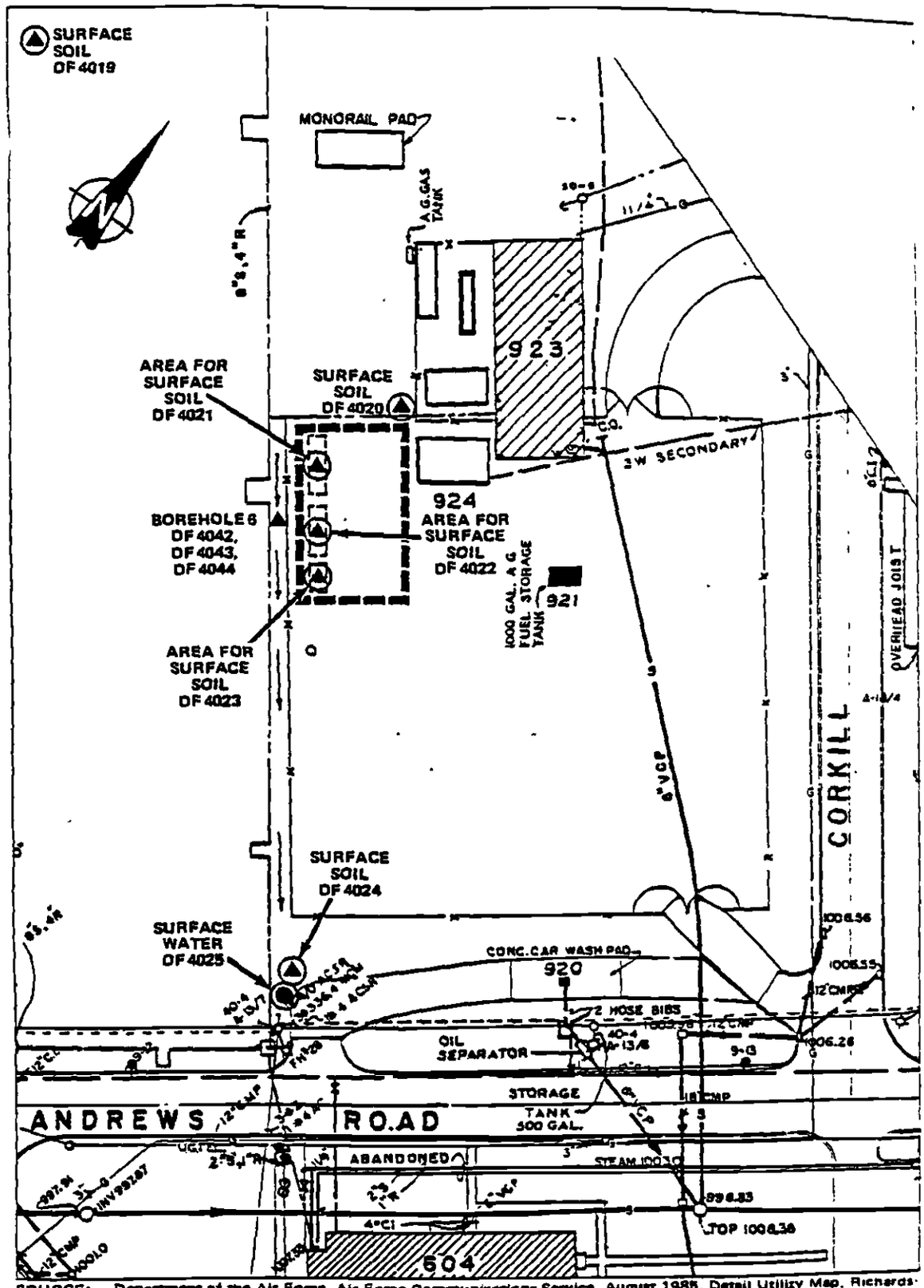


SOURCE. Department of the Air Force, Air Force Communications Service, August 1986, Detail Utility Map, Richards Gebaur AFB, Missouri

KEY:
- Site Boundary
- Surface Runoff Direction
- Subsurface Soil Sampling Location
- Surface Soil Sampling Location
- Groundwater Sampling Location
- Surface Water Sampling Location

SCALE 0 50 100 200 300 FEET

Figure 3–7 SAMPLING LOCATIONS AT SITE 9, OIL-SATURATED AREA

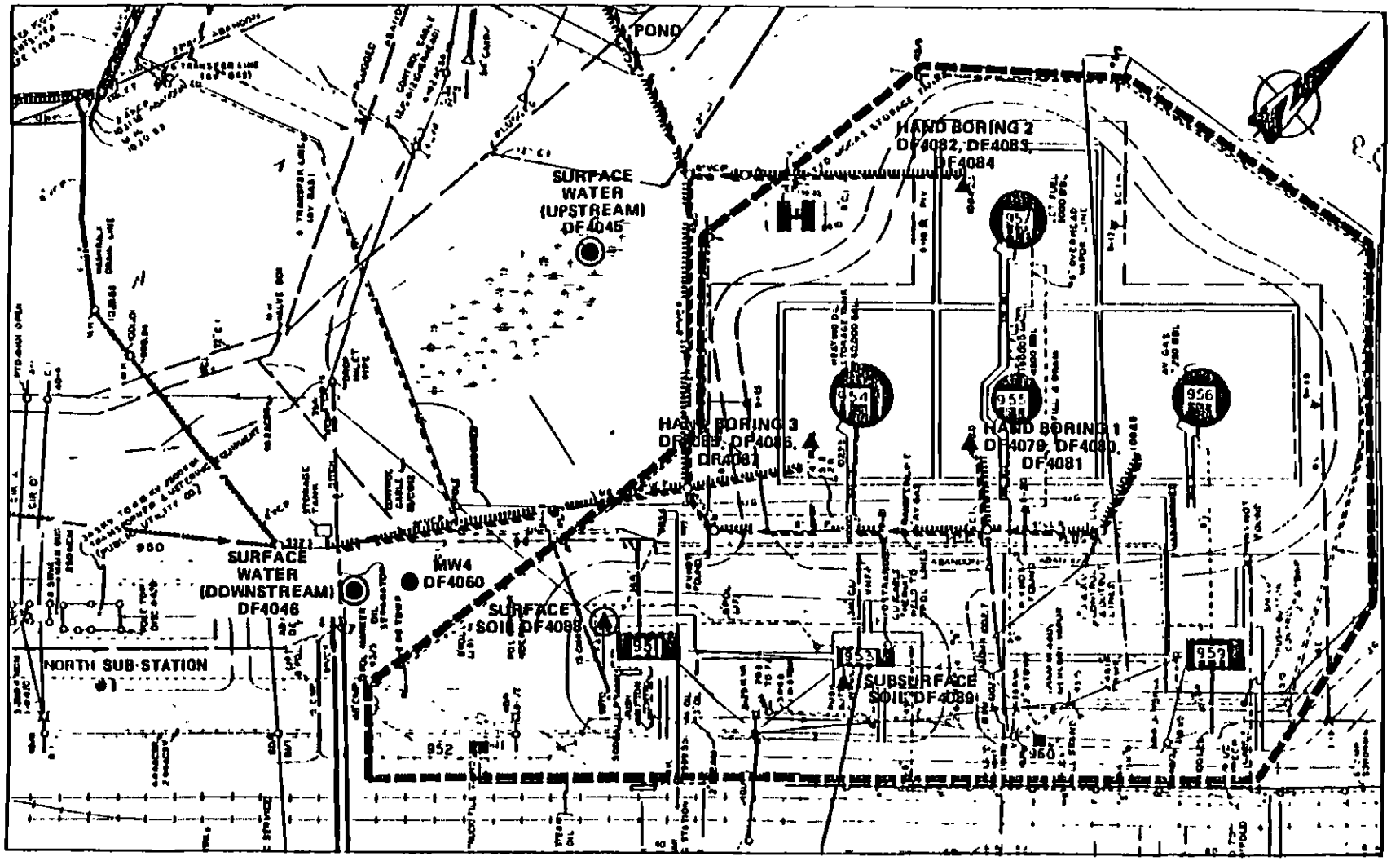


SOURCE: Department of the Air Force, Air Force Communications Service, August 1985, Detail Utility Map, Richards-Gebaur AFB, Missouri.

KEY:
- Site Boundary
- Surface Runoff Direction
- Subsurface Soil Sampling Location
- Surface Soil Sampling Location
- Groundwater Sampling Location
- Surface Water Sampling Location

SCALE: 0 50 100 200 300 FEET

Figure 3–8 SAMPLING LOCATIONS AT SITE 10, HAZARDOUS WASTE DRUM STORAGE AREA



SOURCE: Department of the Air Force, Air Force Communications Service, August 1985, Detail Utility Map, Richards Gebaur AFB, Missouri

KEY: Site Boundary; Surface Runoff Direction; Subsurface Soil Sampling Location; Surface Soil Sampling Location; Groundwater Sampling Location; Surface Water Sampling Location

SCALE 0 50 100 200 FEET

Figure 3–9 SAMPLING LOCATIONS AT SITE 12, POL STORAGE YARD

37 442

Table 4-6

RESULTS OF WATER SAMPLE ANALYSES FOR SITE 6, NORTH BURN PIT AREA

(ug/L, unless otherwise specified)

Parameter	EPA Drinking Water Standards and Health Advisories*			Surface Water	Groundwater		
	EPA MCL	EPA RMCL	EPA HA				
Well No.:				NBW1	NWMW	NEMW	SEMW
Date Sampled:				10/9	10/21	10/21	10/21
Field Sample No.:				DF4006	DF4057	DF4058	DF4059
Lab Sample No.:				8776 (9088)	9076	9077	9078
Petroleum Hydrocarbons (mg/L)	--	--	--	ND	NR	NR	NR
Halogenated Volatile Organics							
Chloroform	100	--	--	ND	0.50	ND	0.61
Methylene Chloride	--	--	350**	ND	ND	37	ND
Tetrachloroethylene	--	--	680**	ND	0.71	ND	0.41
Aromatic Volatile Organics	--	--	--	ND	ND	ND	ND

*Key: MCL = Maximum Contaminant Limit
RMCL = Recommended Maximum Contaminant Limit
HA = Lifetime Health Advisories developed by EPA for noncarcinogenic effects
ND = Not Detected
NR = Not run due to insufficient sample volume

**EPA is currently reviewing the potential carcinogenicity of this chemical. If the agency concludes the chemical ought to be regulated as a carcinogen in drinking water, the agency will establish a health advisory significantly lower than the current HA.

Table 4-7

RESULTS OF SOIL SAMPLE ANALYSES FOR SITE 6, NORTH BURN PIT AREA

(mg/kg, all concentrations on an as received basis.)

Parameter	Date Sampled: / Boring: / Depth: / Field No.: / Lab No.:	10/9 NBAS-1 0-1' DF4001 8765	10/9 NBAS-2 0-1' DF4002 8766	10/9 NBAS-3 0-1' DF4003 8767	10/9 NBAS-4 0-1' DF4004 8768	10/9 NBAS-5 0-1' DF4005 8769	10/10 NBAS-6 0-1' DF4014 8795	10/15 NBAB-1 3.5-4.5' DF4027 8894	10/15 NBAB-1 7-8' DF4028 8895	10/15 BNAB-1 12-12.4' DF4029 8896	10/15 NBAB-2 2-3' DF4030 8897	10/15 NBAB-2 5-6' DF4031 8898	10/15 NBAB-2 11-12' DF4032 8899	10/15 NBAB-2 11-12' DF4032D 8900	10/15 NBAB-3 2-3' DF4033 8901	10/15 NBAB-3 5-6' DF4034 8902	10/15 BNAB-3 11-12' DF4035 8903
Volatile Organics Compounds		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons		34	1.4	5.4	2.8	5.7	2.8	ND	3.8	3.8	1.9	1.6	2.0	1.4	ND	ND	ND

ND = Not Detected

Table 4-11

RESULTS OF SOIL SAMPLE ANALYSES FOR
SITE 9, OIL-SATURATED AREA

(mg/kg; all concentrations on an as received basis)

Parameter	Date Sampled: / Boring: / Depth: / Field No.: / Lab No.:	10/9 OSAS-1 0-1' DF4007 8770	10/9 OSAS-2 0-1' DF4008 8771	10/9 OSAS-3 0-1' DF4009 8772	10/9 OSAS-4 0-1' DF4010 8773	10/9 OSAS-5 0-1' DF4011 8774	10/10 OSAS-6 0-1' DF4012 8775	10/17 OSAB-1 3-4' DF4039 8966	10/17 OSAB-1 8-9' DF4040 8967	10/17 BNAB-1 15.5-16.5' DF4041 8968
Volatile Organic Compounds		ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead		169	117	343	14.1	14.8	18.5	20.2	9.22	10.2
Petroleum Hydrocarbon		2000	3800	670	ND	2	3	9.0	ND	ND

ND = Not Detected

Table 4-13

RESULTS OF SOIL SAMPLE ANALYSES FOR
SITE 10, HAZARDOUS WASTE DRUM STORAGE AREA

(mg/kg; all concentrations on an as received basis)

Parameter	Date Sampled:	10/10	10/10	10/10	10/10	10/10	10/10	10/17	10/17	10/17
	Station No.:	HWDSAS-1	HWDSAS-2	HWDSAS-3	HWDSAS-4	HWDSAS-5	HWDSAS-6	HWDSAB-1	HWDSAB-1	HWDSAB-1
	Depth:	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0.5-1.5'	9-10'	4.5-5.5'
	Field No.:	DF4019	DF4020	DF4021	DF4022	DF4023	DF4024	DF4042	DF4043	DF4044
	Lab No.:	8800	8801	8802	8803	8804	8805	8969	8970	8971
Volatile Organic Compounds		ND	ND	ND	ND	ND	ND	ND	ND	ND
EP TOX Metals		ND	ND	ND	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons		ND	1900	55	46	140	2.9	ND	ND	1.2

ND = Not Detected

recycled paper

ecology and environment

37 446

Table 4-15

RESULTS OF SOIL SAMPLE ANALYSES FOR
SITE 12, POL STORAGE YARD

(mg/kg; all concentrations on an as received basis)

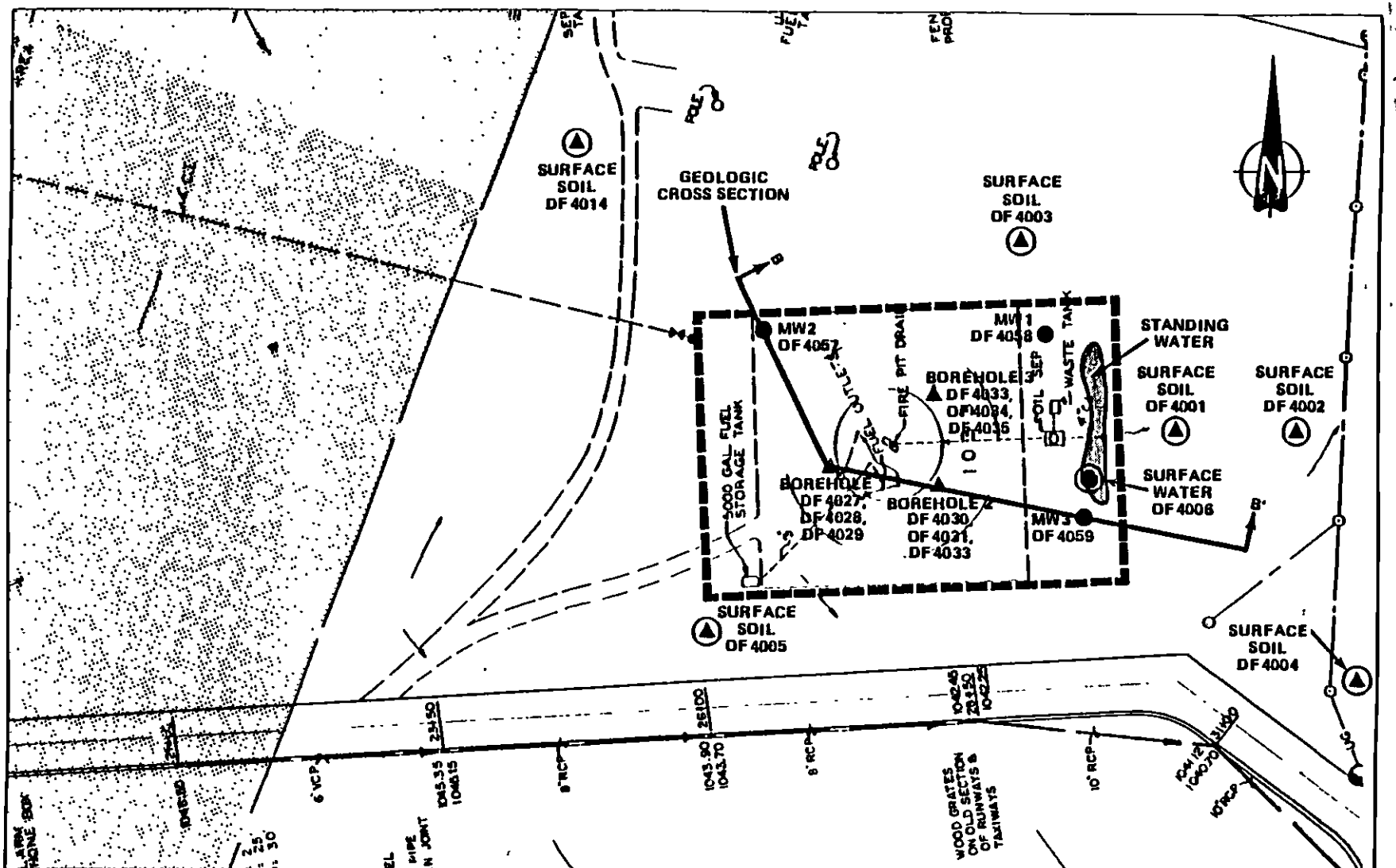
Parameter	Date Sampled: / Station No.: / Depth: / Field No.: / Lab No.:	10/28 POLHB-1 1.0' DF4079 9343	10/28 POLHB-1 2.1' DF4080 9344	10/28 POLHB-1 6.0' DF4081 9345	10/28 POLHB-2 1.0' DF4082 9346	10/28 POLHB-2 2.8' DF4083 9347	10/28 POLHB-2 6.0' DF4084 9348	10/28 POLHB-3 1.0' DF4085 9349	10/28 POLHB-3 3.0' DF4086 9350	10/28 POLHB-3 5.0' DF4087 9351	10/28 POLHB-3 5.0' DF4087D 9352	10/28 POLS-1 0.5' DF4088 9353	10/28 POLS-2 3.0' DF4089 9596
Volatile Organic Compounds													
• Benzene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.25
• Total Xylenes		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.25
• Ethylbenzene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.25
EP TOX Metals		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons		93	390	6.9	67	270	44	9.9	1500	11	28	2800	100

ND = Not Detected

recycled paper

ecology and environment

Figure 3–4 SITE 6, NORTH BURN AREA, SOIL GAS SURVEY LOCATIONS



SOURCE. Department of the Air Force, Air Force Communications Service, August 1985, Detail Utility Map, Richards-Gebaur AFB, Missouri

KEY: Site Boundary; Surface Runoff Direction; Subsurface Soil Sampling Location; Surface Soil Sampling Location; Groundwater Sampling Location; Surface Water Sampling Location

SCALE 0 50 100 200 300 FEET

Figure 3–5 SAMPLING LOCATIONS AT SITE 6, NORTH BURN PIT AREA

37 448

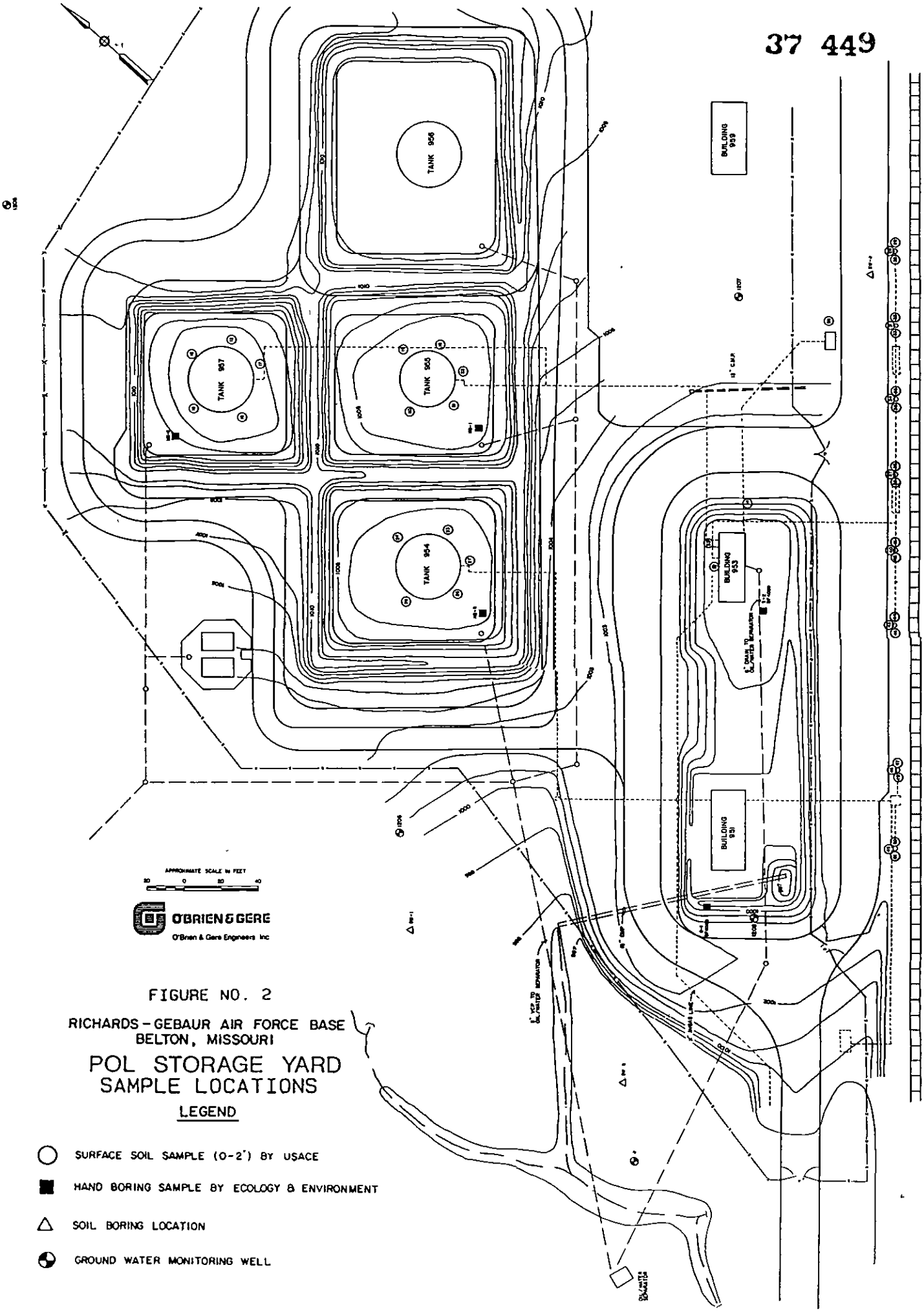


FIGURE NO. 2

RICHARDS-GEBAUR AIR FORCE BASE
BELTON, MISSOURI

POL STORAGE YARD
SAMPLE LOCATIONS

LEGEND

- ○ SURFACE SOIL SAMPLE (0-2') BY USACE
- ■ HAND BORING SAMPLE BY ECOLOGY & ENVIRONMENT
- △ SOIL BORING LOCATION
- ◐ GROUND WATER MONITORING WELL

TABLE 4-3

SUMMARY OF ANALYTICAL RESULTS FROM SOIL SAMPLES COLLECTED BY THE ARMY CORPS OF ENGINEERS FROM ST005 - POL STORAGE YARD

Sample ID	Location	TPH (mg/kg)	Sample ID	Location	TPH (mg/kg)
A89-13	A	X	A89-35	3	X
A89-14	A	X	A89-36	3	X
A89-15	A	X	A89-37	4	X
A89-16	A	X	A89-38	4	X
A89-17	A	X	A89-39	4	2,518
A89-18	B	433	A89-40	5	X
A89-19	B	260	A89-41	5	X
A89-20	B	96	A89-42	5	X
A89-21	B	84	A89-43	6	X
A89-22	B	X	A89-44	6	X
A89-23	C	80	A89-45	6	U
A89-24	C	38	A89-46	7	U
A89-25	C	90	A89-47	7	3,114
A89-26	C	206	A89-48	7	2,335
A89-27	C	120	A89-49	8	2,954
A89-28	1	263	A89-50	8	8,568
A89-29	1	X	A89-51	8	4,428
A89-30	1	136	A89-52	9	627
A89-31	2	X	A89-53	9	X
A89-32	2	X	A89-54	9	U
A89-33	2	X	A89-55	9	313
A89-34	3	X			

X - Samples not analyzed due to strong odor of jet fuel

U - Below Detection Limits

Locations of samples are indicated on Figure 4-1. Locations A, B, and C are sub-surface soil samples collected from beneath the bermed areas at the POL storage tanks. Locations 1 - 8 indicate surface soil samples collected from around the fuel transfer stations. Location 9 indicates surface soil samples collected from around Building 953.

EXHIBIT B

PREVIOUS BORING LOGS

37 452
Site 6

Client: Ecology & Environment, Inc

Owner: U.S. Air Force

SUMMARY OF BORING

PROJECT and LOCATION: Ground Water Investigation of North Burn Area @ Rich... Gebaur AFB, Belton

JOB NO: DF 40002	BORING NO: MW-3	DRILL RIG: CME 55	AMOUNT OF CUT OR FILL:	DATE (s): 10/16/86
LOCATION OF HOLE: Northwest corner of burn pit compound		DRILLING METHOD: CME continuous sampler	TOPOGRAPHY AND DRAINAGE: Flat - fair to poor	TOTAL DEPTH: 7.5'
ELEV.:		AUGER SIZE: 3 3/4" / BIT TYPE: H.S. Auger	SURFACE MATERIAL: Gravel	DRILLER: M. Maniaci / HELPER: D. Meye
DATUM:		TYPE AND SIZE OF SAMPLERS: 1 1/4" PVC bailer @ 3.0' L	GWL DEPTH AND TIME OF READING: Dry	INSPECTOR:

FIELD DATA / **LABORATORY DATA**

DEPTH IN FT. or ELEV (1)	SAMPLE DATA (2)	OVA (ppm) (3)	COLOR (4)	MOISTURE (5)	TEXTURAL CLASSIF (6)	CONSISTENCY or DENSITY (7)	GEOLOGICAL DESCRIPTION and OTHER REMARKS (8)	MOISTURE IN % (9)	DRY DENSITY PCF (10)	UNCONFINED COMPRESSIVE STRENGTH TSF (11)	CLASSIF (12)
1				DRY	COURSE	LOOSE	GRAVEL, WELL-GRADED HIGH POROSITY LITTLE OR NO FINE ESTIMATED 1.5' DEPTH				
2, 3, 4, 5, 6		>100x @ 2.5'	DK BR	MOIST	SL-CL	STIFF	GROUT CASING @ 2.0' D OVA READING TAKEN THROUGH CARBON FILTER & STILL >100x. POSSIBLY METHANE GAS HIGH PLASTICITY, LOW POROSITY 2.0' BETONITE PELLETS FOR SEALING 3.5' SAND FILL TO BOTTOM OF BORING CHERT @ 6.0'				
7	DF 4057 (1)	>100 @ 7.5'	DK BR	MOIST	SL-CL	STIFF	2.5' SCREEN INSTALLED HIGH OVA READING FROM PROBABLE METHANE GAS BEDROCK				
8							BOTTOM OF BORING @ 7.5' NO WATER FOUND (10/16/86)				

(1) = VERY LITTLE WATER FOUND ON 10/17/86. <60'

Project: RICHARDS-GEBAUR AFB PHASE II STAGE 2 INVESTIGATION

Boring No. MW-3 **Date of Boring** 10/16/86 **Project No.** DF4000 **Sheet** 1 **of** 1

Sample No. and Method	Blows/Foot (N)	Unconfined Compressive Strength (TSF)	Penetrometer Value (TSF)	Moisture Content (%)	Dry Unit Weight (PCF)	Unified System Symbol	Depth (Feet)	Description	Water Table Observation
							Surface	NORTH BURN AREA	
								GRAVEL, WELL GRADED, DRY	
								OVA >100ppm DK. BROWN SILTY CLAY HIGHLY PLASTIC, STIFF MOIST	
							5	CHERT	
								OVA >100ppm DK. BROWN SILTY CLAY, MOIST	
								BEDROCK TOTAL DEPTH = 7.5'	
							10	NO WATER	
							15		
							20		
							25		
							30		
							35		
							40		

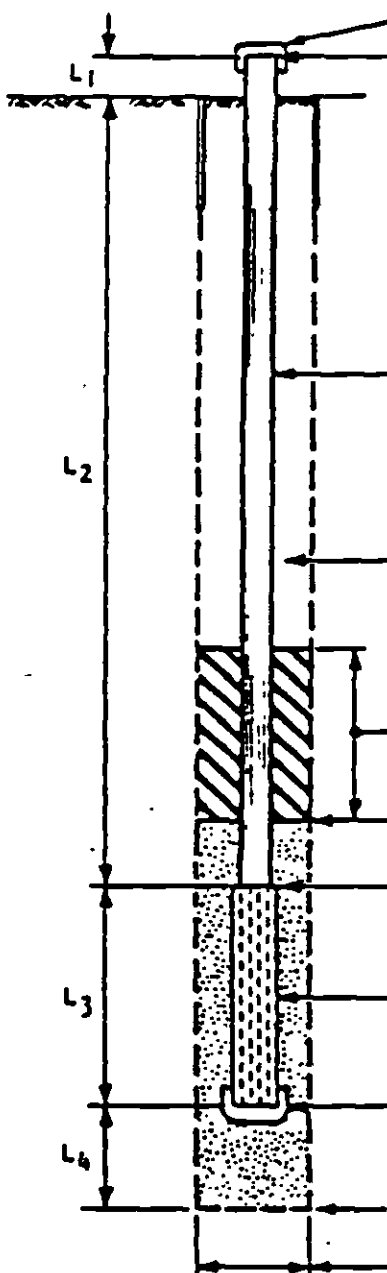
Remarks:
DRILLING CO.: GEOTECHNOLOGY, INC. CME CONTINUOUS SAMPLER
DRILLER: M. MANIACI HELPER: D. MEYER

Note: All Shelby tube (ST) unconfined compression tests performed in the laboratory.

FIELD BORING LOG

ecology and environment, inc.

Ground Elevation and Datum: _____



Elevation of top of riser pipe +2.0'
Determined by:
☐ Survey
☐ Estimated

I.D. of riser pipe
Type of riser pipe 2" PVC SCH 40

Type of backfill around riser Cement Grout

Thickness of seal
Type of seal: Bentonite Pellet Seal 2.0' Thick

Elevation of top of filter sand 4.0'

Elevation of bottom of riser 5.0'

Slotted section
Screen gauge or size of openings 0.010"

Elevation of bottom of piezometer 7.5'

Elevation of bottom of borehole 7.5'

Diameter of borehole 8.5"

L_1 = 2.0' ft

L_2 = 5.0 ft

L_3 = 2.5' ft

L_4 = 0.0' ft

GROUNDWATER MONITORING WELL

MW#3

GEOTECHNOLOGY, INC.

37 455 Site 12

Client: Ecology & Environment, Inc

Owner: U.S AIR FORCE

SUMMARY OF BORING

PROJECT and LOCATION Ground Water Investigation POL Fuel Storage Area Richards-Gebaur AFB, Belton

Job No: DF 4000 2	Boring No: MW-4	Drill No: CME-55	Amount of Cut or Fill	Date Bd: 10/16/86
Location of Hole: West of POL (Flamable) Fuel Storage Area		Drilling Method: CME Continuous Sampling	Topography and Drainage: FLAT - FAIR	Total Depth: 10.0'
Elev.		Auger Size: 3 3/4" / Bit Type: HS AUGER	Surface Material: GRASS	Driller: M. MANIACI / Helper: D. MEYER
Datum		Type and Size of Samples: 1 1/4" PVC BAILERS @ 3.0'L	Gwl. Depth and Time of Reading: 10.0' @ 1525 HRS	Inspector

FIELD DATA / **LABORATORY DATA**

Depth in Ft. or Elev (1)	Sample Data (2)	OVA (ppm) (3)	Color (4)	Moisture (5)	Material Class. (6)	Consistency or Density (7)	Geological Description and Other Remarks (8)	Moisture in % (9)	Dry Density PCF (10)	Unconfined Compressive Strength in tsf (11)
			DK BR	DAMP			TOPSOIL @ 6" O. ROOT HAIRS CEMENT CAP			
1			DK BR	DAMP	SL-CL	STIFF	@ 2' GROUT CASING			
2		<1.0 (BK) @ 2.5'								
3							@ 2' BETONITE PELLETS FOR SEALING			
4							6' SAND FILL TO BOTTOM OF BORING			
5										
6										
7			GR-BR		SL-CL	STIFF	5' SCREEN INSTALLED			
8			YL/BR				CHERT @ 8.0'			
9										
10							BEDROCK, WATER ENCOUNTERED BOTTOM OF BORING @ 10.0'			
11										

Project: RICHARDS-GEBAUR AFB PHASE II STAGE 2 INVESTIGATION

Boring No. MW-4 **Date of Boring** 10/16/86 **Project No.** DF4000 **Sheet** 1 of

Sample No. and Method	Blows/Foot (N)	Unconfined Compressive Strength (TSF)	Penetrometer Value (TSF)	Moisture Content (%)	Dry Unit Weight (PCF)	Unified System Symbol	Depth (Feet)	Description	Water Table Observations
								Surface — POL STORAGE AREA	
								TOP SOIL, DAMP, DK BROWN	
								OVA = 6.1 ppm — DARK BROWN SILTY CLAY, DAMP	
							5	GRAY BROWN SILTY CLAY	
								YELLOW BROWN CHERT	
								GRAY BROWN SILTY CLAY	
							10	BEDROCK	
								TOTAL DEPTH = 10.0'	
								WATER IN WELL.	
							15		
							20		
							25		
							30		
							35		
							40		

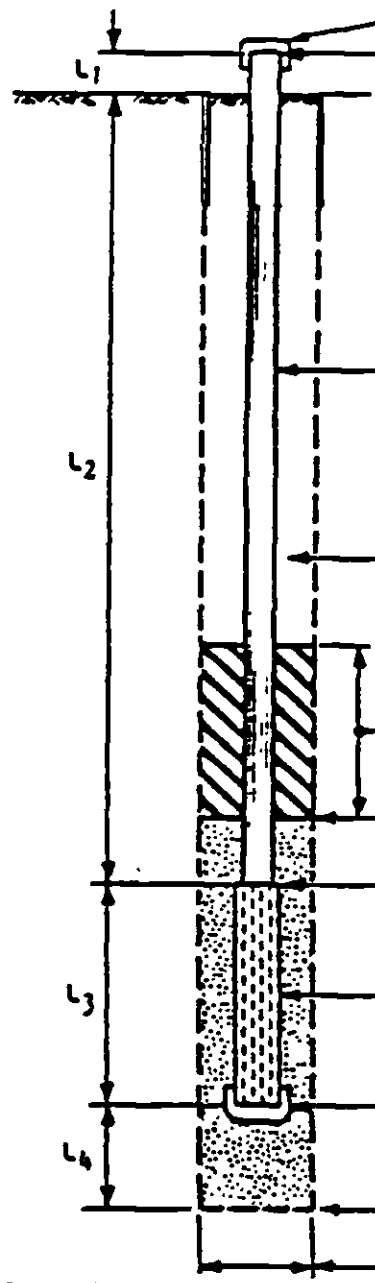
Remarks:
DRILLING CO.: GEOTECHNOLOGY, INC.
DRILLER: M. MANIACI HELPER: D. MEYER

Note: All Shelby tube (ST) unconfined compression tests performed in the laboratory.

FIELD BORING LOG

ecology and environment, inc.

Ground Elevation and Datum: _____



Vented cap

Elevation of top of riser pipe +2.0'

Determined by:

☐ Survey

☐ Estimated

I.D. of riser pipe 2" PVC

Type of riser pipe SCH 40

Type of backfill around riser Cement grout

Thickness of seal Bentonite Pellet Seal

Type of seal* 2.3' Thick

Elevation of top of filter sand 4.8'

Elevation of bottom of riser 5.8'

Slotted section

Screen gauge or size of openings 0.010"

Elevation of bottom of piezometer 9.8'

Elevation of bottom of borehole 9.8'

Diameter of borehole 7.5"

L_1 = 2.0 ft

L_2 = 5.3 ft

L_3 = 4.0 ft

L_4 = 0.0 ft

GROUNDWATER MONITORING WELL

MW-4

GEOTECHNOLOGY, INC.

Client: ECOLOGY & ENVIRONMENT, INC

Owner: U.S. AIR FORCE

SUMMARY OF BORING

PROJECT and LOCATION: GROUND WATER INVESTIGATION, NORTH BURN AREA @ RICH. GEBAUR AFB, GELTC

JOB NO: DF 4000 2	BORING NO: MW-1	DRILL RIG: CME 55	AMOUNT OF CUT OR FILL	DATE (s): 10/16/86
LOCATION OF HOLE: NORTHEAST CORNER OF BURN PIT COMPOUND		DRILLING METHOD: CME CONTINUOUS SAMPLER	TOPOGRAPHY AND DRAINAGE: FLAT – FAIR TO POOR	TOTAL DEPTH: 20.0'
ELEV.		AUGER SIZE: 3 3/4" / BIT TYPE: H.S. AUGER	SURFACE MATERIAL: GRASS	DRILLER: M. MANIACI / HELPER: D. MEYE
DATUM		TYPE AND SIZE OF SAMPLER: 1'1/4" PVC BAILER @ 3.0'L	GWL DEPTH AND TIME OF READING: DRY	INSPECTOR

FIELD DATA								LABORATORY DAT.			
DEPTH IN FT. or ELEV (7)	SAMPLE DATA (8)	OVA (ppm) (9)	COLOR (10)	MOISTURE (11)	TEXTURAL CLASSIF. (12)	CONSISTENCY or DENSITY (13)	GEOLOGICAL DESCRIPTION and OTHER REMARKS (14)	MOISTURE IN % (15)	DRY DENSITY PCT. (16)	UNCONFINED COMPRESSIVE STRENGTH TSF (17)	CLASSIF. (1
			DK BR	DAMP	SL-CL	STIFF	TOPSOIL @ 6" D. MED. PLASTIC ROOT HAIRS CEMENT CAP				
2							GROUT CASING @ 2.0' D				
							MED. PLASTICITY				
4				DAMP	SL-CL	MED. STIFF	SAND FILL TO @ 7.0' D.				
6							10' OF 2" PVC MONITORING PIPE INSTALLED				
8		1.0 @ 7.6'					BELT AT @ 9.0'				
10			YL/BR	MOIST	SL-CL	STIFF	MED. PLASTICITY				
12		4.0 @ 12.5'					10' OF SCREEN TO BOTTOM				
14							BETONITE SEAL EQUIVALANT @ 5.0' (15.0' DEPTH)				
16							SAMPLES FOR OIL IN CUTTING @ 17.5' WITH NONE DETECTED				
18				MOIST	SL-CL	V. STIFF	BETONITE PELLETS AROUND SCREEN TO DEPTH @ 2.0'				
20		3.0 @ 20'					WEATHERED CLAY				
							NO BEDROCK ENCOUNTERED AT 20.0'				
							NO WATER FOUND (10/16/86)				

Project: RICHARDS-GEBAUR AFB PHASE II STAGE 2 INVESTIGATION

Boring No. MW-1 Date of Boring 10/16/86 Project No. DF4000 Sheet 1 of 1

Sample No. and Method	Blows/Foot (N)	Unconfined Compressive Strength (TSF)	Penetrometer Value (TSF)	Moisture Content (%)	Dry Unit Weight (PCF)	Unified System Symbol	Depth (Feet)	Description	Water Table Observations
							Surface	NORTH BURN AREA	
								TOPSOIL, DK BROWN SILTY CLAY	
								BROWN SILTY CLAY, MED. PLASTICITY DAMP	
							5		
								OVA = 1.0 PPM	
								CHERT	
							10	YELLOW-BROWN SILTY CLAY, MED. PLAST. MOIST	
								OVA = 4.0 PPM	
							15		
							20	OVA = 3.0 PPM	
								TOTAL DEPTH = 20.0'	
								NO BEDROCK	
								NO WATER.	
							25		
							30		
							35		
							40		

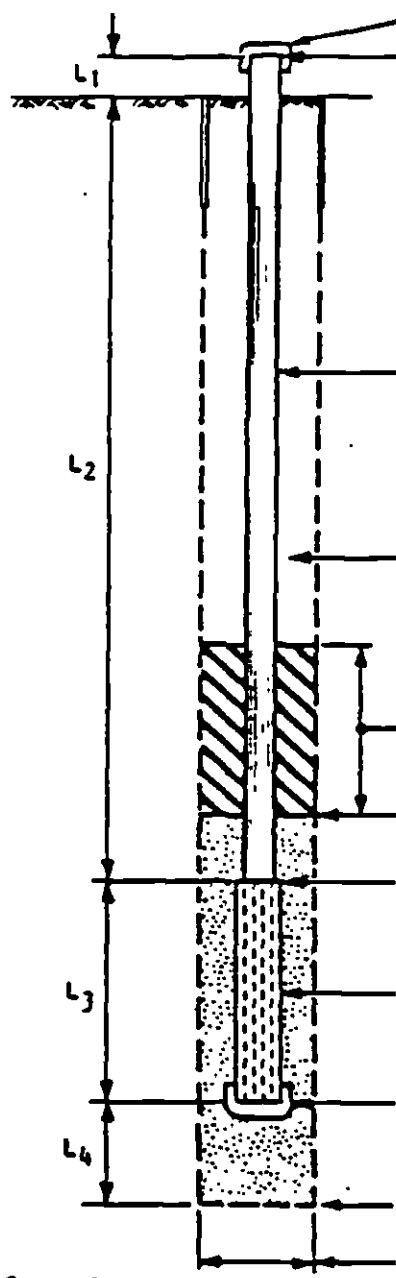
Remarks:
DRILLING CO.: GEOTECHNOLOGY, INC.
DRILLER: M. MANIACI HELPER: D. MEYER
CME CONTINUOUS SAMPLER

Note: All Shelby tube (ST) unconfined compression tests performed in the laboratory.

FIELD BORING LOG

ecology and environment, inc.

Ground Elevation and Datum: _____



Elevation of top of riser pipe +2.0'
Determined by:
- [ ] Survey
- [ ] Estimated

I.D. of riser pipe / Type of riser pipe: 2" PVC Sch 40

Type of backfill around riser: Cement grout

Thickness of seal / Type of seal: Bentonite pellet Seal 5.0' Thick

Elevation of top of filter sand: 7.0

Elevation of bottom of riser: 10.0

Slotted section / Screen gauge or size of openings: 0.010"

Elevation of bottom of piezometer: 20.0'

Elevation of bottom of borehole: 20.0'

Diameter of borehole: 7.5"

L_1 = 2.0 ft

L_2 = 10.0 ft

L_3 = 10.0 ft

L_4 = 0.0 ft

GROUNDWATER MONITORING WELL

MW #1

GEOTECHNOLOGY, INC.

Client: ECOLOGY & ENVIROMENT, INC

Owner: U.S AIR FORCE

SUMMARY OF BORING

PROJECT and LOCATION: GROUND WATER INVESTIGATION NORTH BURN AREA @ RICHARDSON GEBAUR AFB, BELTON, MO

JOB NO: DF 4000 2	BORING NO: MW-2	DRILL RIG: CME 55	AMOUNT OF CUT OR FILL	DATE BORED: 10/16/86	
LOCATION OF HOLE: SOUTHEAST CORNER OF BURN PIT COMPOUND		DRILLING METHOD: CME CONTINUOUS SAMPLER	TOPOGRAPHY AND DRAINAGE: FLAT - FAIR TO POOR	TOTAL DEPTH: 10.5'	
ELEV.		AUGER SIZE: 3 3/4" / BIT TYPE: HS AUGER	SURFACE MATERIAL: GRASS	DRILLER: M. MANIACI	HELPER: D. MEY
DATUM		TYPE AND SIZE OF SAMPLER: 1 1/4" PVC BAILER @ 3.0' L	GWL DEPTH AND TIME OF READING: DRY	INSPECTOR	

FIELD DATA / LABORATORY DATA

DEPTH IN FT. OR ELEV (m)	SAMPLE DATA (m)	OVA (ppm) (m)	COLOR (m)	MOISTURE (m)	MATERIAL CLASSIF (m)	CONSISTENCY OR DENSITY (m)	GEOLOGICAL DESCRIPTIONS AND OTHER REMARKS (m)	MOISTURE IN % (m)	DRY DENSITY PCF (m)	UNCONFINED COMPRESSIVE STRENGTH TSF (m)	CLASSIF.
			RED/BR	DAMP	CL	STIFF	TOPSOIL, ≤6" D, MED PLASTICITY ROOT HAIRS CEMENT CAP				
1							GROUT CASING @ 2.0' D				
2		0.0 @2.5'									
3			DK BRN	MOIST	SL-CL	STIFF	MED PLASTICITY				
4											
5							3.0' BENTONITE PELLETS FOR SEALING				
							5.0' SAND FILL TO BOTTOM OF BORING				
6											
7							CHERT @ 7.4'				
8		120 @ 7.5'									
					SL-CL		4.0' SCREEN INSTALLED				
9											
10		0.0 (m) @ 10.5'					BEDROCK				
11							BOTTOM OF BORING @ 10.5' NO WATER FOUND				

Project: RICHARDS-GEBAUR AFB PHASE II STAGE 2 INVESTIGATION

Boring No. MW-2 **Date of Boring** 10/16/86 **Project No.** DF4000 **Sheet** 1

Sample No. and Method	Blows/Foot (N)	Unconfined Compressive Strength (TSF)	Penetrometer Value (TSF)	Moisture Content (%)	Dry Unit Weight (PCF)	Unified System Symbol	Depth (Feet)	Description	Water Table Observations
								Surface NORTH BURN AREA	
								TOP SOIL, RED BROWN CLAY	
								OVA = 0 PPM DK BROWN SILTY CLAY MEDIUM PLACTICITY, MOIST	
							5		
								OVA = 12000 PM CHERT	
								DK BROWN SILTY CLAY	
							10		
								BEDROCK TOTAL DEPTH = 10.5'	
								NO WATER	
							15		
							20		
							25		
							30		
							35		
							40		

Remarks:
DRILLING CO.: GEOTECHNOLOGY, INC.
DRILLER: M. MANIACI HELPER: D. MEYER

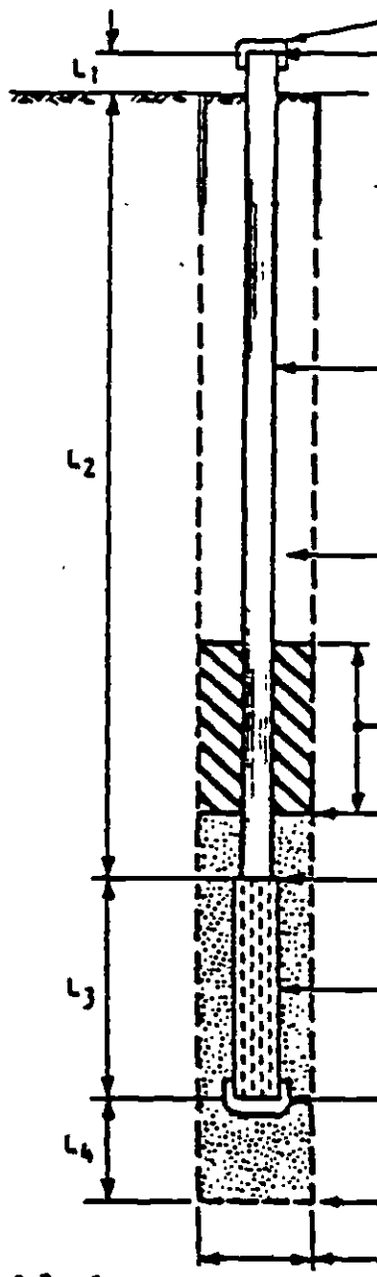
CME CONTINUOUS SAMPLER

Note: All Shelby tube [ST] unconfined compression tests performed in the laboratory.

FIELD BORING LOG

ecology and environment, inc.

Ground Elevation and Datum: _____



Elevation of top of riser pipe +2.0'
Determined by:
☐ Survey
☐ Estimated

I.D. of riser pipe
Type of riser pipe 2" PVC SCH 40

Type of backfill around riser Cement grout

Thickness of seal
Type of seal* Bentonite Pellet Seal 3.0' Thick

Elevation of top of filter sand 5.0

Elevation of bottom of riser 6.5

Slotted section
Screen gauge or size of openings 0.010"

Elevation of bottom of piezometer 10.5'

Elevation of bottom of borehole 10.5'

Diameter of borehole 7.5"

L_1 = 2.0 ft

L_2 = 6.5 ft

L_3 = 4.0 ft

L_4 = 0.0 ft

GROUNDWATER MONITORING WELL

MW#2

GEOTECHNOLOGY, INC.

EXHIBIT C

WATER WELL LOCATION MAP

BACKGROUND INFORMATION ON WATER WELLS

Well No. 1 - Property owner Mrs. Clark Rhoden. Spoke with Charles G. Randall, Estate Executor, P.O. Box 322, Grandview, MO 64030 (941-2290). He purchased the property in 1980 and unsuccessfully tried to locate the well. Well is apparently inactive and no other information is available.

Well No. 2 - Appears to be located on Air Force property. Well may be in open field near electric substation which is Air Force property. North of the field is Marine Corps family housing. Air Force has no information on this well. Well apparently was abandoned when the Air Force acquired the property.

Well No. 3 - E & E talked with the oldest residents in the area. None of them knew anything about a well at this location.

Well No. 4 - Two wells at Liz Ann Trailer Court. Both inactive for about 10 years since court switched to city water. Current owner never used the wells and has no information on them. The former owner, Robert Jones (331-6442), could not be located.

Well No. 5 - Inactive well in the vicinity of 115-127 Markey, Belton. Brown Bros. Excavation (331-6289) may have used the well. Probably supplied water to an old house which once stood on site.

Well No. 6 - Inactive well used for a brief time to supply water to a trailer court. Has not been used for 25 years. No other information.

Well No. 7 - Two wells. Property owner Joe Harding (331-3581). One well is hand dug, 3 to 4-foot diameter, 20 feet deep, 7 feet to water. Inactive until June 1988. Owner now is pumping water to irrigate garden. Other well is immediately south of hand-dug well. Owned by the City of Belton. Approximately 250 feet deep; inactive 25 to 30 years; flow rate 60,000 gal/day maximum; high sulfur content.

Well No. 8 - Located on west side of creek. Apparently on school property and inactive.

Well No. 9 - Property owner John Wedgeworth. Inactive well. Approximately 10 feet to water. Reportedly drilled by Calvin Jackson to supply water to subdivision.

Well Nos. 10, 11 - Unable to locate. Possibly drilled by Calvin Jackson and originally designed to supply water to housing development (see No. 9).

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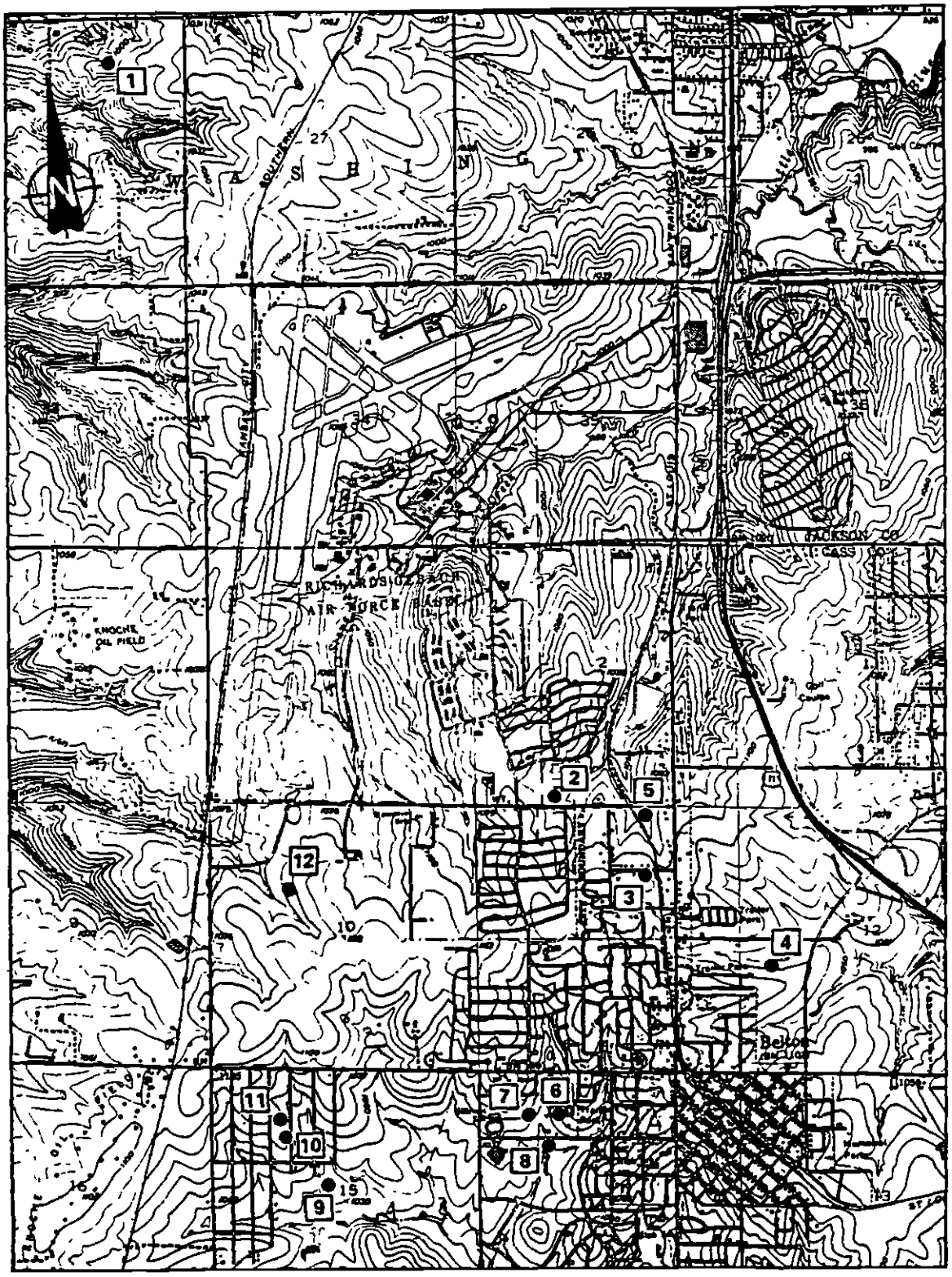
Well No. 12 - Unable to access area. Appears to be on Air Force property, southwest of munitions maintenance and storage--controlled area. Possibly may be Belton property, but they have no information on well. The Air Force has no information on this well. It probably was abandoned when the Air Force acquired the land.

recycled paper

ecology and environment



SCALE

0 ½ 1 1½ 2 MILES

0 .5 1 1.5 2 KILOMETERS

KEY:

● Water Well

Figure P–1 LOCATION OF WATER WELLS

EXHIBIT D

ANALYSIS OF BASE WATER SUPPLY

(USED IN DRILLING)

METALS - MONTHLY ANNALYSIS OF DELIVERED WATER - 1989

Compound: (concentration in milligrams per liter or PPM)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	QUANTIFICATION LIMITS	AVERAGE (TO DATE)
	CADMIUM	<.001	<.001	0.004	<0.002	<0.002	0.002	<0.002	<0.001	<0.002	<0.002	<0.002	0.002	0.0005	0.003
	CHROMIUM	<.004	0.002	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	0.002
	COPPER	<.003	0.002	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.002
*	LEAD	0.002	0.004	0.002	0.003	<0.001	0.004	0.003	0.004	<0.002	0.004	0.007	0.002	0.001	0.004
	NICKEL	<.010	<.010	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	0.000
	ZINC	0.006	0.018	<0.010	<0.010	0.025	0.013	<0.010	0.027	<0.100	0.035	0.017	0.023	0.010	0.021
*	ARSENIC	<.010	<.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.000
*	SELENIUM	<.010	<.010	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.000
**	MERCURY	<.0002	<.0005	0.001	<.0002	<.0005	<.0005	<.0005	<.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.001
	BARIUM	0.032	0.034	<0.010	<0.010	0.021	0.022	0.020	0.021	<0.025	0.019	<0.010	0.020	0.010	0.024
*	SILVER	<.002	<.002	<0.001	<0.001	<0.001	0.234	<0.001	0.001	0.001	<0.001	0.001	<.001	0.001	0.059
	CALCIUM	29.870	31.140	32.900	23.373	39.800	36.010	38.700	41.600	27.750	36.170	29.700	38.680	0.050	33.808
	MAGNESIUM	17.240	14.941	10.500	5.757	7.540	3.900	4.190	5.160	6.700	7.060	10.400	13.500	0.010	8.907
	SODIUM	62.240	56.980	57.100	54.010	76.200	57.460	76.540	66.700	51.370	69.370	54.500	64.590	0.250	62.255
	POTASSIUM	5.890	5.471	6.060	6.186	2.961	5.274	6.820	5.037	5.954	6.360	4.980	5.650	0.250	5.354
	IRON	0.053	0.097	0.174	0.048	0.082	0.087	0.282	0.262	<0.030	0.305	0.048	0.195	0.030	0.148
	ALUMINUM	0.161	0.151	0.078	0.165	<0.025	<0.025	0.112	0.104	<0.025	0.307	<0.025	0.117	0.025	0.149
	BORON	0.089	0.092	0.064	0.473	0.065	0.086	0.080	0.121	0.086	0.141	0.070	0.097	0.010	0.122
	BERYLIUM	<.001	<.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.000
	COBALT	<.010	<.002	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.005	<0.025	<0.025	<0.025	0.025	0.000
*	LITHIUM	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.002	0.000
	MANGANESE	0.003	0.047	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.031	<0.010	<0.010	0.010	0.027
	MOLYBDENUM	0.016	0.026	0.024	<0.025	<0.025	<0.010	<0.010	<0.010	0.010	<0.025	<0.025	<0.025	0.025	0.019
*	ANTIMONY	<.010	0.005	<0.010	0.013	<0.010	<0.025	<0.010	<0.025	0.012	0.021	0.035	<.010	0.010	0.017
	SILICON	6.331	5.701	5.700	3.075	2.895	2.970	3.200	3.100	3.480	3.890	4.371	5.980	0.025	4.216
	STRONTIUM	0.242	0.242	0.204	0.199	0.265	0.212	0.241	0.264	0.205	0.239	0.214	0.226	0.005	0.229
	TIN	NR	NR	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.128	0.050	0.128
	TITANIUM	0.007	0.015	<0.025	<0.025	<0.010	<0.025	<0.025	0.022	<0.010	<0.025	<0.025	<0.025	0.025	0.015
	VANADIUM	0.016	0.012	<0.025	0.055	<0.010	<0.025	<0.025	<0.010	<0.025	<0.025	0.011	<.012	0.025	0.024
*	THALLIUM	<.010	<.010	<0.010	<0.010	<0.010	0.010	<0.010	0.017	LA	0.010	0.011	<.005	0.005	0.012

BDL=BELOW QUANTIFICATION LIMIT
* analysis by Graphite furnace
** analysis by Coleman mercury analyzer
all others by ICP

AVERAGE MONTHLY MINERAL & PHYSICAL ANALYSES
MISSOURI RIVER & DELIVERED WATER

RESULTS IN PARTS PER MILLION
FISCAL YEAR 1989-1990

PURIFICATION DIVISION — KANSAS CITY, MO WATER DEPT

MONTH	TOTAL SOLIDS	SILICA SiO_2	IRON & ALUMINA R_2O_3	CALCIUM CA	MAGNESIUM MG	SODIUM & POTASSIUM — NA	SULFATES SO_4	CHLORIDES CL	ALKALINITY $CaCO_3$ P	ALKALINITY $CaCO_3$ MO	TOTAL HARDNESS $CaCO_3$	pH	TEMPERATURE — °F	CHLORINE Cl_2	TURBIDITY NTU
RIVER															
MAY, 1989	827	9.0		58.5	23.7	77.1	244	32	2	169	243	8.4	65		48
JUNE	1305	9.4		60.6	21.1	63.1	243	34	1	154	243	8.2	72		205
JULY	796	21.5		63.5	24.6	75.1	224	31	1	159	232	8.3	81		73
AUGUST	911	8.4		61.8	25.1	67.9	216	32	2	157	237	8.3	79		58
SEPTEMBER	1342	40.8		54.4	20.4	62.8	205	29	1	143	209	7.8	70		132
OCTOBER	619	7.0		62.3	26.0	71.4	265	35	1	171	241	8.4	59		15
NOVEMBER	600	8.1		70.4	27.8	61.4	219	39	1	199	266	8.4	47		13
DECEMBER															
JAN, 1990															
FEBRUARY															
MARCH															
APRIL															
AVERAGE															
DELIVERED															
MAY, 1989	409	2.6		35.2	7.9	77.9	215	30	21	51	129	10.0		1.81	.24
JUNE	394	1.6		41.4	4.3	60.5	206	32	21	53	123	9.9		1.82	.23
JULY	404	3.1		44.0	4.8	80.5	202	30	19	49	120	9.9		1.89	.14
AUGUST	446	2.9		47.4	4.8	69.7	256	31	20	52	127	9.9		2.02	.13
SEPTEMBER	344	3.4		35.0	7.1	54.9	178	29	17	50	111	9.7		2.18	.20
OCTOBER	417	3.1		36.9	7.5	73.1	233	34	16	47	120	9.8		2.03	.24
NOVEMBER	405	4.7		33.6	12.3	57.4	195	38	19	58	131	9.8		1.92	.35
DECEMBER															
JAN, 1990															
FEBRUARY															
MARCH															
APRIL															
AVERAGE															

River Fluoride .61
TEL 1.11

SHEET 11