INSTALLATION RESTORATION PROGRAM

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SITE INVESTIGATION REPORT

147TH FIGHTER INTERCEPTOR GROUP TEXAS AIR NATIONAL GUARD ELLINGTON FIELD HOUSTON, TEXAS

JANUARY 4, 1991





HAZWRAP SUPPORT CONTRACTOR OFFICE

Oak Ridge, Tunnessee \$7831
Operated by MARTIN MARIETTA ENERGY SYSTEMS, INC.
For the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-840R21400

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Site Investigation Report for sites suspected to con-	tain hazardous waste
contamination. The report describes the site and the	
results are analyzed and conclusions stated as to the	
Future work is proposed according to the data collec	ted. The study was
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R-48-05-0-016H FINAL

INSTALLATION RESTORATION PROGRAM SITE INVESTIGATION REPORT

147TH FIGHTER INTERCEPTOR GROUP TEXAS AIR NATIONAL GUARD ELLINGTON FIELD HOUSTON, TEXAS

SUBMITTED BY
HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
MARTIN MARIETTA ENERGY SYSTEMS, INC.
OAK RIDGE, TENNESSEE

PREPARED FOR
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WASHINGTON, D.C. 20310
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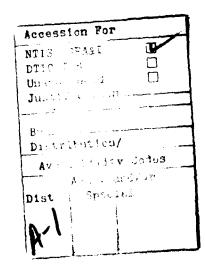
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EXECUTIVE SUMMARY

As part of the Air National Guard (ANG) Installation Restoration Program (IRP), NUS conducted a Site Investigation (SI) at the Ellington Field (ANG) facility in Houston, Texas. Work was performed under Task Order Y-04 of the Martin Marietta Energy Systems Inc. Hazardous Waste Remedial Actions Program (HAZWRAP). This document presents the findings of all activities undertaken during the SI.

The purpose of the investigation was to determine whether soils or ground water at two sites had been attected a result of past waste management practices. The two sites evaluated as part of the SI were the Former Base Landfill and the Petroleum, Oils and Lubricants (POL) Storage Area. Field activities were performed in accordance with procedures outlined in the SI Sampling and Analysis Plan (SAP) issued on October 26, 1989.

Specific elements of the SI included the following:

- A geophysical survey Magnetometry and electromagnetic conductivity techniques were employed at the Former Base Landfill to aid in characterizing the shallow subsurface prior to drilling and sampling activities.
- Installation of soil borings, piezometers and monitoring wells A total of three piezometers, four soil borings and nine monitoring wells were installed at the two sites to characterize geologic and hydrogeologic conditions and provide locations for the collection of environmental samples.
- Collection of environmental samples A total of three surface soil samples, 32 subsurface soil samples and nine ground-water samples were collected at the two sites.
- Water level measurements and slug testing Ground-water elevations in piezometers and wells were determined in order to establish ground-water

flow direction and hydraulic gradient at the two sites. Slug test data were used to calculate estimations of aguifer parameters.

- Chemical laboratory analysis Samples were sent to a fixed-base laboratory for chemical analysis to determine whether soil and ground water at the sites had been affected.
- Risk Assessment Based on the results of field activities and laboratory analysis, an evaluation was performed to determine actual or potential threats to public health and the environment.
- Data evaluation and report preparation This report was prepared to present the findings of all SI activities.

Tables ES-1 and ES-2 show the maximum soil and ground-water concentrations detected at both sites. The tables also indicate the sample number and; for soils, the sample source. Standards for soils that are enforceable in Texas are indicated in Table ES-1 notes. Federal drinking water standards are given in Table ES-2, where available. For risk assessment purposes, soil sample concentrations are compared to background data. The location of samples are indicated by sample number on Figures ES-1 and ES-2. A brief discussion of the contaminants detected during the SI, information about ground water at each site, and conclusions from the risk assessment are provided in the following sections.

FORMER BASE LANDFILL

Soil

A number of Base Neutral compounds and several pesticides were detected in surface soil samples collected from the central and eastern portion of the landfill surface. Several inorganics were detected in surface soil samples at concentrations higher than literature background values. Heptachlor and phenol were detected only one subsurface soil sample. Mercury was detected in several samples at concentrations higher than literature background concentration.

Ground Water

Ground water was encountered at depths varying from 10 feet below land surface at the southern end of the site to 20 feet below land surface in the northeastern corner of the site. Ground-water direction is to the east-northeast. The ground-water flow gradient appears to be strongly influenced by the presence of a large commercial sand pit east of the landfill.

Two pesticides, alpha-BHC and methoxychlor, were detected at very low concentrations in two ground-water samples. These compounds are not chemicals of concern for the following reasons. These compounds are relatively insoluble, and, based on available data, their source cannot be tied to the landfill. Aluminum was detected at a concentration approximately three times literature background in one sample. Aluminum is not considered a toxic chemical and is not currently regulated. Iron was detected in one ground-water sample at a concentration 10 times greater than the Federal drinking water standard. However, the concentration of iron detected is well within the range of background concentrations indicated in the reference literature (Dragen, 1988).

The risk assessment concludes that no significant risks to human health appear to exist at the Former Base Landfill based on the available data and the exposure scenarios considered. It is recommended that no further action be undertaken at the site and that a Decision Document be prepared in support of this recommendation.

POL STORAGE AREA

Soil

Several volatiles organic compounds were detected in subsurface soil samples beneath the diked area and adjacent to the railroad spur. The highest concentration was 13,000 µg/kg ethylbenzene in a sample collected at 4-6 feet beneath the dike. Two base neutrals were also detected in low concentrations in subsurface soil samples. All compounds detected in soils at the POL Storage Area, except 4-methyl-2-pentanone (MIBK), are considered in the risk assessment. MIBK, a noncarcinogenic chemical, was detected at a maximum concentration of 4 µg/kg, and was not found in any of the ground-water samples. Petroleum hydrocarbons were detected at

132 mg/kg in one subsurface soil sample, which is above the Texas Water Commission (TWC) criteria for clean closure. TWC clean closure criteria is 100 ppm for total petroleum hydrocarbons.

Ground Water

Ground water was encountered at depths ranging from 10 feet below grade at the western edge of the site to 16 feet below grade in the southeastern portion of the site. Ground water flows to the east, and aquifer recharge appears to occur in portions of the drainage ditch west of the site.

Several volatiles organics were detected at extremely low concentrations in ground-water samples collected at the site. No contaminants were detected in ground water at the POL Storage Area that exceed final Maximum Contaminant Levels or Drinking Water Health Advisories.

The risk assessment concludes that no significant risks to human health appear to exist at the POL Storage Area. However, the extent of soil contamination at the site has not been determined. It is therefore recommended that a soil boring program be implemented at the POL Storage Area to delineate the extent of contaminated soils east of the railroad spur.

TABLE ES-1 MAXIMUM SOIL CONCENTRATIONS

Chemical	Concentration (µg/kg)	Sample Source	Sample Number
Former Base Landfill			
Butylbenzylphthalate	290*	Surface	01-FD05-A
Acenaphthene	400*	Surface	01-FD05-A
Anthracene	810*	Surface	01-FD05-A
Benzo(a)anthracene	2,350*	Surface	01-FD05-A
Benzo(b)fluoranthene	1,800*	Surface	01-FD05-A
Benzo(k)fluoranthene	1,850*	Surface	01-FD05-A
Benzo(a)pyrene	2,000*	Surface	01-FD05-A
Chrysene	2,250*	Surface	01-FD05-A
Fluoranthene	4,350*	Surface	01-FD05-A
Fluorene	410*	Surface	01-FD05-A
Indeno(1,2,3-cd)pyrene	930*	Surface	01-FD05-A
Phenanthrene	3,250*	Surface	01-FD05-A
Pyrene	3,550*	Surface	01-FD05-A
Dibenzofuran	200*	Surface	01-FD05-A
Phenol	22 J	Subsurface	01-FD02-A
4,4'-DDT	10J	Surface	01-SS03-A
4,4'-DDD	11J	Surface	01-FD05-A
4,4'-DDE	12J	Surface	01-FD05-A

ND Not detected.

NA Not analyzed.

[]

Lab qualifier indicating estimated value.
Data validation qualifier indicating estimated value.
Texas clean closure standard for total petroleum hydrocarbons is 100 parts per million.

Average of two duplicate samples using one-half the detection limit for non-detects.

Texas clean closure standard is 30 parts per million for the sum total of benzene, toluene, ethylbenzene, and xylene.

TABLE ES-1 (CONTINUED) MAXIMUM SOIL CONCENTRATIONS PAGE TWO OF THREE

Chemical	Concentration (µg/kg)	Sample Source	Sample Number
Heptachlor	21	Subsurface	01-SB03B-A
Aluminum	11,000*	Surface	01-SS03-A
Arsenic/	32*	Surface	01-FD05-A
Barium	302 J	Surface	01-SS01-A
Beryllium	0.9	Subsurface	01-SB04A-A
Calcium	39,900	Surface	01-SS02-A
Chromium	16	Surface	01-SS02-A
Cobalt	22	Subsurface	01-SB04A-A
Copper	8.9	Subsurface	01-SB01A-A
Iron	16,000	Subsurface	01-SB01A-A
Lead	141	Surface	01-SS02-A
Magnesium	3,460	Subsurface	01-SB01A-A
Manganese	540	Subsurface	01-SB04A-A
Mercury	0.34	Subsurface	01-SB05A-A
Nickel	16.2	Subsurface	01-SB04A-A
Potassium	1,400	Subsurface	01-SB01A-A
Sodium	[253]	Surface	01-SS03-A
Vanadium	20.9	Subsurface	01-SB04A-A
Zinc	180J	Surface	01-SS03-A

ND Not detected.

NA Not analyzed.

Lab qualifier indicating estimated value.

- Data validation qualifier indicating estimated value.

Texas clean closure standard for total petroleum hydrocarbons is 100 parts per million.

Average of two duplicate samples using one-half the detection limit for non-detects.

Texas clean closure standard is 30 parts per million for the sum total of benzene, toluene, ethylbenzene, and xylene.

TABLE ES-1 (CONTINUED) MAXIMUM SOIL CONCENTRATIONS PAGE THREE OF THREE

Chemical/Site(A)	Concentration (µg/kg)	Sample Source	Sample Number
Pol Storage Area			
Naphthalene	180*	Subsurface (>2')	02-SB13B-A
2-Methylnaphthalene	640	Subsurface (>2')	02-SB13B-A
Benzene**	180J	Subsurface (<2')	02-SB13A-A
Ethylbenzene**	13,000J	Subsurface (>2')	02-SB13B-A
Total xylenes**	240J	Subsurface (<2')	02-SB13A-A
Styrene	5,1	Subsurface (>2')	02-SB13C-A
Chlorobenzene	1J	Subsurface (>2')	02-SB13C-A
Methylene chloride	6,100J	Subsurface (>2')	02-SB13B-A
1,2-Dichloropropane	1J	Subsurface (>2')	02-SB13C-A
Petroleum Hydrocarbons +	132,000	Subsurface (<2')	02-SB13A-A
Acetone	250J	Subsurface (<2')	02-SB14A-A
2-Butanone	41J	Subsurface (<2')	02-SB14A-A
4-Methyl-2-pentanone	41	Subsurface (>2')	02-SB13C-A

ND Not detected.

NA Not analyzed.

Lab qualifier indicating estimated value.

Data validation qualifier indicating estimated value.

Texas clean closure standard for total petroleum hydrocarbons is 100 parts per million (mg/kg). Average of two duplicate samples using one-half the detection limit for

non-detects.

Texas clean closure standard is 30 parts per million for the sum total of benzene, toluene, ethylbenzene, and xylene.

TABLE ES-2 MAXIMUM GROUND-WATER CONCENTRATIONS

Chemical	Concentration (µg/L)	Sample Number	Primary or Secondary Drinking Water Regulations(A) (µg/L)
Former Base Landfill			
Alpha-BHC	0.037J	01-MW01-A	NA
Methoxychlor	0.022	01-MW-05-A	NA
Aluminum	2,910	01-MW04-A	NA
Barium	517	01-MW03-A	1,000
Beryllium	[1.3]	01-MW04-A	NA
Calcium	176,000	01-MW01-A	NA
Chromium	[7.9]	01-MW04-A	50
Iron	3,710	01-MW04-A	300
Lead	10.6	01-MW02-A	50/5(B)
Manganese	498	01-MW04-A	NA
Nickel	[12.1]	01-MW04-A	NA
Vanadium	[10.8]	01-MW04-A	NA
Petroleum Hydrocarbon (mg/L)	0.9J	01-MW05-A	NA
POL Storage Area			
Ethylbenzene	6J	02-MW10-A	700/700(B)
Chlorobenzene	6)	02-MW10-A	100/100(B)
Total Xylenes	23J	02-MW10-A	10,000/10,000(B)
Styrene	10	02-MW10-A	5-10/10(B)

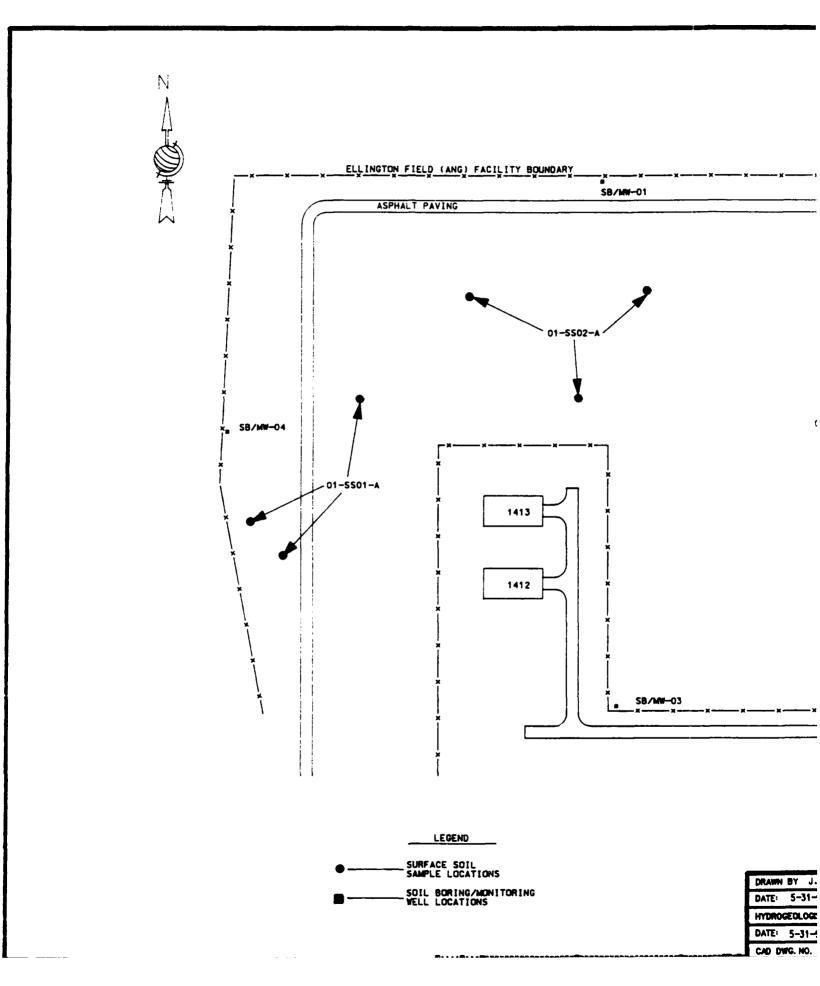
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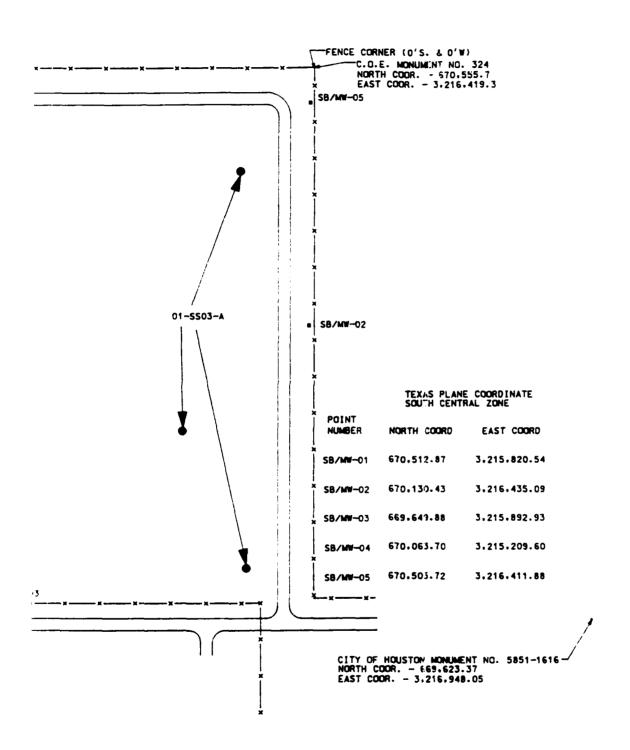
(A) 40 CFR 141 and 143

(B) Proposed maximum contaminant level (MCL/maximum contaminant level goal (MCLG).

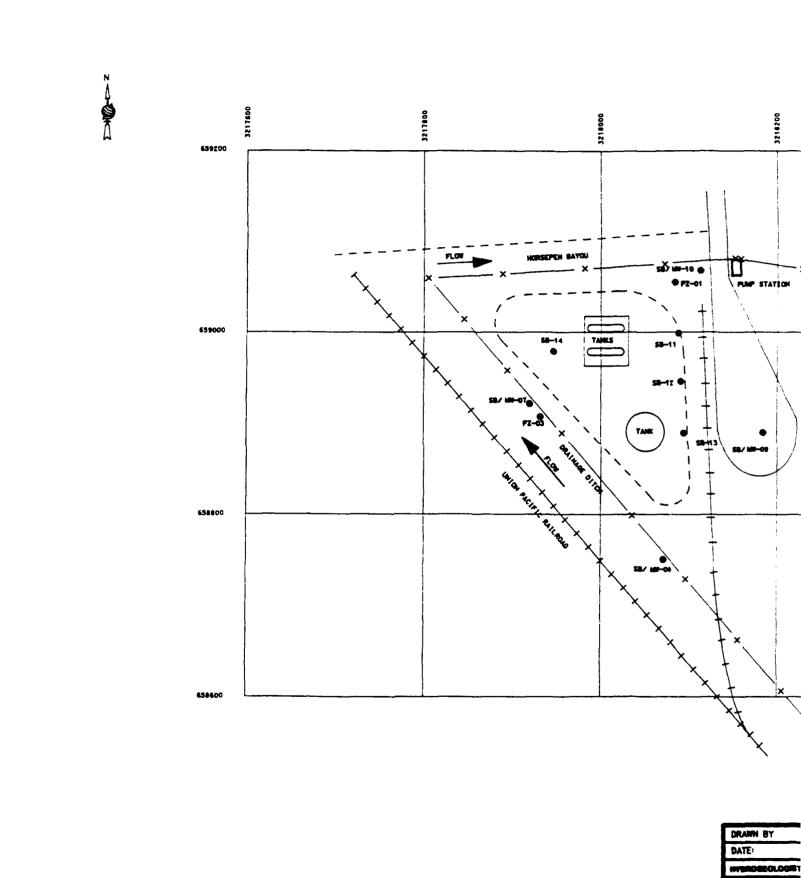
Lab qualifier indicating estimated value.
Data validation qualifier indicating estimated value.
Not Available

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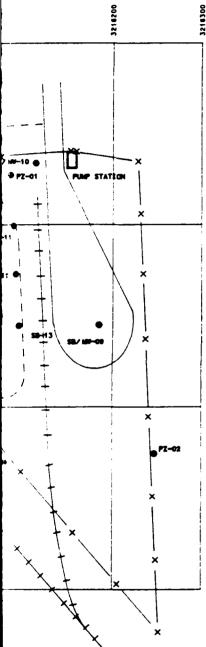
1	DRAWN BY J. ATKINSON	FIGURE ES-1	
	DATE: 5-31-90	SAMPLE LOCATION MAP	
ı	HYDROGEOLOGIST D. UPTHEGROVE	FORMER BASE LANDFILL	CORPORATION
1	DATE: 5-31-90	ELLINGTON FIELD (ANG) HOUSTON. TEXAS	A Halifibardor Common
_	CAD DWG. NO. 363M2801.DGN	RCALE: 1" - 180" NUS DWG, NO. 363M-2801 REV. 1	A Halliburton Company



1111 0 0 11111 19

DATE:

CAD DWG. NO.



LEGEND

MW - MONITOR WELL

PZ = PIEZOMETER

S8 = SOIL BORING

POINT NUMBER	TEXAS PLANE COORCINATE SOUTH CENTRAL ZONE				
	NORTH COORD.	EAST COORD.			
SB/ MW-07	658.931.22	3.217.921.70			
SB/ MW-08	658.757.71	3.218.072.43			
S8/MM-09	658.895.21	3.218.182.34			
SB/MW-10	659.073.15	3.218.110.76			
PZ-01	659.060.17	3.218.081.47			
PZ-02	658.753.85	3-218-241-40			
PZ-03	(A)	(A)			
SB-11	659.004.16	3.218.085.49			
SB-12	658.951.06	3.218.087.97			
58- 13	658.894.38	3.218.091.83			
SB-14	658.984.11	3.217.944.55			

(A) NOT SURVEYED. APPROXIMATE LOCATION SHOWN.

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FIGURE ES-2 SAMPLE LOCATION MAP POL STORAGE AREA

ELLINGTON	FIELD	(AMG)	KOUSTON.	TEXAS
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1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

The purpose of this report is to present the findings of all activities conducted as part of the Site Investigation (SI). Field activities undertaken during the SI included the characterization of site-specific geologic and hydrogeologic conditions, as well as the collection of environmental samples for laboratory analysis. Results of laboratory analysis have aided in the determination of contaminant occurrence and distribution at the two sites investigated. Utilizing the results of sampling and analytical activities, a preliminary risk assessment was performed to evaluate actual or potential exposure risks to public health and the environment. Finally, the combined results of all SI activities were evaluated to determine what, if any, further actions are warranted at each site.

1.2 REPORT ORGANIZATION

The introduction (Section 1) presents background information and outlines the purpose and scope of the investigation. Section 2 describes field activities performed by NUS. The results of field investigations and laboratory analyses are presented in Section 3. Section 4 contains the preliminary risk assessment, and Section 5 presents summaries, conclusions and recommendations. A list of acronyms is provided in Section 6.

The appendices contain the following material: regulatory correspondence, field data, slug test calculations, the geophysical survey report, the analytical data base, data validation reports, and risk assessment data.

1.3 FACILITY BACKGROUND

1.3.1 Ellington Field Air National Guard (ANG)

Ellington Field (ANG) construction began September 14, 1917. The first contingent of air service personnel (the 120th Aero Squadron) arrived on November 10, 1917. A

variety of military aircraft have used the facility throughout its history, including the T-33, F-4C, C-131, Curtis JN-4 and "Super Guppy" aircraft. Ellington Field (ANG) is now operated by the 147th Fighter Interceptor Group (FIG) of the Texas Air National Guard, which moved onto the property in 1955. The facility also operated as a United States Air Force Base from 1917 through 1976.

Ellington Field (ANG) occupies 209 acres of essentially flat coastal plain approximately 15 miles south of downtown Houston in Harris County, Texas. The extent of Ellington Field (ANG) property is shown in Figure 1-1. The area within a 1-mile radius of Ellington Field (ANG) is sparsely populated, however densely populated suburbs of Houston (Pasadena, Friendswood, Clear Lake City, South Houston, etc.) are located within 5 miles of the facility. The Ellington Field (ANG) property at the north and and south ends of the facility is separated by Ellington Field property owned and operated by the City of Houston. Ellington Field (ANG) property is bordered to the west by a golf course and undeveloped land, to the east by open fields and a large commercial sand pit and to the north and south by undeveloped land.

1.3.2 Former Base Landfill

The Former Base Landfill is located at the northern end of Ellington Field (ANG) property. Site features are shown in Figure 1-2. The landfill site is approximately 30 acres in size and is bordered by a golf course to the west, an undeveloped wooded area to the north, a commercial sand pit to the east and additional ANG property to the south. Two munitions storage igloos (Buildings 1412 and 1413) were constructed on the south central portion of the site and are secured by a chain-link fence. A chain-link fence coincidental with the Ellington Field (ANG) property line also surrounds the site on the north, east and west sides. A shallow surface water drainage ditch is present just outside the asphalt perimeter road on the north and east sides of the landfill. However, the landfill's irregular surface promotes the pooling of water, and it appears that most precipitation evaporates or infiltrates into the shallow soils rather than running off site.

The landfill was used by the United States Air Force from 1942 or 1943 until 1974. Although no documentation exists regarding the types and amounts of wastes landfilled, verbal reports by past and present facility personnel indicate that the

landfill was used only for the disposal of municipal solid waste generated on the facility property. Modern containment methods were not employed at the landfill (i.e., the landfill is not capped or lined, and no leachate collection system is in place). Concrete rubble, one rusty drum, and some uncovered domestic garbage were noted on the surface of the landfill during site visits.

1.3.3 Petroleum, Oils, and Lubricants (POL) Storage Area

The POL Storage Area is isolated from the main portion of Ellington Field (ANG), at the south end of the City of Houston property. The site is surrounded by a chain-link fence which approximates the ANG property line. The POL Storage Area is bordered by Union Pacific Railroad right-of-way property on the southwest side, Horsepen Bayou on the north side and undeveloped land on the east side. A drainage ditch on the railroad right-of-way flows northwest into Horsepen Bayou, which subsequently flows eastward into Armand Bayou, Pasadena and Mud Lakes, Clear Lake and, finally, Galveston Bay.

Three above-ground JP-4 fuel tanks (Tanks 39, 164, and 165) and a fuel pump station (Building 180) are located at the site. The fuel tanks are within a concrete diked area. A cul-de-sac driveway, which allows passageway for refueling tanker trucks, runs north-south between the diked area and the pump station. A railroad spur used for the delivery of JP-4 to the site is situated between the driveway and the diked area. Six fuel feed standpipes are located just east of the railroad spur, with an underground 8-inch diameter fuel loading pipeline leading to the storage tanks. The layout of the site is depicted in Figure 1-3.

A 1973 incident at the POL Storage Area resulted in the release of 8,000 gallons of JP-4 into the shallow drainage ditch over the period of one weekend. Water that had collected in the storage tank sump was being pumped into the drainage ditch. The pump was inadvertently left on and fuel was allowed to discharge into the ditch. Although attempts were made to contain the spill, most of the fuel reached Horsepen Bayou. No documentation of regulatory involvement in spill reporting, containment or countermeasure activities has been found regarding this incident.

Other spill incidents, including one in August 1989 which resulted in an immediate response action (see Section 1.4.2), are known to have occurred at the POL Storage

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Area in the past. Due to the evidence of fuel-contaminated soils at the site, a decision was made to investigate the entire POL Storage Area, not just the 1973 spill site.

1.4 PREVIOUS PROGRAM ACTIVITIES

A Preliminary Assessment (PA) Records Search conducted by the Hazardous Materials Technical Center between December 1985 and October 1987 identified three sites at Ellington Field (ANG) which were potentially contaminated with hazardous materials. Although three sites were identified, only two, the Former Base Landfill and the POL Storage Area, were investigated as part of the SI. It was determined that any potential contamination at the third site, the Fuel System Repair Shop, would be the result of activities occurring after January 1984 and, therefore, not subject to IRP investigation.

SI activities at the POL were expanded to address the entire area as one site, as a result of an earlier study which concluded that contaminated soil was the result of past spills. A report on these activities (Report on POL Remediation Activities at Ellington Field Air National Guard Base, NUS Report Number R-34-10-9-002H) was issued to the ANG and the Texas Water Commission (TWC) in November 1989.

In summary, on August 19, 1989, JP-4 was found to be seeping into Horsepen Bayou through and over its south bank, adjacent to the railroad spur at the site. Fuel was collected from the bayou with absorbent booms and disposed of in a Class 2 landfill. Approximately 1700 cubic yards of fill and ballast were removed before interim remedial activities were suspended. Although the vast majority of the contaminated materials was removed, remedial efforts required to excavate all materials contaminated above TWC guidelines were not completed. TWC requirements to achieve clean closure are excavation and removal of all soils containing concentrations of petroleum hydrocarbons greater than 100 ppm or the sum total of benzene, toluene, ethylbenzene, and xylene (BTEX) greater than 30 ppm. Figure 1-4 depicts areas where laboratory results indicate the presence of petroleum hydrocarbons in soils at concentrations greater than 100 ppm. Once the remedial efforts were halted, the trench was backfilled and compacted and the railroad tracks replaced.

1.5 REGIONAL INVESTIGATION AREA

The following sections contain information on the regional environmental setting, geology and hydrogeology.

1.5.1 Environmental Setting

Meteorology

Mean annual precipitation in the vicinity of Ellington (ANG) is approximately 46 inches, while mean annual lake evaporation is approximately 53 inches. The 1-year 24-hour rainfall intensity is approximately 2.75 inches. Normal daily minimum temperature in January is 42° Fahrenheit (F); normal daily maximum temperature in July and August is 92°F (U.S. Dept. of Commerce, 1968).

Topography and Drainage

The topography of Ellington Field (ANG) is typical of the Gulf Coastal Plain, which is characterized by gently gulfward sloping land. The Pleistocene Beaumont Formation, which crops out at the facility, has an average erosional surface slope of 1.65 feet per mile from its landward extent to the shoreline. Surface elevations at Ellington Field (ANG) range from 40 feet above mean sea level (MSL) in the northwest corner to 25 feet above msl in the southeast corner (U.S.G.S., 1982).

The only major surface water body is Horsepen Bayou. This bayou flows eastward approximately 10 miles, where it flows into Armand Bayou, Pasadena and Mud Lakes, Clear Lake and, finally, Galveston Bay. Horsepen Bayou and its tributaries receive some overland drainage and runoff from drainage ditches on the Ellington Field (ANG) property. However, due to the relatively flat site topography, a great deal of surface water pools on site and either evaporates or percolates slowly to the ground water through semi-permeable surficial clays.

1-5

1.5.2 Regional Geology and Hydrogeology

Geology

Ellington Field (ANG) is located within the West Gulf Coastal Plain physiographic province. The formations underlying the site are comprised of consolidated and unconsolidated sediments of the Miocene, Pliocene and Pleistocene ages. These formations crop out in belts parallel to the coast and dip gently to the southeast. Younger formations crop out nearer the Gulf, older formations further inland. Due to the downdip thickening of the coastal sediments, the older formations dip more steeply than the younger ones (Texas State Board of Water Engineers, 1950).

The sediments comprising these strata were derived largely from the weathering of older Tertiary and Cretaceous formations, and were deposited in fluvial, deltaic, lagoonal and shallow marine environments. Owing to the differing modes of deposition, lithologies are diverse and complexly interbedded, and, therefore, individual beds can rarely be traced over long distances. Layers and lenses of clay grade laterally and vertically into sand zones; sands and gravels likewise grade into clay zones. Characteristic geologic and geomorphic features of the Gulf Coastal Plain include salt domes, down-to-the-gulf growth faults, scarps, pimple mounds and undrained depressions.

Hydrogeology

The geologic formations from which potable water is available in the site area are the Pleistocene formations, whose water-bearing units comprise the Chicot Aquifer, and the Pliocene-aged Goliad Sand, whose sand beds comprise the Evangeline Aquifer. The Chicot has a maximum thickness of 700 feet in the site vicinity; the Evangeline a maximum thickness of 2000 feet. Both aquifer systems consist predominantly of complexly interbedded sands and clays (Texas Water Development Board, 1975).

No continuous confining layers overlie the Chicot, and where the Beaumont Formation crops out, the aquifer extends to the ground surface, suggesting that the aquifer is under water table conditions. Although electric logs do not show any definite confining unit above the Evangeline, artesian conditions do exist within the

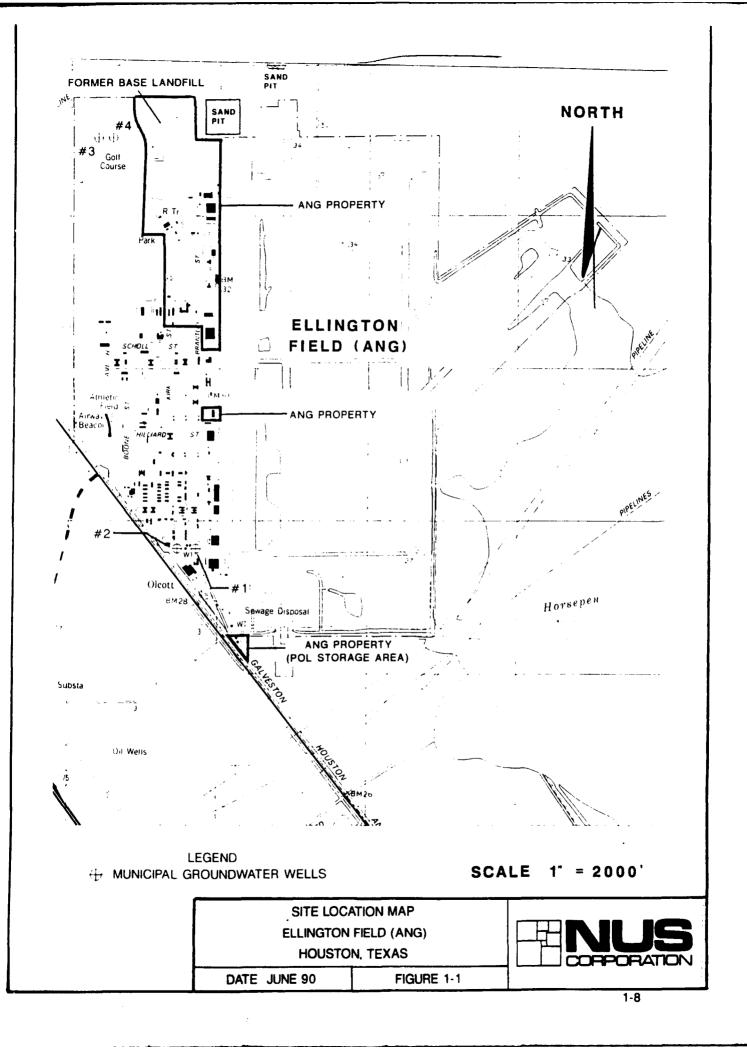
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aquifer. This, along with the difference in water level elevations between the two aquifers, suggests that the hydraulic connection between them is minimal. Recharge to the Chicot is via direct infiltration of precipitation from the ground surface; recharge to the Evangeline is probably by slow percolation of ground water through the overlying Pleistocene formations.

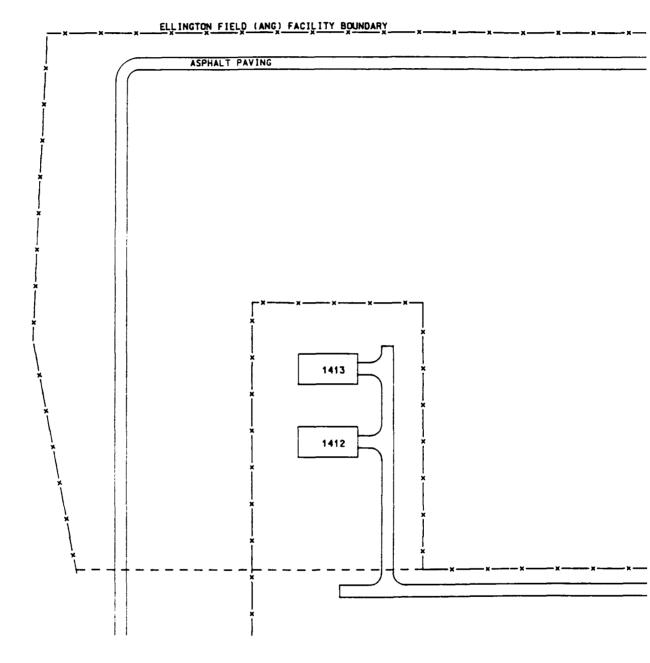
Available information indicates four municipal wells are located on City of Houston or City of Pasadena property in the vicinity of Ellington Field (ANG). The location of these wells is indicated on Figure 1-1. Well 1, located one block west of Cockran and Brantly was removed 6 months ago by the City of Houston. Use of well 2 was discontinued by the City of Houston on July 15, 1990. Wells 3 and 4 are owned by the City of Pasadena and are used by the golf course located west of the Former Base Landfill. These wells all produce water from the lower unit of the Chicot aquifer, a massive sand section known as the Alto Loma Sand. Screened intervals in these wells range from 390 to 570 feet below land surface (Texas Water Development Board, 1972).

1.5.3 Background

To characterize contamination at the site, it was first necessary to determine background inorganic concentrations in soil and ground water. TCL organic compounds are not naturally occurring, therefore background levels are considered zero. Background inorganic concentrations in soil and ground water were derived from reference literature (Shacklette and Boergen, 1984; Dragen 1988). For more information on background levels and a comparison of background levels to maximum site concentrations, see Section 4.2.2, Hazard Identification.



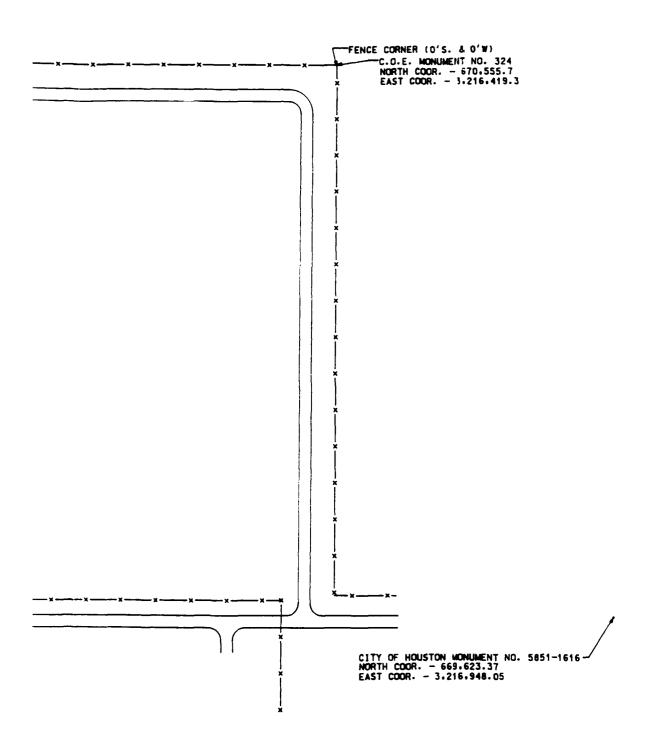




NOTE: APPROXIMATE LIMITS OF LANDFILL COINCIDENTAL WITH FENCE EXCEPT WHERE DASHED LINE INDICATES OTHERWISE. — — —

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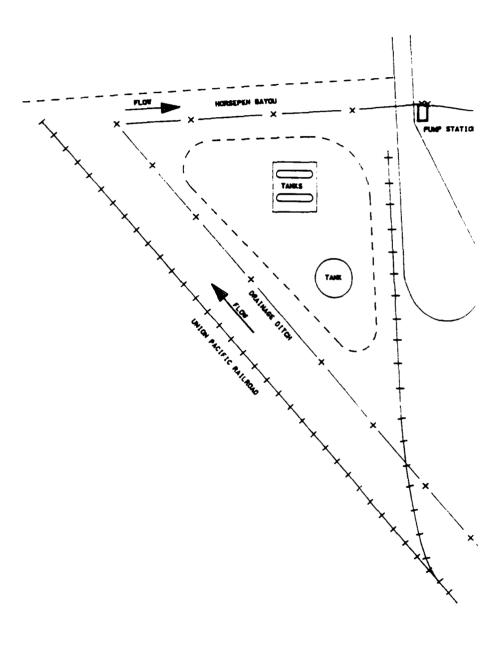
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DRAWN BY J. ATKINSON FIGURE 1-2 DATE: 5-31-90 SITE MAP FORMER BASE LANDFILL ELLINGTON FIELD (ANG) HYDROGEOLOGIST D. UPTHEGROYE HOUSTON. TEXAS DATE: 5-31-90 RCALF: 1"-150' NUS DWG. NO. 363M-2801 REV. 0 TO A Halliburton Company CAD DWG. NO. 363M2BD1.DGN





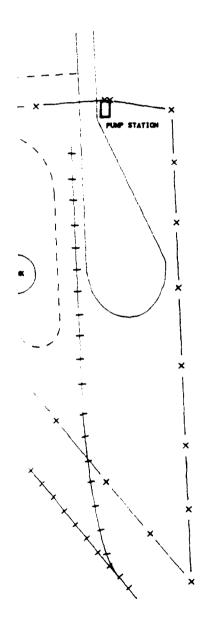


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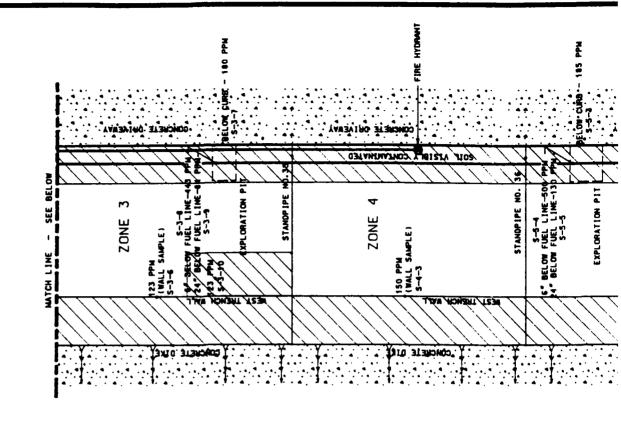
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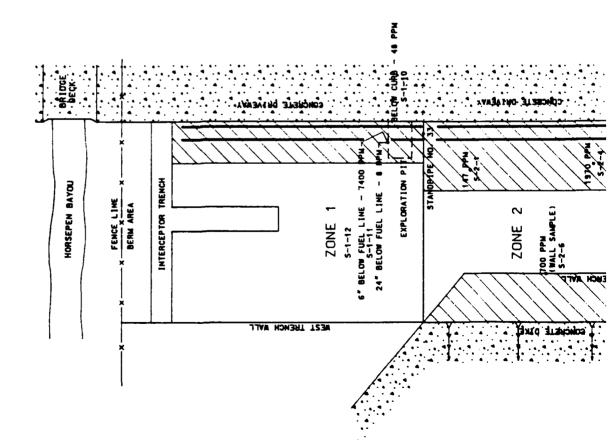
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FIGURE 1-3
SITE MAP POL STORAGE AREA
ELLINGTON FIELD (ANG)
HOUSTON, TEXAS

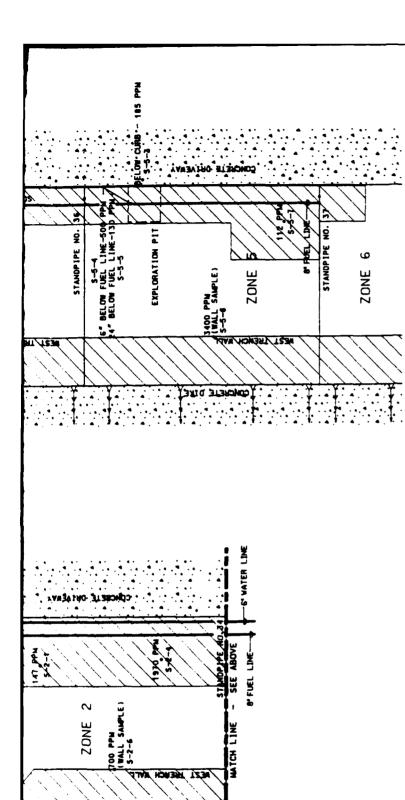


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SIGNIFIES AREAS IN WHICH ANALYTICAL RESULTS INDICATE TPH CONCENTRATIONS AT >100 PPM.

FIGURE 1-4	AREAS WITHIN REMEDIATION TRENCH WITH	TPH >100 PPM-POL STORAGE AREA	ELLINGTON FIELD (ANG) HOUSTON. TEXAS	0 / 10 - 40 00 00 00 000 000 00 00 00 00 00 00 0
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2.0 FIELD PROGRAM

2.1 FIELD PROCEDURES

2.1.1 **Geophysical Investigation**

A geophysical survey was conducted at the Former Base Landfill to aid in the characterization of shallow subsurface conditions before undertaking drilling and sampling activities at the site. Magnetometry and electromagnetic conductivity techniques were utilized during the survey. Instruments used were an EDA OMNI-IV PLUS Magnetometer/Gradiometer and a Geonics Limited EM-31 DL Electromagnetic Recording System. Readings were taken with both instruments at 25-foot intervals along mutually perpendicular lines, and more frequently where subsurface conditions caused anomalous readings.

2.1.2 Drilling

All drilling activities conducted as part of the SI were performed using truck-mounted drilling rigs. Borings were advanced by the hollow stem auger method. Soil samples were continuously collected from each boring to determine lithology beneath the site and for chemical laboratory analysis (where appropriate). A portion of each recovered sample was placed in a zip-loc bag and the headspace scanned for organic vapors using a photoionization detector (PID) and flame ionization detector (FID). An explosimeter was utilized during drilling activities to detect the presence of potentially flammable/explosive atmospheres.

Borings not completed as monitoring wells or piezometers were backfilled to ground surface with a cement/bentonite grout. Drill cuttings from borings for monitoring wells were drummed and stored on site pending results of laboratory analyses of soil samples collected from the borings. Cuttings from borings for piezometers were used as backfill material. Boring logs depicting site lithology are included in Appendix A.

2.1.3 <u>Subsurface Soil Sampling</u>

Subsurface soil samples were collected by pushing an oversized split-spoon sampler in advance of the hollow stem augers. Brass liners were utilized for the collection of volatile organic samples. Shelby tubes were used only for the collection of samples on which no chemical analyses were to be performed. Once a sample was brought to the surface, it was described then immediately placed in the appropriate sample container (if selected for chemical analysis) and iced to 4 degrees Centigrade(°C). All samples were delivered to the NUS Laboratory in Clear Lake City, Texas for chemical analysis. Field data is presented on soil sample log sheets which are contained in Appendix A. Soil profiles are shown in cross-sections contained in Section 3 (Figures 3-3, 3-4, 3-8, and 3-9).

2.1.4 Surface Soil Sampling

Composite surface soil samples were collected using stainless steel spoons and glass mixing bowls. Subsamples were collected from the interval between 0 and 6 inches below ground surface. Equal portions of subsamples were mixed thoroughly, then placed in the appropriate sample containers.

2.1.5 Monitoring Well/Piezometer Installation

All monitoring wells and piezometers installed during the SI were screened in the shallowest zone of saturated, permeable sediments beneath the facility. Borings used for the installation of monitoring wells/piezometers were advanced to a depth 3 feet below the base of the selected screened interval to accommodate a sediment trap and bottom cap. A silica sand filter pack was installed through the augers to extend approximately 2 feet above the top of the screen. A 2-foot thick bentonite seal was then placed above the sand pack. The remainder of the borehole was backfilled with cement/bentonite grout for monitoring wells and with natural backfill (drill cuttings) for piezometers. Most monitoring wells were surface completed with stainless steel locking casings, concrete pads and steel guard posts. Several wells, however, due to their locations, were flush-mounted and completed with locking caps, christy boxes, manhole covers and concrete pads. Typical piezometer construction is illustrated in Figure 2-1, while Figure 2-2 depicts typical

monitoring well construction. As-built diagrams for all piezometers and monitoring wells are contained in Appendix A.

Upon completion, monitoring wells were developed through a combination of surging and bailing and air lifting sediment until water was essentially sediment free. The volume of water developed from wells was recorded on well development forms, which are contained in Appendix A. Development water was only drummed when field evidence of contamination was detected. Several well volumes of water were removed from each piezometer to ensure the accuracy of water level measurements. Piezometers were not utilized for the collection of ground-water samples. Once a preliminary determination of ground-water flow direction had been made, piezometers were abandoned according to TWC regulations.

2.1.6 **Ground-Water Sampling**

Ground-water samples were collected from all monitoring wells installed as part of the SI. Each monitoring well was purged (approximately three well volumes were removed) prior to the collection of samples. Samples were collected using bottom-loading stainless steel bailers and were transferred directly to the appropriate sample container (with the exception of samples collected for metals analysis, which were filtered prior to being containerized). Pertinent data were recorded on monitoring well sample log sheets which are contained in Appendix A.

2.1.7 Aquifer Testing

The aquifer testing program consisted of performing slug tests at all monitoring wells installed as part of the SI. A pressure transducer, a Hermit datalogger and a PVC slug of known volume were utilized for the tests. Data generated were used to calculate approximate hydraulic conductivities of the water-bearing sediments beneath the facility. Slug test calculations are presented in Appendix B.

2.1.8 <u>Site Investigation Derived Waste Management</u>

All cuttings generated by the drilling of soil borings were drummed and stored at their respective drill sites pending chemical analysis of soil samples. At boring locations where no significant soil contamination was detected through laboratory

analysis, cuttings will be spread on the ground surface and raked level. Cuttings from boring SB-13 at the POL Storage Area will be disposed of in a Class II landfill. This is due to the presence of total petroleum hydrocarbons in one sample from the boring at a concentration (132 ppm) above TWC guidelines.

Development water from one well was drummed based on field evidence of contamination. However, no contamination was detected through laboratory analysis of ground water from that well. The drummed water will therefore be discharged onto the ground surface and allowed to evaporate or infiltrate into the shallow soils.

2.2 FORMER BASE LANDFILL

2.2.1 Summary

The field investigation at the Former Base Landfill was conducted to characterize shallow subsurface conditions and to determine whether soils and ground water had been affected by waste disposal activities at the site. Activities included the following:

- A geophysical survey utilizing magnetometry and electromagnetic conductivity techniques.
- Installation of five ground-water monitoring wells.
- Collection of three surface soil samples, nine subsurface soil samples, and five ground-water samples for fixed-base laboratory analysis.
- Measurement of water levels in all monitoring wells.
- Slug testing in all monitoring wells.

2.2.2 Deviations From the Work Plan

Deviations from the Sampling and Analysis Plan (SAP) during the field investigation of the landfill were as follows:

- To better define anomalous areas during the geophysical survey, readings were sometimes taken at intervals less than 25 feet.
- The laboratory informed field personnel of hexane contamination in rinseate blanks. An additional methanol rinse was added during decontamination to help air dry sampling equipment (per HAZWRAP Quality Control Requirements for Field Methods, HZ/RAP-102-2).

2.2.3 Geophysical Investigation

Before conducting the geophysical survey at the landfill, a grid system was surveyed at the site with stations at 100-foot intervals on mutually perpendicular lines. The grid was then filled in at 25-foot intervals using a measuring tape and pin flags. Readings were taken at each station with both the magnetometer and electromagnetic conductivity meter. As previously mentioned, more detailed surveying was conducted in anomalous zones.

The magnetometer has its own data recording system, while readings taken with the EM-31 were manually recorded in a logbook. The EM-31 displays a continuous readout, while the magnetometer must be triggered to record data at a sample point. A total of 1998 magnetic data points and 1537 electromagnetic conductivity data points were collected during the survey. In anomalous areas where more detailed surveying was performed, additional magnetic data points were always recorded. The EM-31 was monitored for variability in the readings, and only those readings where significant change was noted were recorded. This resulted in the disparity in sample data points between the two methods.

2.2.4 Soils Investigation

Five soil borings were drilled along the perimeter of the Former Base Landfill during the SI (SB-01 through SB-05). All five were completed as monitoring wells (MW-01 through MW-05). Lithologic samples were continuously collected from the borings.

A total of nine subsurface soil samples were collected from the borings for chemical laboratory analysis. One sample was collected at the top of the saturated zone from each boring, while the remaining four were collected at various depths based on field evidence of contamination. Subsurface soil samples were analyzed for target compound list (TCL) volatiles, TCL Base Neutrals/Acid Extractables (BNAs), TCL pesticides, target analyte list (TAL) inorganics and potroleum hydrocarbons.

Three composite surface soil samples (01-SS01-A, 01-SS02-A and 01-SS03-A) were collected at the landfill during the SI. For the purpose of sampling, the landfill was divided into thirds, with one composite sample being collected from each third. Each sample was a composite of three subsamples collected from areas with surficial evidence of subsurface fill (e.g., concrete rubble, uncovered domestic garbage, etc.). Surface soil samples were analyzed for TCL BNAs, TCL pesticides, TAL inorganics and petroleum hydrocarbons.

Sample locations at the Former Base Landfill are shown in Figure 2-3. Table 2-1 presents a summary of laboratory analysis of soil samples from the landfill.

2.2.5 <u>Hydrogeologic Investigation</u>

Water levels in the five wells installed at the site were measured and top of well casing elevations were surveyed. The resulting water level elevations were used to establish ground-water flow direction and hydraulic gradient across the site. Ground-water samples were collected from all five wells for chemical laboratory analysis to determine whether ground-water quality has been adversely affected by wastes disposed of in the landfill. Ground-water samples were analyzed for TCL volatiles, TCL BNAs, TCL pesticides, TAL inorganics and petroleum hydrocarbons. Finally, slug tests were performed at the wells to estimate aquifer parameters of the water-bearing sediments beneath the site.

Table 2-2 presents a summary of laboratory analysis of ground-water samples from the Former Base Landfill.

2.3 POL STORAGE AREA

2.3.1 Summary

The field investigation at the POL Storage Area was conducted to characterize shallow subsurface conditions and to determine whether soils and ground water had been affected as a result of fuel handling operations at the site. Activities included the following:

- The installation of three piezometers, four soil borings and four ground-water monitoring wells.
- Collection of 23 subsurface soil samples and four ground-water samples for fixed-base laboratory analysis.
- Measurement of water levels in all piezometers and monitoring wells.
- Slug testing in all monitoring wells.

2.3.2 Deviation from the Work Plan

Deviations from the SAP during the field investigation of the POL Storage Area are as follows:

- Sediment traps were added below the screen in the three piezometers due to the extremely silty nature of the shallow aquifer beneath the site.
- Three of the four wells installed at the site were changed to flush-mounted completions due to their locations.
- Again, a second methanol rinse was added during decontamination to help air dry sampling equipment.

 A field duplicate was inadvertently marked for BNA analysis resulting in one too many BNA duplicate samples.

2.3.3 Soils Investigation

A total of eleven borings were drilled at the POL storage area as part of the SI. All borings were continuously sampled for the collection of lithologic data. Borings PZ-01 through PZ-03 were completed as piezometers. No soil samples for chemical analysis were collected from these borings. Borings SB-11 through SB-14 were drilled inside the diked area. Samples for chemical analysis were collected from 0-2 feet below the diked area, at the top of the saturated zone and at an intermediate depth dependent on field evidence of contamination. Borings SB-07 through SB-10 were drilled for the installation of monitoring wells MW-07 through MW-10. Again, samples were collected from 0-2 feet below grade and at the top of the saturated zone, except in SB-10, which was drilled through fill material at the north end of the railroad spur. In this boring, one sample was collected at 0-2 feet below the filled material (8-10 feet below grade) and one at the top of ground water. Intermediate samples from SB-07 through SB-09 were collected due to the depth to ground water. A total of 23 subsurface soil samples were collected at the POL Storage Area for chemical analysis. All samples were analyzed for TCL volatiles and petroleum hydrocarbons. One sample from each of eight borings (SB-07) through SB-14) was analyzed for TCL BNAs based on field evidence of contamination. In the absence of field evidence of contamination, the sample was collected at the top of ground water.

Sample locations at the POL Storage Area are shown in Figure 2-4. Table 2-3 summarizes laboratory analysis of soil samples from the site.

2.3.4 <u>Hydrogeologic Investigation</u>

Water level measurements taken in the three piezometers were used to establish ground-water elevations and preliminary flow direction at the POL Storage Area. No ground-water samples were collected from piezometers. All piezometers were abandoned subsequent to determining preliminary flow direction. Water level data were also obtained from the four wells installed at the site. Ground-water sampling was conducted at all four wells to determine whether ground-water quality has

been affected by fuel management operations at the site. Samples were analyzed for TCL volatiles, TCL BNAs and petroleum hydrocarbons. Slug tests were performed at the wells to determine hydraulic properties of the shallow aquifer beneath the site.

Table 2-4 summarizes laboratory analysis of ground-water samples from the POL Storage Area.

TABLE 2-1

SUMMARY OF LABORATORY ANALYSIS OF SOIL SAMPLES FORMARY BASE LANDFILL

Parameter	Analytical Method	QC Level	Number Environmental Samples	Number Field Duplicates	Number Trip Blanks	Number of Field/Rinsate Blanks	Total Number Environmental and QA/QC	Laboratory Duplicates MS/MSD(a)	Total Lab (QA/QC)	Grand
TCL Volatiles(b)	CLP(c)	J	6	-	m	4/2	19	3/3	4	35
TCI DAIA	3.0	ļ							>	7
וכרפונא	CLP	ر	12	7	;	4/2	20	3/3	9	26
TAL Inorganics(d)	CLP 200 Series	U	12	2	;	4/2	20	8/8		36
TCL Pesticides	CLP	J	12	,		2/2	5	5,6	,	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						7/15	707	3/3	٥	56
retroleum Hydrocarbons EPA 418.1(e)	EPA 418.1(e)	J	12	7	:	4/2	20	8/8	9	56

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MS/MSD - Matrix Spike/Matrix Spike Duplicate TCL - Target Compound List CLP - Contract Laboratory Program, February 1988 for organic parameters, July 1987 for metals TAL - Target Analyte List Soils are prepared by Method 3550 using freon as the extraction solvent and treating the extract with silca gel.

SUMMARY OF LABORATORY ANALYSIS OF GROUND-WATER SAMPLES FORMER BASE LANDFILL

Grand Total			:	7	=		-		11		
Total Lab (QA/QC)			,	•	7		7		7		_
aboratory Duplicates AS/MSD(a)			1/1		7.		1/1		=		_
Total Number nvironmental	ر الم		01		6		n .	Š	ת		n
Number ield/Rin Blank		,,,	1/7	7	27.1	1/2		2/1	2/1	2/1	-
Numbe Trip Blanks		-		:		:		:		:	
Number Field Duplicates		-		_		_	1			_	
Number Environmental Samples		\$		<u>_</u>		1	U	7		C	
OC Level	ļ	J	,	_ ر		,	J	,	Ĺ	,	
Analytical Method	13015	(1)	مال	(5)	CLP 200 Series		d T		EPA 418 1		
Parameter	TCL Volatiles(b)		ICL BNA		! AL Inorganics(d)		I CL Pesticides		Petroleum Hydrocarbons		

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MS/MSD - Matrix Spike/Matrix Spike Duplicate TCL - Target Compound List CLP - Contract Laboratory Program, February 1988 for organic parameters, July 1987 for metals TAL - Target Analyte List

TABLE 2-3

SUMMARY OF LABORATORY ANALYSIS OF SOIL SAMPLES POL STORAGE AREA

Parameter	Analytical Method	OC Level	Number Environmental Samples	Number Field Duplicates	Number Trip Blanks	Number Number of Trip Field/Rinsate Blanks Blanks	Total Laboratory Total Grant Laboratory Total Grant Laborates Lab Grand MS/MSD(a) (QA/QC)	Laboratory Duplicates MS/MSD(a)	Total Lab (QA/QC)	Grand
TCL Volatiles(b)	CI P(c)	J	2							
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TCL BNA	ا ال	U	æ	١					,	30
		,	,	7	;	4/3	17	- 12	2	0.
Petroleum Hydrocarbons EPA 418.1	[EPA 418.1	U	23	ſ		1			'	
		,		n	:	4/3	ee ee		2	25
										י

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MS/MSD - Matrix Spike/Matrix Spike Duplicate TCL - Target Compound List CLP - Contract Laboratory Program, February 1988 for organic parameters, July 1987 for metals

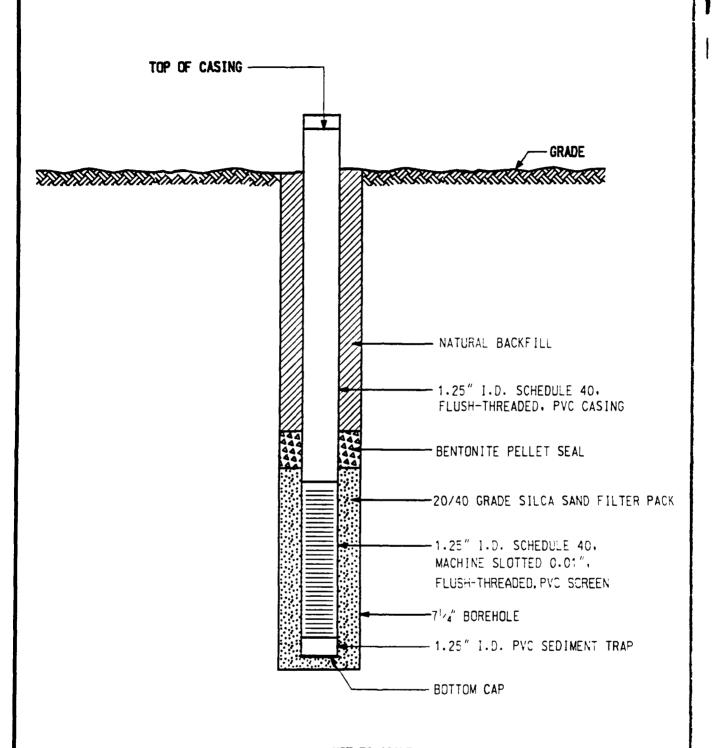
TABLE 2-4

SUMMARY OF LABORATORY ANALYSIS OF GROUND-WATER SAMPLES
POL STORAGE AREA

Parameter	Analytical Method	OC Level	Number Environmental Samples	Number Field Duplicates	Number Trip Blanks	Number Number of Field Trip Field/Rinsate E	Total Number invironmental and QA/QC	iboratory uplicates S/MSD(a)	Total Lab (QA/QC)	Grand Total
TCL Volatiles(b)	C) B(C)	ļ								
	,,,,	ر	4	:	~	7.	&	:	٥	٥
TCLENA	CLP	U	_						Ì	0
		'			:	=	9	:	0	¥
retroleum Hydrocarbons EPA 418.1	EPA 418.1	U	4	:	1	.,,				,
							•	;	0	9

MS/MSD - Matrix Spike/Matrix Spike Duplicate TCL - Target Compound List CLP - Contract Laboratory Program, February 1988 for organic parameters, July 1987 for metals

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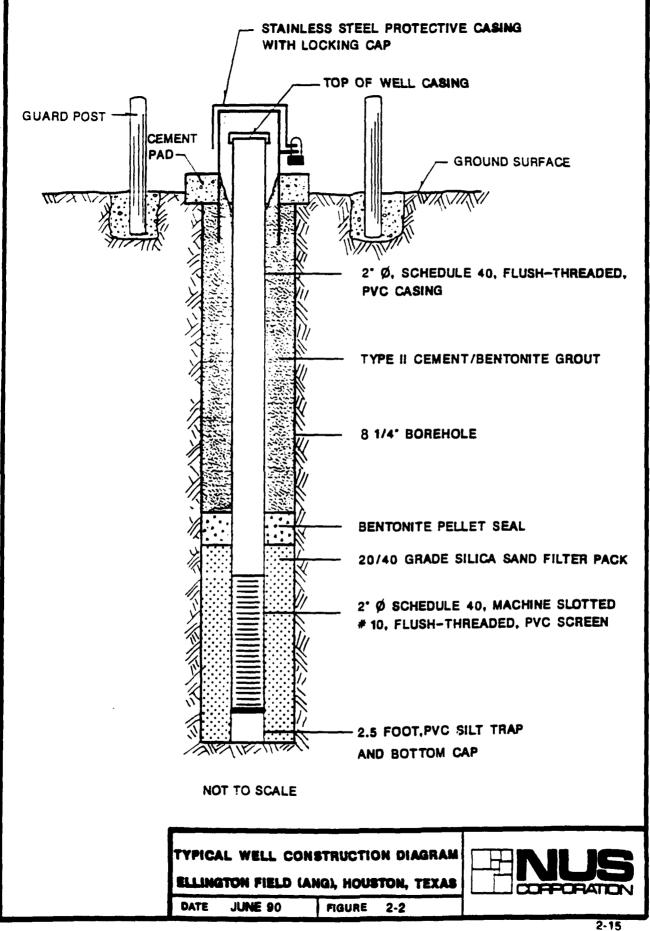
NOT TO SCALE

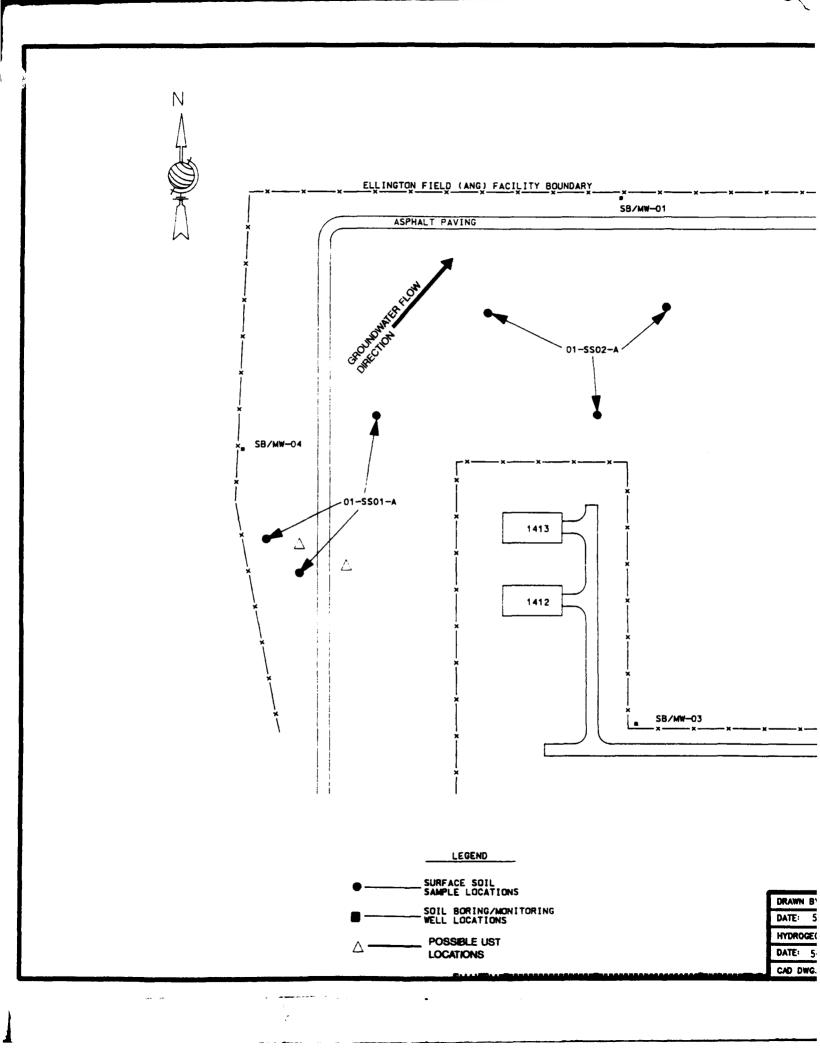
FIGURE 2-1
TYPICAL PIEZOMETER
CONSTRUCTION DIAGRAM
ELLINGTON FIELD (ANG) HOUSTON, TEXAS

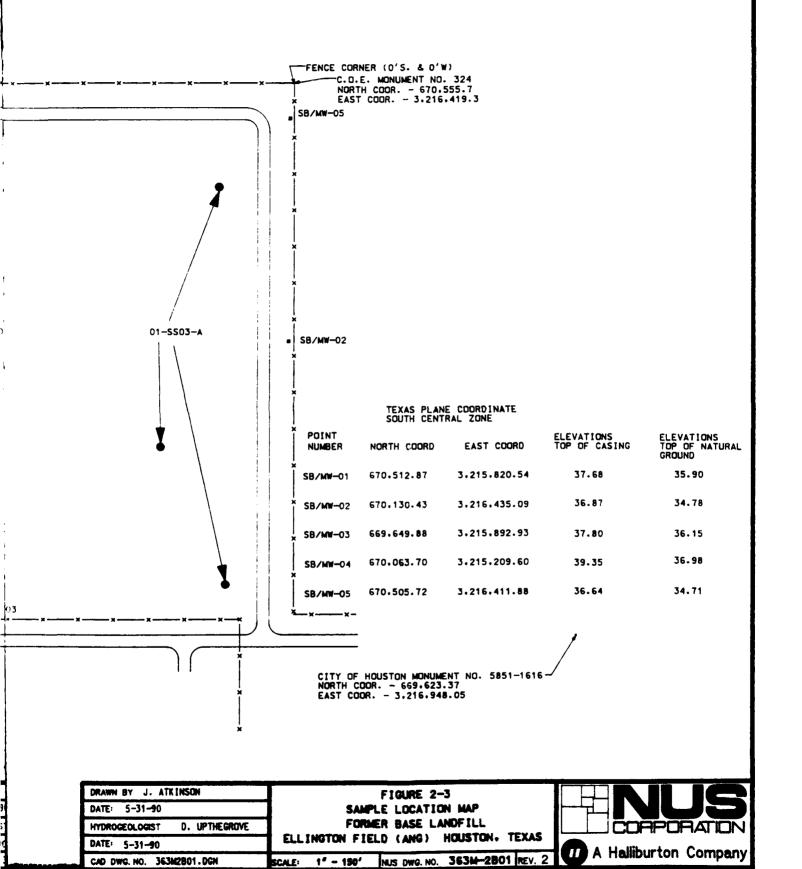
DATE: JUNE 90 NUS DWG. NO. 363M-4A01

REV. 1

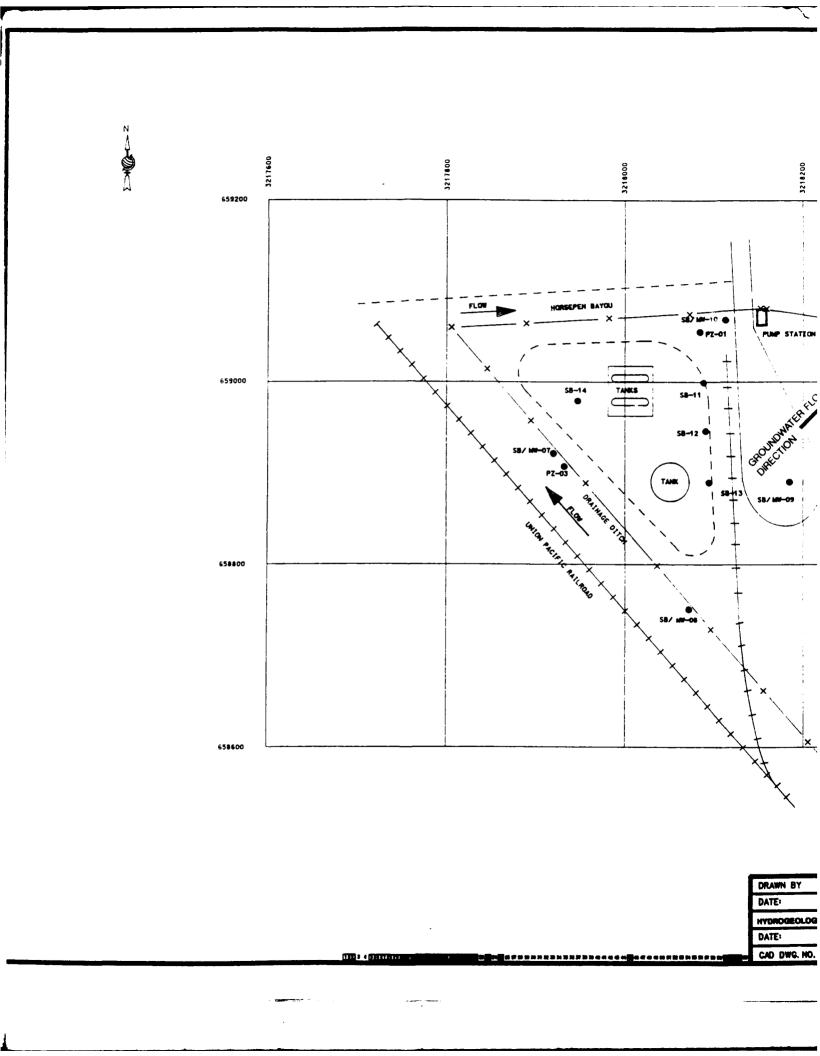


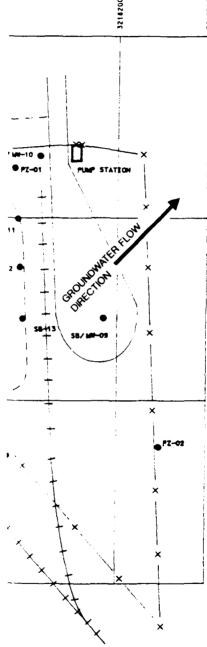






2-16





LEGEND

MAP SHOWING

MW = MONITOR WELL

LOCATIONS AND ELEVATIONS OF MONITORING WELLS, PIEZOMETERS, AND SOIL BORINGS AT THE POL STORAGE AREA ELLINGTON FIELD (ANG) HOUSTON, TEXAS

PZ = PIEZOMETER

SO = SOIL BORING

POINT NUMBER		E COORDINATE NTRAL ZONE	ELEVATIONS TOP OF CASINGS	TOP OF CONCRETE/NATURAL GROUND ELEVATION
	NORTH COORD.	EAST COORD.		
SB/MW-07	658,931.22	3.217.921.70	23.16	23.23 (NG)
SB/ MW-08	658.757.71	3,218,072,43	23.31	23.55 (NG)
SB/ MW-09	658.895.2	3,218,182.34	25.27	25.65 (CONC)
SB/MW-10	659,073.15	3,218,110.76	27.59	25-82 (CONC)
PZ-01	659.060.17	3,218,081.47	28.73	26.65 (NG)
PZ-02	658.753.85	3.218.241.40	26.78	24.85 (NG)
PZ-03	(A)	(A)	25.10	23.45 (NG)
SB-11	659.004.16	3.218.085.49		23.71 (CONC)
SB-12	658.951.06	3.218.087.97		23.89 (CONC)
58-13	658.894.38	3.218.091.83		24.00 (CONC)
58-14	658,984.11	3.217.944.55		23.73 (CONC)
(A) NOT	CUBVEVES ASSO		I disabilit	

(A) NOT SURVEYED. APPROXIMATE LOCATION SHOWN.

ELEVATIONS SHOWN HEREON ARE BASED ON N.G.S. MONUMENT M-1276 (1987 ADJ)

DRAWN BY	J. ATKINSON
DATE	6-1 <i>-</i> 90
HYDROGEOLOGIST	D. UPTHEGROVE
DATE:	6-1 <i>-</i> 90
	TOTAL COMMENT

FIGURE 2-4 SAMPLE LOCATION MAP POL STORAGE AREA ELLINGTON FIELD (ANG) HOUSTON. TEXAS



3.0 SIGNIFICANCE OF RESULTS

3.1 FORMER BASE LANDFILL

The following sections summarize the results of field investigations and laboratory analysis at the Former Base Landfill.

3.1.1 Geophysical Survey

The geophysical survey was most effective in determining locations of buried ferrous materials at the landfill. During the interpretation of geophysical data, it was observed that, more often than not, zones exhibiting anomalously high magnetic field values exhibited high electromagnetic conductivity values as well. These are typical responses for both instruments in disturbed zones where ferrous objects are at or near the surface.

The Geophysical Survey Report (Appendix C) identified 36 detailed anomalous zones. Although in some cases these zones are isolated from what appear to be major fill areas, they are, for the most part, considered to be part of a depositional trend of ferromagnetic materials across the landfill. The grid system utilized to conduct the geophysical survey and locations of the detailed anomalous zones are shown in Figure 3-1.

In areas relatively free of disturbed zones, an attempt was made to correlate electromagnetic conductivity values with soil types at the landfill. The only relatively undisturbed areas at the landfill are found in the southeast quadrant of the site, in the eastern half of the southwest quadrant, in the southern portion of the northeast quadrant and along portions of the fenceline. In general, the survey indicated that the landfill area consists of saturated sands and sandy clays to the north grading south into predominantly clays.

The location of the underground storage tank at the former incinerator site in the southwest quadrant of the landfill was not positively identified. However, magnetic field signatures centered at Line 1135, Position 585 and Line 1075, Position 600 suggest these to be the most likely UST Locations (see Figure 3-1).

3-1

3.1.2 Soils Investigation

The five borings installed at the Former Base Landfill ranged in depth from 24 feet (SB-03 and SB-04)) to 30 feet (SB-01 and SB-05). Three distinct stratigraphic zones were identified during the investigation. Descriptions of the three zones, in descending order, are as follows:

Zone 1

Zone 1 is a brown and green-gray clay which changes to rust and light gray in color with depth. The clay contains varying amounts of silt and some very fine grained sand. The amount of silt and sand present in Zone 1 tends to increase with depth, with the bottom several feet becoming very silty and moist, apparently grading into the clayey silt and silty sand of Zone 2. The clay is soft to hard, plastic, and contains calcareous zones with gravel up to 1 inch in diameter. Iron staining and small iron nodules are common throughout, and abundant roots and organic material are present in the top two feet. Zone 1 ranges in thickness from 6 feet in SB-04 to 12.5 feet in SB-02.

• Zone 2

Zone 2 is a layer of dense, brown and tan clayey silt and silty sand. It is the first zone of saturated sediments with sufficient permeability to allow observable ground water to enter a borehole during drilling. Zone 2 contains some interbedded silty clay and small amounts of semiconsolidated sand/siltstone. This relatively thick sand/silt body is typically fining-upward and probably represents point bar deposition in an ancestral stream bed. The thickness of Zone 2 in the vicinity of the landfill ranges from 2.5 feet in SB-02 to greater than 20 feet in SB-05.

Zone 3

Zone 3 is a gray-green and rust clay. The clay is very stiff to hard and contains minor amounts of sand and silt. SB-01, SB-02 and SB-03 were

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terminated in Zone 3, while SB-04 and SB-05 were terminated in Zone 2. The thickness of Zone 3 was not determined, as none of the borings drilled at the landfill fully penetrated the clay bed.

Two cross-sections were constructed using logs of soil borings advanced at the landfill. Figure 3-2 depicts the location of these profiles, which are shown in Figures 3-3 and 3-4.

3.1.3 Hydrogeologic Investigation

A network of five ground-water monitoring wells was installed at the landfill as part of the SI. Pertinent monitoring well data is presented in Table 3-1. Initially, four monitoring wells, MW-01 through MW-04, were installed at the approximate midpoints of the north, east, south and west sides of the landfill, respectively. Water levels in these wells were measured and, using surveyed elevations of tops of casings, converted to elevations with respect to mean sea level. This allowed for the construction of a ground-water elevation contour map (Figure 3-5), which gives a preliminary indication of ground-water flow direction in the shallow sediments beneath the site.

Figure 3-5 depicts ground-water flow on December 19-20, 1989 as being to the north-northeast in the southwestern portion of the landfill and changing to an east-northeast direction in the northeastern portion of the site. In order to fulfill TWC minimum requirements (one upgradient and three downgradient wells), it was decided to install a fifth well, MW-05, in the northeastern corner of the landfill. Figure 3-6 is a ground-water elevation contour map constructed using elevations derived from measurements taken in all five wells on January 25-26, 1990. This map shows the anticipated direction of ground-water flow (east-northeast) in the northeastern corner of the landfill to be accurate

The hydraulic gradients estimated from ground-water contours across the site are much larger than average for shallow Gulf Coast sediments. Hydraulic gradients in the Upper Chicot aquifer normally range from 2 to 20 feet/mile. The hydraulic gradient along line A-A' on Figure 3-5 is 0.011 feet/feet (60 feet/mile); along line B-B' the gradient is 0.008 feet/feet (42 feet/mile). On Figure 3-6 the hydraulic gradient along A-A' is 0.015 feet/feet (80 feet/mile); along B-B' the gradient is 0.0084 feet/feet

3-3

(44 feet/mile). As would be expected, the expansive commercial sand pit just east of the landfill apparently has a profound effect on shallow ground-water flow at the Former Base Landfill. At the time of field activities, excavation of sand was occurring in an area 200-300 feet northeast of MW-05, to a depth of approximately 30 feet. The sand excavations indicated that no water was being pumped from the excavation pit.

Slug tests were performed at each of the five wells installed at the landfill to estimate hydraulic conductivities of the Zone 2 sediments. Hydraulic conductivities were calculated using the Bouwer and Rice method for partially or completely penetrating wells in unconfined aquifers. Several general and site-specific assumptions were made in the evaluation of slug test data. These assumptions are as follows:

General Assumptions:

- The aquifer is homogeneous and isotropic
- Head losses as water enters the well are negligible
- Flow above the water table is typically ignored, as it does not significantly affect slug test data evaluation
- Drawdown of the water table is negligible (Bouwer and Rice, 1976)

Site-Specific Assumptions:

- The effective length is the length of the screen (10 feet) in the wells unless there was open screen above the water level. In those instances, the effective length is the portion of the screened interval below static water level.
- Soils above and below Zone 2 contribute negligibly to equalization of the head in the well during the test.
- Time and "head" translational data, rather than theoretical estimates of head change with time, were utilized in performing slug test calculations to avoid instrument "noise" at the beginning of each test (i.e., the first consistent time/head values were used as H(0) (Pandit, et.al., 1986).

• If there was any question as to which straight line on a graph was more indicative of flow from the undisturbed aquifer, the steeper line was used in calculations as it yields a higher (more conservative) hydraulic conductivity.

Table 3-2 presents calculated hydraulic conductivity and transmissivity values. Values from rising head tests range from 4.15 × 10-3 cm/sec to 2.67 × 10-4 cm/sec. Generally wells in areas where the aquifer was comprised of a relatively thick, clean, sand body exhibited higher hydraulic conductivity values. Rising head tests are assumed to be more accurate than falling head tests for the following reasons. Rising head tests are not influenced by gravity, and, falling head tests involve wetting soils which may have previously been dry. Values from falling head tests were used for comparative purposes and were observed to be equal or similar to rising head values. Transmissivity values were estimated based on the thickness of the saturated permeable sediments. Values range from 774.59 gallons/day/foot to 14.21 gallons/day/foot due to the variability in hydraulic conductivity values and aquifer thickness. Hydraulic conductivity and transmissivity values appear to be high for clayey silt and silty sand; however, slug tests do not typically provide data as accurate as that from pump tests or laboratory tests.

Using the equation for Darcian seepage velocity, estimates of horizontal ground-water flow velocities were calculated for variable hydraulic conductivities and effective porosity estimates. Table 3-3 presents seepage velocity estimates for Zone 2 at the landfill. Estimates range from 377.41 feet/year to 16.64 feet/year. The high end of the range was calculated using the highest hydraulic conductivity and steepest gradient, while the low end was calculated using the lowest hydraulic conductivity and gentlest gradient.

3.1.4 Background Samples

The objective of the SI was to determine whether soils or ground water have been affected by past waste management practices and did not provide for collection of background samples. Naturally occurring levels of inorganics identified in published literature, as referenced in Section 4.2.2 of this report, were used as actual background data. Upgradient ground-water and soil samples were collected from areas not believed to have been affected by past waste management practices. Therefore, sample 01-MW03-A may be designated the background ground-water

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sample at the Former Base Landfill because it is hydraulically upgradient of the other four wells at the site. The sample contained no TCL volatiles, BNAs, pesticides, or petroleum hydrocarbons. TAL inorganics were present in concentrations comparable to those found in other ground-water samples collected from the site.

Similarly, sample 01-SB03A-A may be designated the background soil sample at the landfill. It was collected from a seemingly undisturbed area and contained no TCL volatiles, BNAs, pesticides, or petroleum hydrocarbons. TAL inorganics were detected in concentrations comparable to those found in other soil samples collected from the site.

3.1.5 Contaminant Occurrence and Distribution

This section summarizes information on the nature and extent of contamination at the Former Base Landfill. More complete information on laboratory analysis is contained in Appendix D, the Analytical Data Base. Additional laboratory data supporting data validation is contained in Appendix D, Data Validation Reports.

Surface Soil

Three composite surface soil samples were collected at the Former Base Landfill as part of the SI. The samples were sent to a fixed-base laboratory and analyzed for TCL BNAs, TCL pesticides, TAL inorganics and petroleum hydrocarbons. Quantitative results are summarized in Table 3-4. A number of Polynuclear Aromatic Hydrocarbons (PAHs) were detected in the landfill surface soil samples at relatively low concentrations. Surface soils also contained butylbenzylphthalate, dibenzofuran and DDT and its metabolites. The concentrations of inorganics in surface soil samples does not appear indicative of a widespread problem. Arsenic, lead, mercury, and zinc were, however, detected at average concentrations higher than the literature background values.

Subsurface Soil

Five soil borings were advanced at the Former Base Landfill. A sample was collected at the top of ground water from each boring. An additional sample was collected from four of the borings based on field evidence of contamination. The samples were sent to a fixed-base laboratory and analyzed for TCL volatiles, TCL BNAs, TCL

pesticides, TAL inorganics and petroleum hydrocarbons. Table 3-5 presents a summary of quantitative results.

Heptachlor was detected in two subsurface soil samples and phenol in one sample at the landfill. No other organic compounds were detected in subsurface soils. Mercury was the only inorganic constituent detected at concentrations higher than reported background levels.

Ground Water

All five soil borings were converted to ground-water monitor wells. Ground-water samples were collected from each of the five monitoring wells installed at the Former Base Landfill. The samples were sent to a fixed-base laboratory and analyzed for TCL volatiles, TCL BNAs, TCL pesticides, TAL inorganics, and petroleum hydrocarbons. A summary of quantitative results is presented in Table 3-6.

No volatile organics were detected in ground water at the landfill. Two pesticides, alpha-BHC and methoxychlor, were detected at very low concentrations in samples collected from MW-01 and MW-05, respectively. Petroleum hydrocarbons were also detected in MW-05 at extremely low levels.

Aluminum was the only inorganic constituent detected at a concentration significantly higher than literature background (in the sample from MW-04). Barium, calcium, chromium, and vanadium were detected in one or more wells at concentrations slightly above reported background levels.

Quality Assurance / Quality Control (QA / QC)

Table 3-7 shows QA/QC sample concentrations for the Former Base Landfill. The presence of blank contamination lends a degree bias to the data, that is, is the compound there because it is in the sample or is it there because of blank contamination? To compensate for this bias, the detection limits of the affected compounds are elevated to negate the influence of blank contamination. First, the maximum concentration of the compound occurring in the blank is determined. Using that value, an action-level of five or ten times the blank concentration is set. Five times is used for uncommon contaminants, and ten times is used for methylene

3-7

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chloride, acetone, toluene, and methylethylketone. All positive values below the action level are qualified with a "B" (Blank contamination), and the data are not used in defining the nature and extent of contamination or in the risk assessment. Matrix spikes (MS) and matrix spike duplicates (MSD) are checked to ensure they are within a specific range. All sample results for which the MS/MSD data are not within the specified range are considered as non-detected data. This data is flagged during data validation.

3.1.6 Data Gaps

The only significant gap in data from the investigation of the Former Base Landfill is the lack of information on the sub-regional ground-water system and ground-water quality and usage in the area. Although a broad discussion of the regional ground-water system (regional aquifers, etc.) is presented in Section 1.5.2, it is difficult to determine how the results of a small scale investigation like the one conducted at the landfill fit into the overall "big picture". More information on ground-water quality and usage in the vicinity of the landfill would be helpful in performing the risk assessment presented in Section 4 of this report.

3.1.7 Conclusions

The following conclusion can be drawn from the Site Investigation at the Former Base Landfill:

- The results of the geophysical survey correlate well with historical aerial photographs which indicate that the majority of disposal activities occurred in the southwest, north central and northeast portions of the landfill.
- The water-bearing sediments of Zone 2 thicken substantially from the south end of the site northward. This was anticipated because the Geophysical Survey Report identified the shallow soils in the northern portion of the landfill as being predominantly sandy grading into clays at the southern end of the site.
- Ground-water flow direction is to the east-northeast, probably at a higher gradient than normal due to the sand pit east of the landfill. The water

3-8

level in MW-03 is observed at depths which correlate with the clays of Zone 1, while unsaturated portions of Zone 2 are present above the water level in the remaining wells.

 No volatile organic compounds were detected in soil or ground-water samples collected at the landfill. Although low concentrations of pesticides were detected in soil and ground-water samples, and several BNAs and metals were present in surface soil samples, there does not appear to be a concern at the landfill.

3.2 POL STORAGE AREA

3.2.1 Soils Investigation

The borings drilled at the POL Storage Area ranged in depth from 20 feet (SB-14) to 33.5 feet (SB-10). The same three zones which are present beneath the landfill were encountered during drilling activities at the POL site. However, due to variations in the soil profile, the clays of Zone 1 were further divided into two subzones (designated as Zone 1A and Zone 1B). Descriptions of the units are as follows:

Zone 1A

Zone 1A consists of soft to stiff, dark brown, black and gray-green clays. Some fill material and abundant roots are present in the top 2-3 feet. Iron staining and nodules are common, as are calcareous zones. Minor amounts of silt and sand are contained within Zone 1A, especially in its lower portions. In several of the borings drilled through the diked area (SB-11 through SB-13), strong hydrocarbon odors and some staining were present in the top 6-8 feet. Zone 1A ranged in thickness from 12 feet in SB-12 and the boring for PZ-02 to 6 feet in SB-08.

Zone 1B

Zone 1B is a medium stiff to very stiff gray and rust silty clay. Iron staining and nodules are common throughout, as is abundant calcareous material. Silt content increases with depth, with the color of the clay changing to

brown with increasing silt content. No hydrocarbon odor was present within this zone in any of the borings. The thickness of Zone 1B ranged from 12 feet in the boring for PZ-01 to 5 feet in SB-07.

Zone 2

Zone 2 is a layer of dense, brown clayey silt and silty sand. As at the landfill, this is the first zone of sediments beneath the site transmissive enough to allow ground water to enter a borehole during drilling. The sand is very fine to fine grained, with iron staining common throughout. Some semiconsolidated sandstone and siltstone are present within the silt/sand layer, as are some silty clay seams. Only SB-08, SB-09 and SB-10 fully penetrated Zone 2; the remainder of the borings were terminated within the zone. Zone 2 ranges from 9.5 feet in SB-07 to greater than 14 feet in SB-09.

Zone 3

Zone 3 is a brown sandy and silty clay. The clay is very stiff to hard, and contains some sandy seams. None of the borings drilled at the site fully penetrated Zone 3. However, an engineering study conducted for the city of Houston in March 1988 indicates that in borings in the vicinity of the POL Storage Area, Zone 3 is between 15 and 25 feet in thickness. This clay is, in turn, underlain by another water-bearing silty sand zone.

Two cross sections were constructed using logs of borings advanced at the POL Storage Area. Figure 3-7 depicts the locations of these cross-sections, which are shown in Figures 3-8 and 3-9.

3.2.2 Hydrogeologic Investigation

Three piezometers and four ground-water monitoring wells were installed at the POL Storage Area as part of the SI. Pertinent piezometer and monitoring well data are presented in Table 3-8. Initially, three piezometers, PZ-01 through PZ-03, were installed at the site. Ground-water elevations derived from January 12, 1990 water level measurements and surveyed top of casing elevations allowed for the

construction of a ground-water contour map (Figure 3-10). This map depicts ground-water flow direction as being to the east-northeast. The cross sections presented in Figures 3-8 and 3-9 for the POL Storage Area show the water table for all monitor wells above the sand layer. This could be indicative of artesian conditions or it could mean that the clays above the aquifer are saturated but do not readily yield ground water to a borehole during drilling.

HAZWRAP was notified of the flow direction, and it was decided that monitoring wells would be installed at the locations proposed in the SAP. Four wells, MW-07 through MW-10, were installed at the POL Storage Area. A ground-water contour map was constructed using measurements taken in the four wells on January 19, 1990. This map (Figure 3-11) confirmed that ground-water flow direction was generally in an easterly direction. The hydraulic gradient calculated using the contours from Figure 3-10 is 0.014 feet/feet (73.92 feet/mile); the gradient using contours from Figure 3-11 is 0.015 feet/feet (79.2 feet/mile). As at the landfill, these gradients were significantly higher than normal (20 feet/mile) for shallow Gulf Coast sediments. This is likely due to the location of MW-07 within a probable recharge area.

Slug tests were performed at all four wells at the site. The assumptions made in evaluating the slug test data were identical to those used in evaluating data from the landfill wells (see pages 3-4 and 3-5). Estimated hydraulic conductivity and transmissivity values are presented in Table 3-9. Values from rising head tests range from 1.46×10^{-3} cm/sec to 9.29×10^{-4} cm/sec. Again, falling head tests were used for comparative purposes and were equal or similar to those for rising head tests. Transmissivity estimates ranged from 402.57 gallons/day/foot to 226.79 gallons/day/foot.

Estimates of horizontal ground-water flow velocities were calculated for variable hydraulic conductivities and effective porosities and are shown in Table 3-10. Estimates range from a maximum of 452.6 feet/year to 57.6 feet/year.

3.2.3 Background Samples

Upgradient background ground-water and soil samples were collected from areas not believed to have been affected by past waste management practices. Samples

02-MW07-A and 02-SB07C-A are designated background ground-water and soil samples, respectively, at the POL Storage Area. The well is hydraulically upgradient of the other wells at the site, and neither of the two samples contained any TCL volatiles, BNAs or petroleum hydrocarbons.

3.2.4 Contaminant Occurrence and Distribution

This section summarizes information on the nature and extent of contamination at the POL Storage Area.

Subsurface Soil

Subsurface soil samples for laboratory analysis were collected from eight borings advanced in the FOL Storage Area. A total of 23 samples were sent to a fixed-base laboratory. All samples were analyzed for TCL volatiles and petroleum hydrocarbons. One sample from each boring was analyzed for TCL BNAs based on field evidence of contamination. In the absence of field evidence, the sample collected at the top of ground water was analyzed for BNAs. Table 3-11 presents a summary of the quantitative results.

Several volatile organic compounds were detected in subsurface soil samples. Ethylbenzene was detected in four samples from two different borings in concentrations ranging from 3 to 13,000 µg/kg. Several volatile compounds were detected in one deep (top of ground water) sample, 02-SB13C-A. The concentrations of these compounds in ground water, however, were extremely low.

Two BNAs, naphthalene and 2-methylnaphthalene, were detected in samples from both SB-10 and SB-13, as were petroleum hydrocarbons.

Ground Water

Ground-water samples were collected from the four wells installed at the POL Storage Area as part of the SI. Samples were sent to a fixed-base laboratory and analyzed for TCL volatiles, TCL BNAs and petroleum hydrocarbons. Table 3-12 presents a summary of the quantitative results. Some samples were reported to have no quantitative results, and therefore, are not indicated in Table 3-12.

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Volatile organics were detected only in the ground-water sample from MW-10. Ethylbenzene, total xylenes, styrene, and chlorobenzene were all detected in extremely low levels in that sample. No BNAs or petroleum hydrocarbons were detected in ground water at the site.

QA/QC

Table 3-13 shows QA/QC sample concentrations for the POL Storage Area. These concentrations were used in conjunction with environmental sample concentrations in the manner described in Section 3.1.4, QA/QC, for the Former Base Landfill.

3.2.5 Data Gaps

The most significant gap in data at the POL Storage Area is that the soil and ground-water contamination in the immediate vicinity of the former remediation trench may not have been adequately characterized. Also, there is a lack of ground-water quality and usage information for the uppermost permeable sediments encountered at Ellington Field (ANG). The underlying (>350 ft below grade) Chicot and Evangeline aquifers are a major source of potable water for the Houston metroplex. Extensive literature references exist for these specific aquifers and the larger Coastal Lowlands aquifer system of which they are a part. At the present time the State of Texas considers all aquifers to be possible sources of potable water. A classification of the States aquifers is currently underway. There are no downgradient wells within one mile of the site. There are four municipal wells located on City of Houston and City of Pasadena property in the vicinity of Ellington Field (ANG). These wells were discussed in Section 1.5.2 of this report.

A survey of wells in the vicinity of Ellington Field (ANG) was not conducted as part of the SI activities. This will be done during the follow on remedial investigation tasks planned. The well survey will determine:

- If there are any wells within a 2-mile radius of Ellington Field (ANG)
- The depth of each well, if any
- Which wells are currently in use as water supply wells, if any

3.2.6 Conclusions

The following conclusions can be drawn from the investigations and interim remedial action at the POL Storage Area.

- Although the thickness of the soil zones varies from boring to boring, the soil profile is relatively uniform across the site. Shallow soils beneath the diked area exhibited some field evidence of fuel contamination.
- The direction of ground-water flow is generally east across the site. The substantially higher water level in MW-07 is probably due to the well's location in the drainage ditch.
- Water levels in all wells are observed at depths which correlate with the silty clays of Zone 1B, indicating that these sediments are probably saturated, but do not readily transmit water to a borehole during drilling, or, the aquifer is semi-confined.
- Several volatile organic compounds and petroleum hydrocarbons were detected in subsurface soil samples from borings within the diked area. Petroleum hydrocarbons were detected in a soil sample from 0-2 feet below the concrete in SB-13 at a concentration of 132 ppm, above the TWC criterion for clean closure (100 ppm). Several samples collected from the walls and flow of the remediation trench contained petroleum hydrocarbons at levels significantly above 100 ppm. The extent of soil contamination east of the remediation trench has not been determined.

TABLE 3-1
MONITORING WELL DATA
FORMER BASE LANDFILL

Monitoring Well	North Coordinate	East Coordinate	Top of Casing Elevation(a)	Natural Ground Elevation	Depth Below Top of Casing	Depth Below Grade	Screened Interval Below Grade	Filter Pack Below Grade	Bottom of Well Flevation
MW-01	670 512 87	670 512 87 3 215 820 54	37.60	25.00					
		2,213,020.34	37.00	35.90	30.87	58	16-26	13.29	5.91
MW-02	670,130,43	670,130,43 3,216,435,09	36.97	27.70	3, 3,			62.61	5
		50:55:15:=15	10.00	24.70	30.18	28.5	15.5-25.5	13.28 5	6,60
MW-03	669.649.88	3 215 892 93	37.80	36.45	25.55			2:21	0.03
		66:360/513/5	20.70	20.13	25.03	23.5	10.5-20.5	8.5-23.5	17 77
MW-04	670,063,70	670,063.70 3.215.209.60	30 35	36.00	35 36				, , , ,
		30:55=/=:=/=	25:55	20.30	7P. 70	72	12-22	10-25	12.65
MW-05	670 505 72	670 505 72 3 216 411 89	26 64	,,,,,					60:31
		00.117,012,0	20.04	34.71	30.68	59	16.5-26.5	13.5-29	5 96
									ה. ה

(a) All elevations in feet with respect to mean sea level.

TABLE 3-2

ESTIMATES OF IN-SITU HYDRAULIC CONDUCTIVITY AND TRANSMISSIVITY FORMER BASE LANDFILL AIR TRANSMISSIVITY

			Hydraulic	Hydraulic Conductivity			
Well	Thickness of Unit (feet)	Rising	Rising Head	Falling Head	Head	Transm	Transmissivity(a)
	•	cm/sec	ft/day	cm/sec	ft/day	ft/day	gallons/day/ft
MW-01	13	3.06×10^{-4}	0.87	3.62×10^{-4}	1.03	11.31	84.60
MW-02	9.51	2.43×10 ⁻³ 2.46×10 ⁻³	6.90 6.97	(q)	(a)	66.28	495.81
MW-03	2.5	2.67×10^{-4}	0.76	3.05×10^{-4}	0.86	1.90	14.21
MW-04	10.72	3.18×10^{-3} 3.41×10^{-3}	9.03 9.66	(a)	(a)	103.55	774.59
MW-05	8.8	4.08×10 ⁻³ 4.15×10 ⁻³	11.58 11.75	(a)	(a)	103.40	773.43

Hydraulic conductivities from rising head tests were used to calculate transmissivities. In instances where two rising head tests were performed, the higher hydraulic conductivity was used. Did not conduct falling head tests due to open screen above water level in wells. Two rising head tests were performed. (a) **(P)**

TABLE 3-3 **ESTIMATES OF DARCIAN SEEPAGE VELOCITY** FORMER BASE LANDFILL

Hydraulic Gradient (ft/ft)		ctive sity ^(a)	Condu	raulic ictivity ay) ^(b)	Velo	Seepage ocity day)	Velo	Seepage ocity rear)
(1010)	Low	High	Low	High	Low	High	Low	High
.015	0.05	0.25	0.76		0.046	0.066	16.64	24.4
.015	0.05	0.25		11.75	0.705	1.03	257.36	377.41

Effective porosity estimates based on estimates of specific yield for similar soil types from Fetter, 1979, <u>Applied Hydrogeology</u>. Hydraulic conductivity estimates based on range of hydraulic conductivities for rising head tests presented in Table 3-2. (a)

(b)

TABLE 3-4 SURFACE SOIL CONCENTRATIONS(a)(b) FORMER BASE LANDFILL

Sample Number Sample Depth Sample Date	01-SS01-A 0"- 6" 1/17/90	01-SS02-A 0"- 6" 1/17/90	01-SS03-A 0"- 6" 1/17/90	01-FD05-A Duplicate of 01-SS03-A
Base/Neutrals (µg/kg)				
Butylbenzylphthalate				420 J
Acenaphthene	-		250 J	5 60 J
Anthracene			520 J	1,100 J
Benzo (A) Anthracene		800	1,500 J	3, 200 J
Benzo (B) Fluoranthene		880	1,300	2,300
Benzo (K) Fluoranthene		930	1,100 J	2,600 J
Benzo (A) Pyrene		1,000	1,300 J	2,7 0 0 J
Chrysene		860	1,500	3,000
Flouranthene	-	1,500	3,300	5,400
Flourene			270 J	560 J
Indene (1,2,3-CD) Pyrene				1,7 0 0 J
Napthalene				190 J
Phenanthrene		510 J	2,300	4,200
Pyrene		1,200	2,500	4,600
Dibenzofuran				240 J
Pesticides (μg/kg)				
4,4'-DDT	,		10 J	
4,4'-DDD				11 J
4,4'-DDE				12 J

 ⁽a) No entry indicates parameter not detected above Contract Required Quantitation Limit
 (b) J - lab qualifier indicating estimated value.
 [] - data validation qualifier indicating estimated value.

TABLE 3-4 (CONTINUED)
SURFACE SOIL CONCENTRATIONS(a)(b) **FORMER BASE LANDFILL PAGE TWO OF TWO**

Sample Number Sample Depth Sample Date	01-SS01-A 0"- 6" 1/17/90	01-SS02-A 0"- 6" 1/17/90	01-SS03-A 0"- 6" 1/17/90	01-FD05-A Duplicate of 01-SS03-A	
Inorganics (mg/kg)					
Aluminum	7,250 J	6,010 J	13,500 J	8, 500 J	
Arsenic	4.4	3.5 J	2.9 J	62.0 J	
Barium	302 J	141 J	115 J	125 J	
Calcium	29,600	39,900	6,4 6 0 J	13,300 J	
Chromium	13.4	16.0	12.2	10.4	
Iron	7,410	6,700 J	10,600	7,330	
Lead	125	141	18.9	26.1	
Magnesium	2,720	1,480	2,000	1,860	
Manganese	152	111 J	91.8	116	
Mercury	[0.10]	[0.19]	[0.06]	[80.0]	
Potassium	[678]	[492]	[934]	[566]	
Sodium	[233]	[253]	[125]	[109]	
Zinc	150	180 J			

⁽a) No entry indicates parameter not detected above Contract Required Quantitation Limit

⁽b) J - lab qualifier indicating estimated value.

[] - data validation qualifier indicating estimated value.

TABLE 3-5

SUBSURFACE SOIL CONCENTRATIONS(4Xb) FORMER BASE LANDFILL

Sample Number Sample Depth	01-SB01A-A 16'-18'	01-5801B-A 26'-28'	01-SB02A-A 16'-18'	01-SB03A-A 8'-10'	01-SB03B-A 12'-14'	01-SB04A-A 4'-6'	01-5B04B-A 12'-14'	01-SB05A-A 10'-12'	01-5B05B-A 18'-22'	01-FD02-A Duplicate of
Sample Date	12/13/89	12/13/89	12/14/89	12/13/89	12/13/89	12/12/89	12/12/89	12/21/89	12/21/89	01-58058-A
Acid Extractables (µg/kg)										
Phenol										22
Pesticides (µg/kg)										
Heptachlor					12					13 J
Inorganics (mg/kg)										
Aluminum	080'6	096'1	849	5,780	3,530	065'6	3,060	6,370	948	1,840
Arsenic	3.9	[99 0]	[0 51]		[1.8]	5.0	[98 0]			1.9
Barium	6 26	[523]	[113]	74.4	136	106	[3 2]	35.1	89	7.4
Beryllium	[0 82]			[0 55]	[0 32]	[06 0]				
Calcium	38,000	20,000		1,240				1881		358
Chromium	101							0.7		2.4
Cobalt	[4 9]					22.0		5.6		1.9
Соррег	8 9	[1.7]		[3.6]	[2.1]	[9 5]		48	2.0	
iron	16,000	2,920	1,430	3,800	4,010	0£1	3,400	9,360	1,600	3,400
Lead	8 2	5 2	18	36	8 7	851	3.4	4.2	2.0	2.4
Magnesium	3,460	[1,030]		1,150	1,250	1,470	[823]			

No entry indicates parameter not detected above Contract Required Quantitation Limit J. lab qualifier indicates estimated result []- data validation qualifier indicating estimated value <u>e</u> e

TABLE 3-5 (CONTINUED)
SUBSURFACE SOIL CONCENTRATIONS(4Xb)
FORMER BASE LANDFILL
PAGE TWO OF TWO

Sample Number Sample Depth Sample Date	01-5801A-A 16'-18' 12/13/89	01-58018-A 26'-28' 12/13/89	01-5802A-A 16'-18' 12/14/89	01-5803A-A 8'-10' 12/13/89	01-SB03B-A 12'-14' 12/13/89	01-SB04A-A 4'-6' 12/12/89	01-5B04B-A 12'-14' 12/12/89	01-5805A-A 10'-12' 12/21/89	01-SB05B-A 18'-22'	01-FD02-A Duplicate of
Manganese	474	905							69/17/2	A-90-90-10
		92	3/3	12.4	452	540	57.4	386	16.3	71.7
wercury	[0 14]	[0 15]	[0 19]	[0.18]	10 191	0.20	95.0			
Nickel	3]				0.50	0.48	0.34	0 2 1	0 33
	1,23	[4.3]	(9 8)	ls s)	[5.5]	16.2	15.61	=		
Potassium	1,400	[210]	145.61	330					23	
7,500				340	14071	[687]	[151]	874	156	
Vandalium	70.7	(3.8)	(3.5)	[3.9]	15.71	20.9	16.31			
Zinc	200						le el	6.0	22	5.5
	, , ; ;			ן ני גני		15.6				

No entry indicates parameter not detected above Contract Required Quantitation Limit J- lab qualifier indicates estimated result [] - data validation qualifier indicating estimated value **e e**

GROUND-WATER CONCENTRATIONS(a)(b) FORMER BASE LANDFILL

Sample Number Sample Date	01-MW01-A 1/25/90	01-MW02-A 1/25/90	01-MW03-A 1/23/90	01-MW04-A 1/23/90	01-MW05-A 1/25/90	01-FD06-A Duplicate of 01-MW05-A
Pesticides (μg/L)						
Alpha BHC	0.037 J					
Methoxychior					0.022 J	
Inorganics (µg/L)						
Aluminum				2910		
Barium			517			
Beryllium				[1.3]		
Calcium	176,000	78,400	002'06	153,000	104,000	101,000
Chromium				<u> </u>		
Iron				3,710		
Lead		10.6		*		
Manganese	255			498		
Nickel				[12.1]		
Vanadium				[8:01]		
Geochemical Parameters (mg/L)						
Petroleum Hydrocarbons					0.9	

No entry indicates parameter not detected above Contract Required Quantitation Limit J - lab qualifier indicating estimated value. [] - data validation qualifier indicating estimate value. **(2)**

TABLE 3-7 BLANK SAMPLE CONCENTRATIONS (a)(b)

FORMER BASE LANDFILL

		HPLC Water		Municip	ai Water	
Sample Number Sample Date Description	01-FB01-A 12/14/89 Field Blank	01-F803-A 12/21/89 Field Blank	01-FB10-A 1/2 4/90 Field Blank	01-FB02-A 12/14/89 Field Blank	01-F804-A 12/21/89 Field Blank	01-FB11-A 1/2 4/90 Field Blank Landfill Hydrant
Volatiles (µg/L)						
Acetone				85		
2-Butanone						110
2-Hexanone						
Benzene			8			
Chloroform						33
Methylene Chloride			14			21
Bromoform				30		21
Bromodichloromethane				15	16	41
Chlorodibromomethane				36	33	44
Carbon Disulfide						
Base Neutrals (µg/L)						
Bis (2-ethylhexyl)phthalate			1			
Pyrene		99				
Acid Extractables (µg/L)						
Pentachiorophenol		230				
Pesticides (µg/L)						
Delta BHC						
Gamma BHC						
Heptachlor						
Inorganics (µg/L)						
Aluminum						
Arsenic		0.18				
Barium						[93.4]
8eryllium		0.44			0.35	
Calcium	[93]		[711]	[85.9]		14,400
Chromium	[1.3]			[1.6]		
Cobalt			[6.9]			[9.8]
Iron			[29.0]			106
Lead				[0.14]	0.33	[1.7]
Magnesium	[75.7]					[4,230]
Manganese						16.5
Mercury			0.21			0.25
Potassium						[1,110]
Silver						
Sodium	[139]			[198]	96.3	100,000
Vandium		1.1				
Zinc	[2.3]			[2.0]	1.0	195

No entry indicates parameter not detected above Contract Required Quantitation Limit.

⁽b) [] data validation qualifier indicating estimated value. NA - Not analyzed.

TABLE 3-7 (CONTINUED) QAYOC SAMPLE CONCENTRATIONS (#Xb) FORMER BASE LANDFILL PAGE TWO OF TWO

Sample Number Sample Date Description	01-RB01-A 12/12/89 Rinsate Blank	01-R803-A 12/14/89 Rinsate Blank	01-RB13-A 1/25/90 Rinsate Blank	01-T801-A 12/13/89 Trip Blank	01-TB03-A 12/14/89 Trip Blank	01-TB04-A 12/21/89 Trip Blank	01-TB09-A 1/25/90 Trip Blank
Volatiles (µg/L)							
Acetone							
2-Butanone	76						
2-Hexanone	27						
Benzene			10				10
Chloroform				33	36	40	53
Methylene Chloride			13	19	19		22
Bromoform							
Bromodichloromethane							
Chlorodibromomethane							
Carbon Disulfide			67				
Base Neutrals (µg/L)							
Bis (2-ethylhexyl)phthalate				NA	NA	NA	NA
Pyrene				NA	NA	NA	NA
Acid Extractables (µg/L)	,-						
Pentachiorophenol				NA	NA	NA	NA
Pesticides (µg/L)							
Delta BHC			0.072	NA	NA	NA	NA
Gamma BHC			0.14	NA	NA	NA	NA
Heptachior			0.18	NA	NA	NA	NA
Inorganics (µg/L)							
Aluminum	[8.8]			NA	NA	NA	NA
Arsenic				NA	NA	NA	NA
Barium				NA	NA	NA	NA
Beryilium				NA	NA	NA	NA
Calcium	[198]	[83.9]	[1,770]	NA	NA	NA	NA
Chromium	[1.1]	(1.1)		NA	NA	NA	NA
Cobait			[8.4]	NA	NA	NA	NA
ron	[2.2]		[52.0]	NA	NA	NA	NA
Lead			[0. 80]	NA	NA	NA	NA
Viagnesium	74.0	[0.14]		NA	NA	NA	NA
Manganese				NA	NA	NA	NA
Mercury				NA	NA	NA	NA
Potassium				NA	NA	NA	NA
ilver			{6.9}	NA	NA	NA	NA
odium	[100]		[540]	NA	NA	NA	NA
/andium	[1.8]			NA	NA	NA	NA
linc		[2.4]	898	NA	NA	NA	NA

⁽a) No entry indicates parameter not detected above Contract Required Quantitation Limit.

⁽b) [] data validation qualifier indicating estimated value.

NA - Not analyzed.

PIEZOMETER/MONITORING WELL DATA
POL STORAGE AREA TABLE 3.8

Top of Casing Ground/Concrete Top of Casing Elevation(a) Elevation Top of Casing Grade Below Grade Relow Grade	72.16	23.23 27.96 28 15.25 12.5.20	23.31 23.55 32.35		25.27 25.65 37.63 23	05:33	27.59 25.82 34.84 33.5	20 13	28.73 26.65 29.52 29 24-26.5 22.20	26.78 24.85 25.75		25.10 23.45 (c) 22.5
of Casing Jation(a)	-						-					_
East Coordinate	3 217 921 70		3,218,072.43	7, 20, 01, 0	3,218,182.34	7, 200 000 0	3,218,081.15	3 218 081 47	7,510,001.47	3,218,241.40		(a)
North Coordinate	658,931.22 3.217.921.70		658,757.71		7.060,000	650 073 15	61.670,660	659 060 17		658,753.85	1	e)
Station Location	MW-07		80-MW	WW.00		MW-10	2	PZ-01		PZ-02	27.03	CO.71

All elevations are with respect to mean sea level.
The horizontal location of PZ-03 was not surveyed.
Total depth of PZ-03 was not measured. <u>@</u>@

TABLE 3-9

ESTIMATES OF IN-SITU HYDRAULIC CONDUCTIVITY AND TRANSMISSIVITY POL STØRAGE AREA

Well	Thickness	Rising	Rising Head	Fallin	Falling Head	Transm	Transmissivity(a)
	(feet)	cm/sec	ft/day	cm/sec	ft/day	ft2/day	gallons/day/ft
AA1A7 07							,
INI NO - O /	8.0	1.33×10-3	3.79	1.38×10-3	3.92	30.32	226.29
4/14/00	12.0	, ,,					(3.0.2.2
OD- AA IAI	13.0	1.46×10-3	4.14	1.07×10^{-3}	3.02	53.82	402 57
M/M/ 00	14.0	, 0,					10:30
60-44141	14.0	3.29 × 10-4	7.63	8.85×10^{-4}	2.51	36.82	275.41
NA/A/ 10	1, 2,						
DI-MIN	13.5	9.45 × 10-4	2.68	9.50 × 10-4	2.69	36.18	270.63
							20.5

(a) Transmissivities calculated using hydraulic conductivities from rising head tests.

TABLE 3-10

ESTIMATES OF DARCIAN SEEPAGE VELOCITY POL STORAGE AREA

Hydraulic Gradient (ft/ft)		ctive sity(a)	Hydi Conduc	raulic :tivity ^(b)	Velo	city	Velo	Seepage ocity ear)
(1010)	Low	High	Low	High	Low	High	Low	High
.015	0.05	0.25	2.63	-	0.158	0.789	57.60	287.99
.015	0.05	0.25	-	4.14	0.248	1.24	90.67	452.60

(a) Effective porosity estimates based on estimates of specific yield for similar soil types from Fetter, 1979, <u>Applied Hydrogeology</u>.
 (b) Hydraulic conductivity estimates based on range of hydraulic conductivities for rising head tests presented in Table 3-9.

TABLE 3-11

SUBSURFACE SOIL CONCENTRATIONS(a) POL STORAGE AREA

Sample Number Sample Depth Sample Date	02-SB10A-A 8'-10' 1/16/90	02-FD04-A Duplicate of 02-SB10A-A	02-5B13A-A 0'-2' 12/19/89	02-5B13B-A 4'-6' 12/19/89	02-5813C-A 20'-22' 12/19/89	02-SB14A-A 0'-2' 12/19/89
Volatiles (µg/kg)						
Acetone			160			250
2-Butanone						41 1
4-Methyl-2-Pentanone					4)	
Benzene			ر 180			
Ethylbenzene	r 99		210 J	ر 000'13	3 Ј	
Total Xylenes			240		12 J	
Styrene					5 Ј	
Chlorobenzene					1)	
Methylene Chloride				6,100 J		
1,2 Dichloropropane					1	
Base/Neutrals (μg/kg)						
Naphthalene		110 J		200 J		
2-Methylnaphthalene	150 J	340 J		640		
Geochemical Parameters (mg/kg)						
Petroleum Hydrocarbons	66	66	132			

(a) No entry indicates parameter not detected above Contract Required Quantitation Limit (b) Jab qualifier indicating estimated value.

TABLE 3-12

GROUND-WATER CONCENTRATIONS(a)
POL STORAGE AREA

Sample Number Sample Date	02-MW10-A 1/22/90
Volatiles (μg/L)	
Ethylbenzene	6 J
Total Xylenes	23 J
Styrene	10 J
Chlorobenzene	6 J

⁽a) J qualifier indicates estimated result.

TABLE 3-13

BLANK SAMPLE CONCENTRATIONS (a)
POL STORAGE AREA

Sample Number Sample Date Description	02-FB05-A 1/13/90 Field Blank HPLC Water	02-FB06-A 1/13/90 Field Blank Municipal Water	02-FD08-A 1/16/90 Field Blank Municipal Water	02-FD09-A 1/24/90 Field Blank POL Spigot
Volatiles (μg/L)				
Acetone	24			
2-Butanone				
2-Hexanone				
Benzene	15			10
Toluene				16
Ethylbenzene				5
Total Xylenes				37
Chlorobenzene		18		
1,1-Dichloroethene				
Chloroform		20	24	36
Methylene Chloride	12			23
Bromoform		15	22	14
Bromodichloromethane			21	9
Chlorodibromomethane		32	34	15
Carbon Disulfide				
Vinyl Acetate		23		
Base Neutrals (µg/L)				
Bis (2-ethylhexyl) phthalate				1
Naphthalene				1
Geochemical Parameters				
Petroleum Hydrocarbons				

⁽a) No entry indicates parameter not detected above Contract Required Quantitation Limit. NA - Not analyzed.

TABLE 3-13
BLANK SAMPLE CONCENTRATIONS (a)
POL STORAGE AREA
PAGE TWO OF THREE

Sample Number Sample Date Description	02-RB05-A 12/19/89 Rinsate Blank	02-RB07-A 1/12/90 Rinsate Blank	02-RB11-A 1/22/90 Rinsate Blank	02-TB03-A 12/19/89 Trip Blank
Volatiles (μg/L)				
Acetone				
2-Butanone				
2-Hexanone		17		
Benzene			8	
Toluene				
Ethylbenzene				
Total Xylenes				
Chlorobenzene				
1,1-Dichloroethene				
Chloroform				20
Methylene Chloride	Ţ		14	
Bromoform				
Bromodichloromethane				
Chlorodibromomethane				
Carbon Disulfide			85	
Vinyl Acetate				
Base Neutrals (µg/L)				
Bis (2-ethylhexyl)phthalate	8		2	NA
Naphthalene				NA
Geochemical Parameters				
Petroleum Hydrocarbons	23			NA

⁽a) No entry indicates parameter not detected above Contract Required Quantitation Limit.

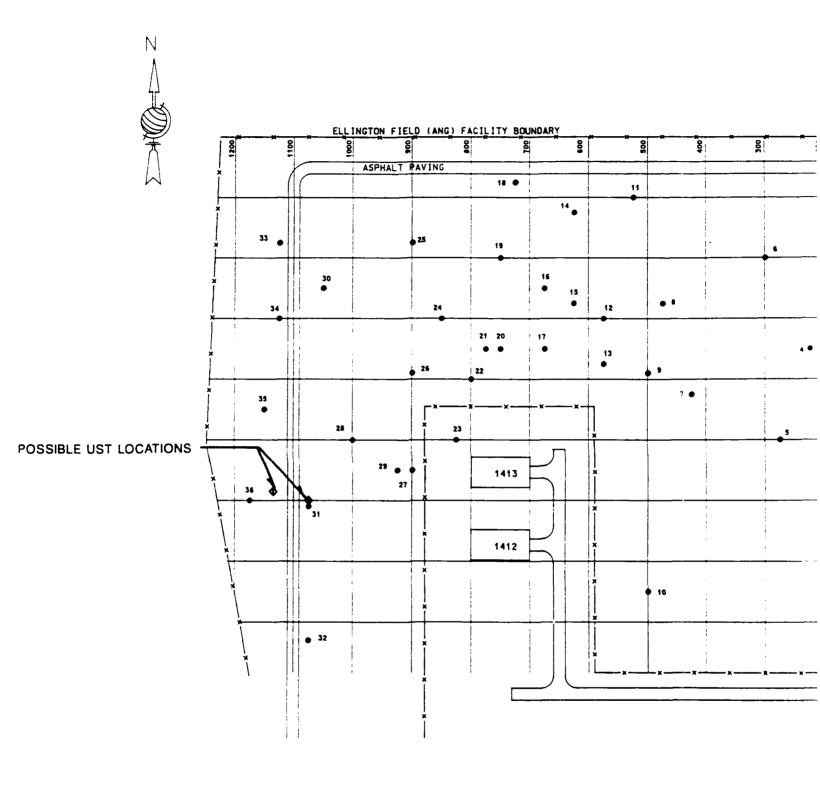
NA - Not analyzed.

TABLE 3-13 BLANK SAMPLE CONCENTRATIONS (a) POL STORAGE AREA PAGE THREE OF THREE

Sample Number Sample Date Description	02-TB05-A 1/12/90 Trip Blank	02-TB06-A 1/16/90 Trip Blank	02-TB07-A 1/22/90 Trip Blank	02-TB08-A 1/24/90 Trip Blank
Volatiles (μg/L)				
Acetone			23	
2-Butanone			6	
2-Hexanone				19
Benzene			9	9
Toluene	ĺ		8	
Ethylbenzene				5
Total Xylenes				
Chlorobenzene				
1,1-Dichloroethene			9	
Chloroform	40	51	30	31
Methylene Chloride			18	18
Bromoform				
Bromodichloromethane				
Chlorodibromomethane				
Carbon Disulfide				15
Vinyl Acetate				
Base Neutrals (µg/L)				
Bis (2-ethylhexyl)phthalate	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA
Geochemical Parameters				
Petroleum Hydrocarbons	NA	NA	NA	NA

⁽a) No entry indicates parameter not detected above Contract Required Quantitation Limit.

NA - Not analyzed.



LEGEND

• --- LOCATIONS OF ANOMALOUS ZONES

• --- POSSIBLE UST LOCATIONS

DRAIM BY J. A
DATE: 5-31-90
HYDROGEOLOGIST
DATE: 5-31-90

CAD DWG. NO. 36

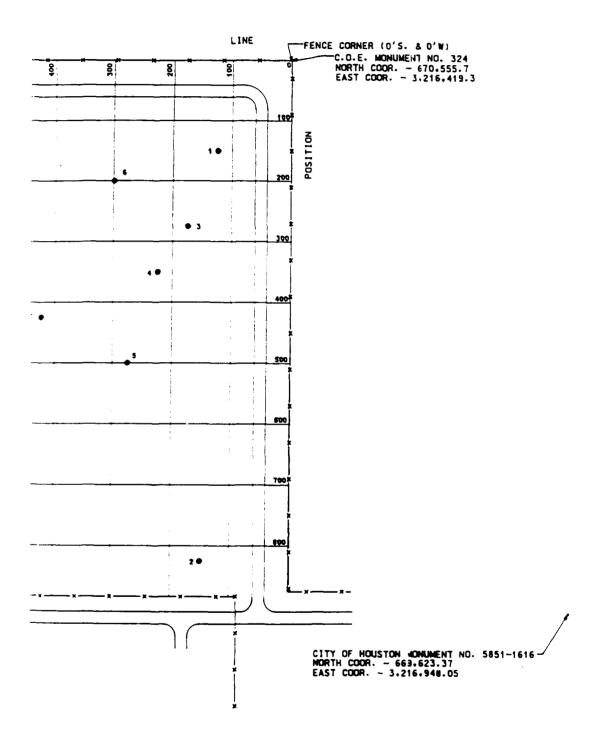


FIGURE 3-1

DRAWN BY J. ATKINSON

DATE: 5-31-90

HYDROGEOLOGIST D. UPTHEGROVE

DATE: 5-31-90

CAD DWG. NO. 363N2801.DGN

LOCATIONS OF ANOMALOUS ZONES AS

DETECTED BY GEOPHYSICS

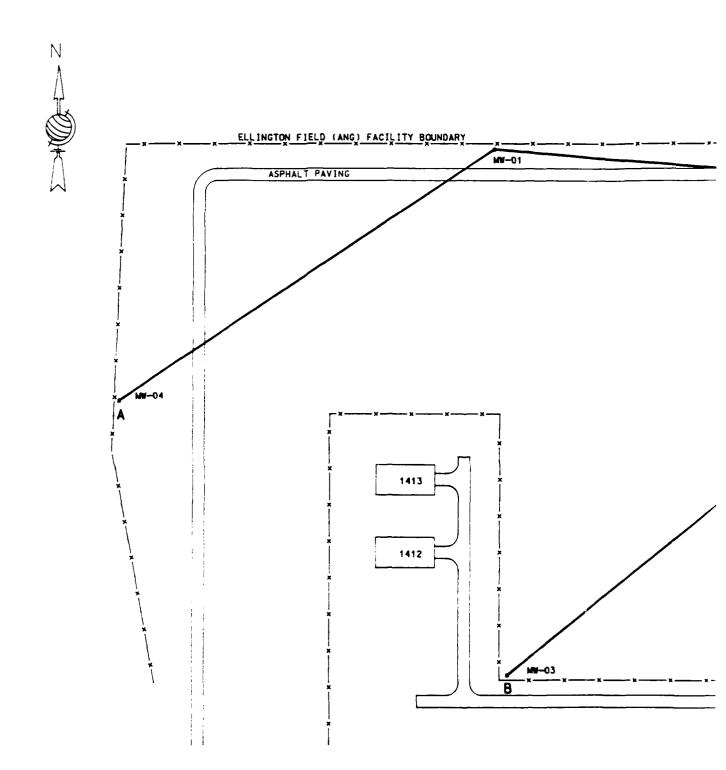
FORMER BASE LANDFILL

ELLINGTON FIELD (ANG) HOUSTON. TEXAS

TO DWG. NO. 363N2801.DGN

BCALE: 1" - 186" MUS DWG. NO. 363N-2801 MEV. 0

A Halliburton Company

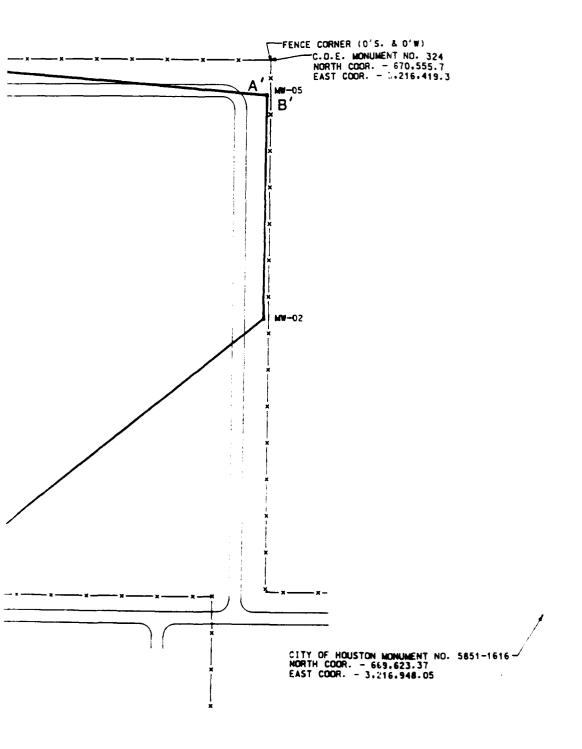


DRAWN BY J.

DATE: 5-31-9

HYDROGEOLOGIS

DATE: 5-31-9(
CAD DWG. NO.



DRAWN BY J. ATKINSON

DATE: 5-31-90

CROSS-SECTION LOCATION MAP

FORMER BASE LANDFILL

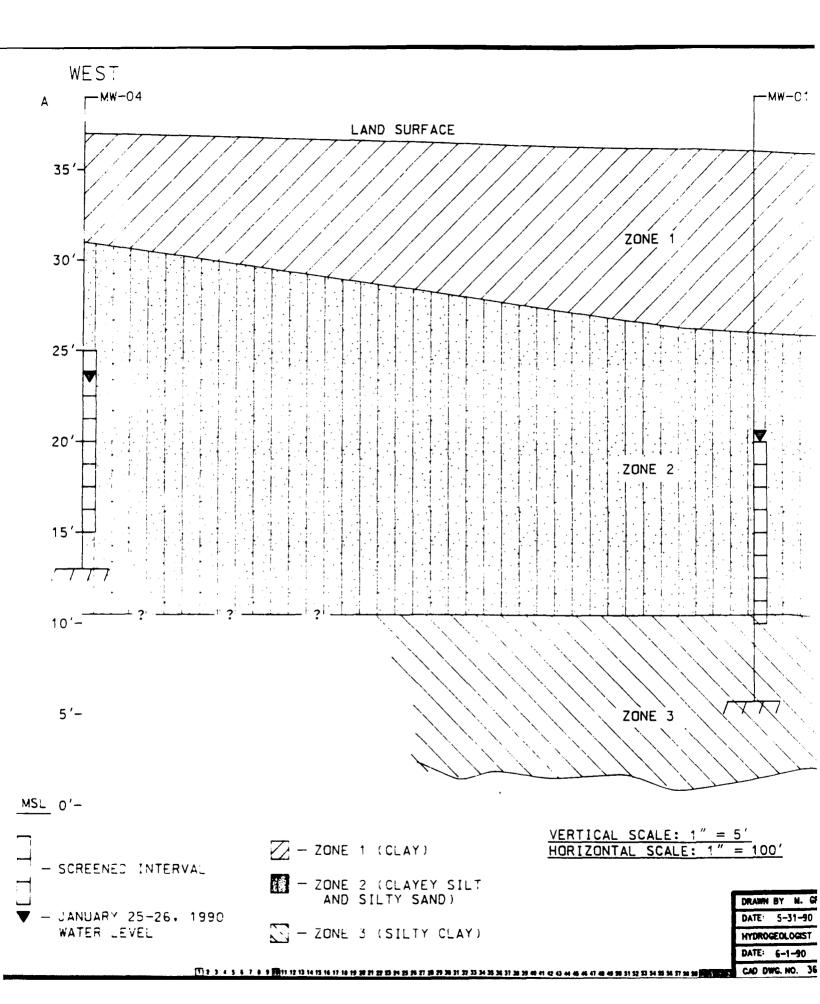
DATE: 5-31-90

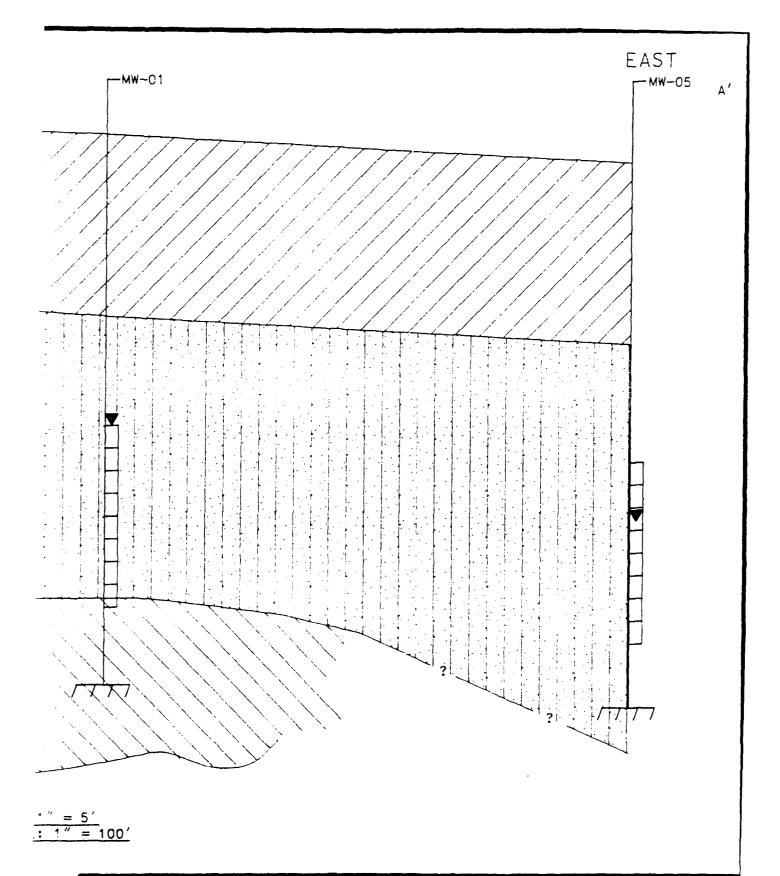
ELLINGTON FIELD (ANG) HOUSTON. TEXAS

CAD DWG. NO. 363M2801. DGN

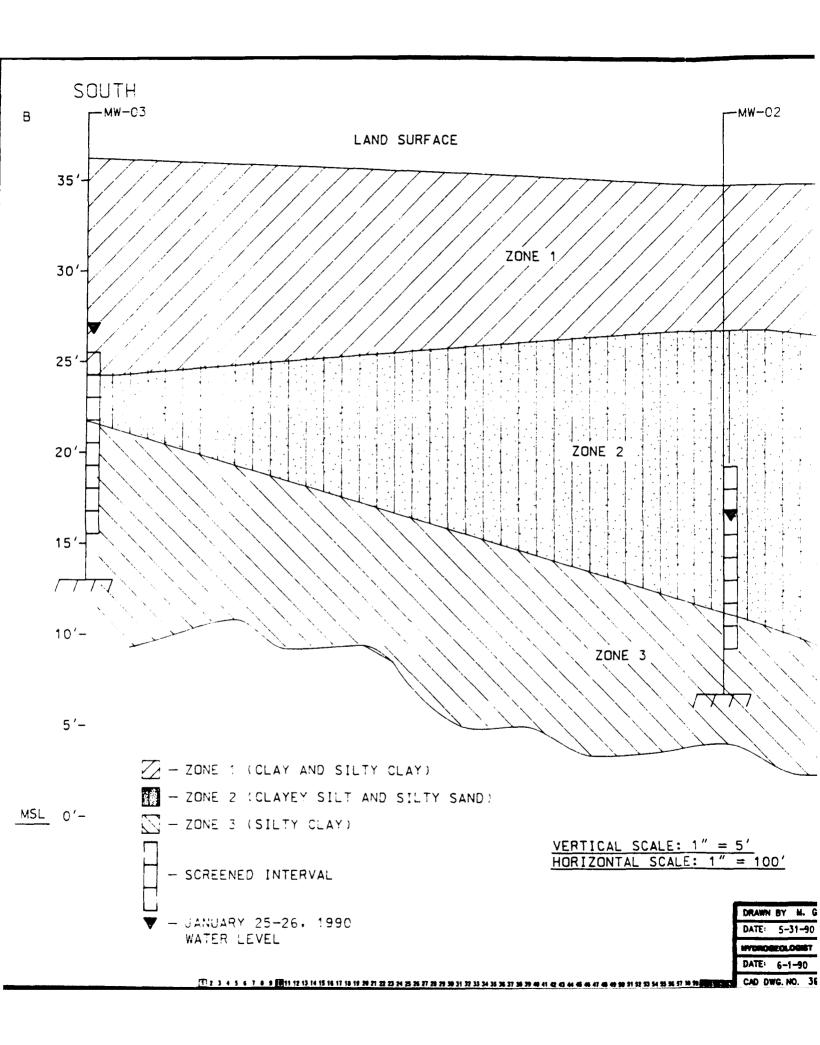
SCALE: 1" - 180" MUS DWG. NO. 363M-2801 MEV. 0

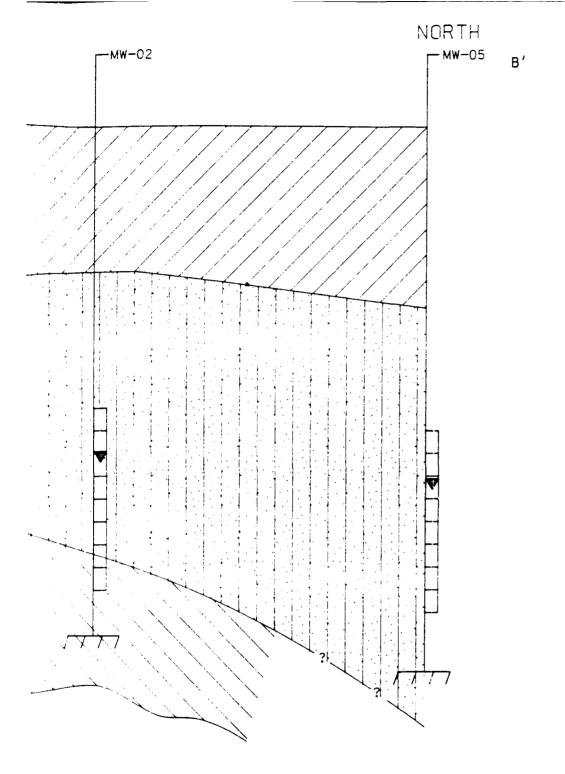
A Halliburton Company





	DRAWN BY M. GREEN	FIGURE 3-3	
- 1	DATE: 5-31-90	CROSS-SECTION A-A'	
	HYDROGEOLOGIST D. UPTHEGROVE	FORMER BASE LANDFILL	CORPORATION
	DATE: 6-1-90	ELLINGTON FIELD (ANG) HOUSTON, TEXAS	
5 X	CAD DWG. NO. 363M1801-DGN	SCALE: AS NOTED NUS DWG. NO. 363M-181 REV. O	A Halliburton Company

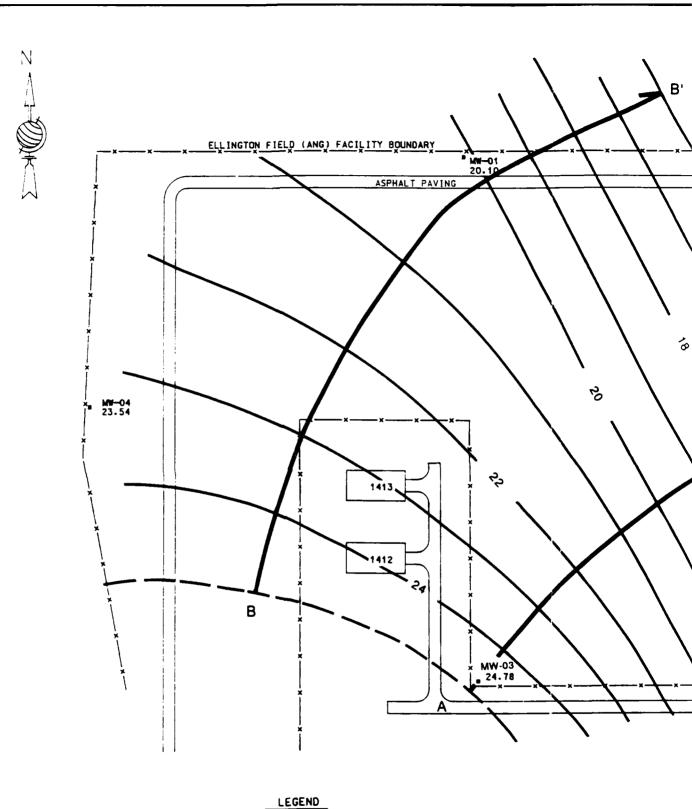




<u>LE: 1" = 5'</u> <u>CALE: 1" = 100'</u>

3 36 ST 10 30 TO

DRAWN BY M. GREEN	FIGURE 3-4	
DATE: 5-31-90	CROSS-SECTION B-B'	
HYDROGEOLOGIST D. UPTHEGROVE	FORMER BASE LANDFILL	LU CORPORATION
DATE: 6-1-90	ELLINGTON FIELD (ANG) HOUSTON. TEXAS	
CAD DWG. NO. 363M1802.DGN	SCALE: AS NOTED NUS DWG. NO. 363M-182 REV. O	W A Halliburton Company

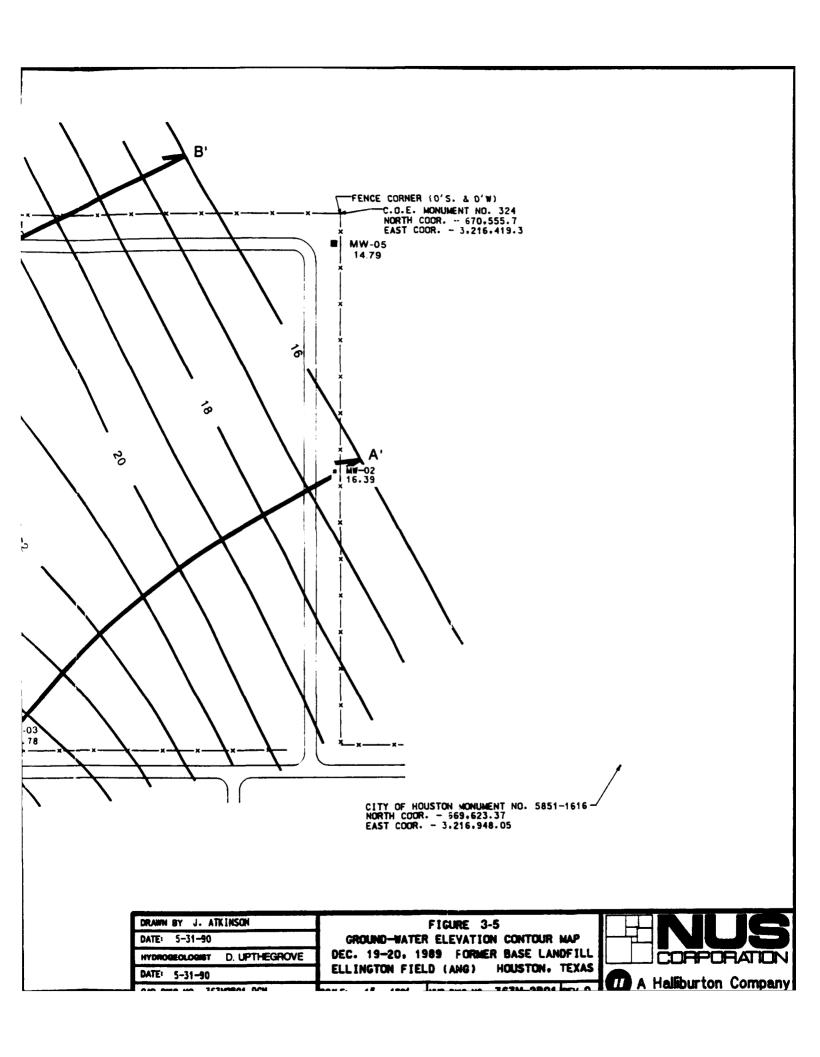


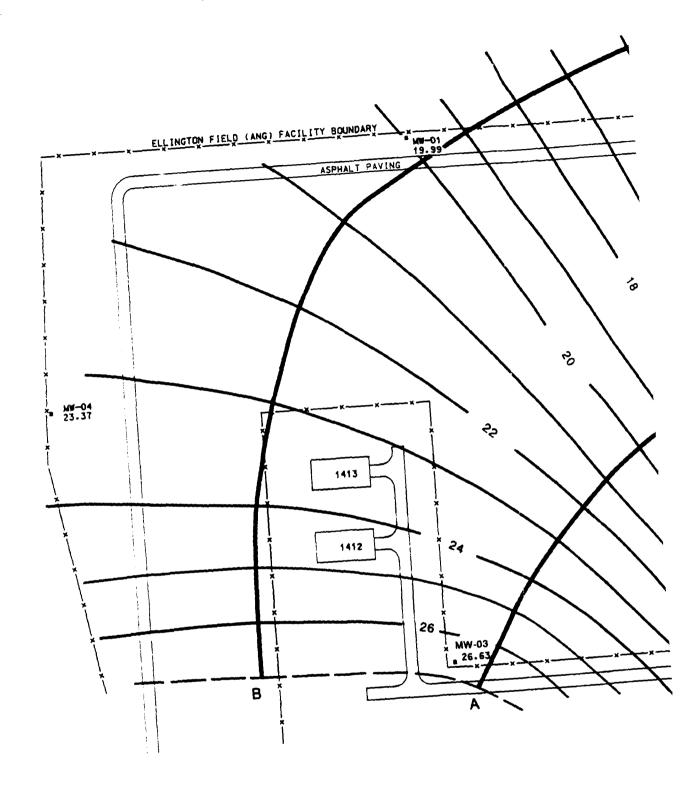
A A'

GROUND-WATER ELEVATION CONTOUR (MSL)

DRAWN BY J. A
DATE: 5-31-90
HYDROGEOLOGIST
DATE: 5-31-90

CAD DWG. NO. 36





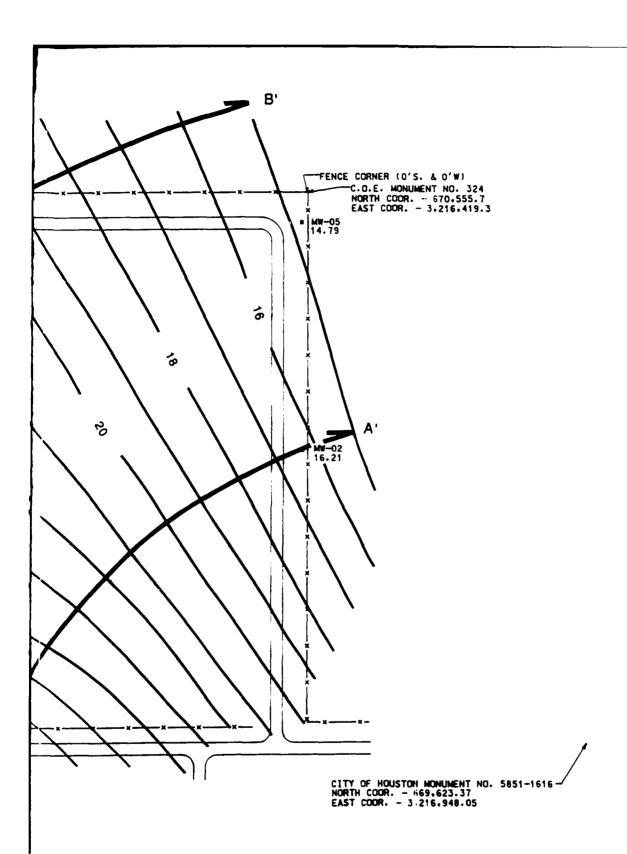
LEGEND

- GROUND-WATER ELEVATION CONTOUR (MSL) HYDRAULIC GRADENT LINE Ā

DRAWN BY J. A DATE: 5-31-90 HYDROGEOLOGIST DATE: 5-31-90

CAD DWG. NO. 36

ARRAGAMARI, DERECTORE

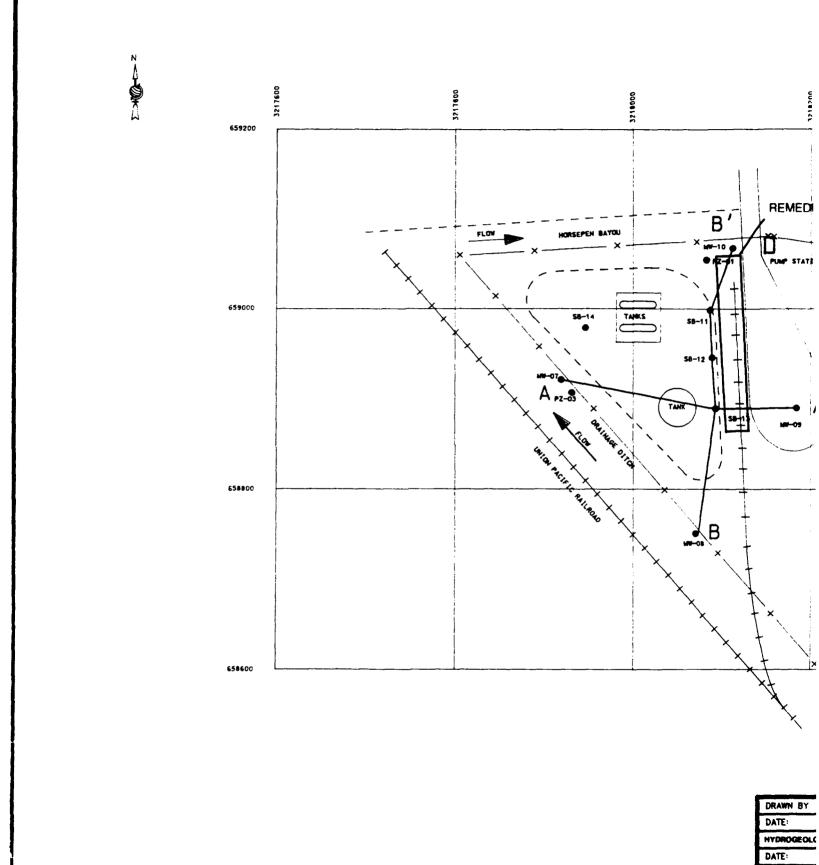


DATE: 5-31-90 HYDROGEOLOGIST D. UPTHEGROVE		CINSON	DRAWN BY J. AT
HYDROGEOLOGIST D. UPTHEGROVE			DATE: 5-31-90
	J	D. UPTHEGROVE	HYDROGEOLOGIST
DATE: 5-31-90	E		DATE: 5-31-90

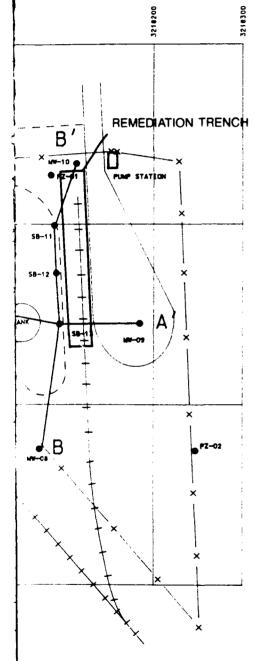
FIGURE 3-6
GROUND-WATER ELEVATION CONTOUR MAP
JAN. 25-26. 1990 FORMER BASE LANDFILL
ELLINGTON FIELD (ANG) HOUSTON. TEXAS



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CAD DWG. NO



LEGEND

MAP SHOWING

MW - MONITOR WELL

PZ = PIEZOMETER

LOCATIONS AND ELEVATIONS OF MONITORING WELLS. PIEZOMETERS. AND SOIL BORINGS AT THE POL STORAGE AREA ELLINGTON FIELD (ANG) HOUSTON, TEXAS

SB = SOIL BORING

POINT NUMBER		E COORDINATE NTRAL ZONE	ELEVATIONS TOP OF CASINGS	TOP OF CONCRETE/NATURAL GROUND ELEVATION
	NORTH COORD.	EAS" COORD.		
MW-07	658.931.22	3.217.921.70	23.16	23.23 (NG)
MW-08	658.757.71	3.218.072.43	23.31	23.55 (NG)
MW-09	658.895.21	3-218-182-34	25.27	25.65 (CONC)
MW-10	659.073.15	3.218.110.76	27.59	25.82 (CONC)
PZ-01	659.060.17	3,218,081,47	28.73	26.65 (NG)
PZ-02	658.753.85	3.218.241.40	26.78	24.85 (NG)
PZ-03	(A)	(A)	25.10	23.45 (NG)
SB-11	659.004.16	3.218.085.49		23.71 (CONC)
SB-12	658.951.06	3.218.087.97		23.89 (CONC)
SB-13	658.894.38	3.218.091.83		24.00 (CONC)
SB-14	658.984.11	3.217.944.55		23.73 (CONC)

(A) NOT SURVEYED. APPROXIMATE LOCATION SHOWN.

ELEVATIONS SHOWN HEREON ARE BASED ON N.G.S. MONUMENT M-1276 (1987 ADJ)

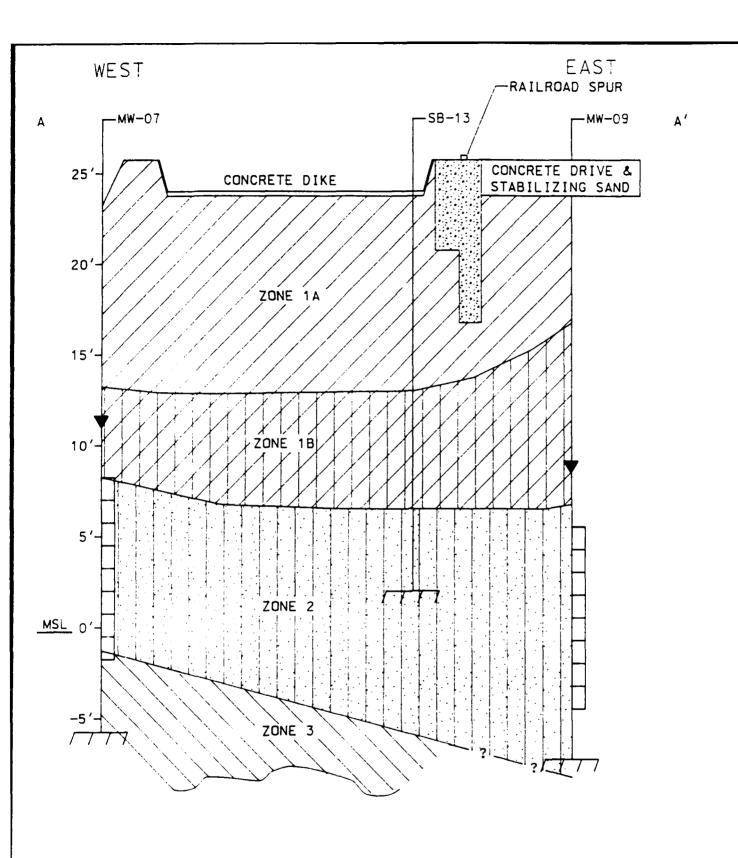
1" = 100"

DRAWN BY	J. ATKINSON
DATE:	6-1-90
HYDROGEOLOGIST	O. UPTHEGROVE
DATE:	6-1-90
CAO DWG NO	363M2R02_DGN

FIGURE 3-7
CROSS-SECTION LOCATION MAP
POL STORAGE AREA
ELLINGTON FIELD (ANG) HOUSTON, TEXAS

MIS DWG NO. 363M-2802 REV. 1





DRAWN BY
DATE: 5-1
HYDROGEOL

DATE: 6-

- RAILROAD BALLAST AND EXCAVATION BACKFILL

- ZONE 1A (CLAY)
- ZONE 1B (SILTY CLAY)
- ZONE 2 (CLAYEY SILT AND SILTY SAND)
- ZONE 3 (SILTY CLAY)
- SCREENED INTERVAL
- JANUARY 25-26, 1990
WATER LEVEL

VERTICAL SCALE: 1" = 5' HORIZONTAL SCALE: 1" = 50'

DRAWN BY M. GREEN

DATE: 5-31-90

CROSS-SECTION A-A'
HYDROGEOLOGIST D. UPTHEGROVE

DATE: 6-1-90

FIGURE 3-0

CROSS-SECTION A-A'
POL STORAGE AREA

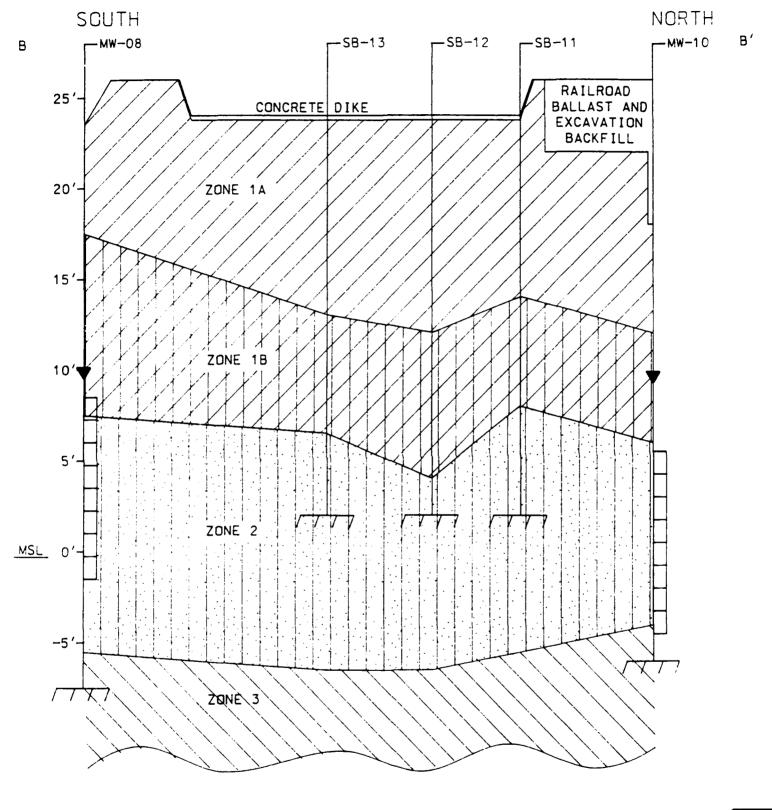
ELLINGTON FIELD (ANG) HOUSTON. TEXAS

AS NOTED NUS DWG. NO. 363M-183 REV. O



1 :7 30 30 E

CAD DWG. NO. 363M1803-DGN



DATE: 5-31
HYDROGEOLOG
DATE: 6-1-6

CAD DWG. NO.

ORTH -mw-10

в'

ZONE 1A (CLAY)
 ZONE 1B (SILTY CLAY)
 ZONE 2 (CLAYEY SILT AND SILTY SAND:
 ZONE 3 (SILTY CLAY)
 SCREENED INTERVAL
 JANUARY 25-26, 1990

VERTICAL SCALE: 1" = 5'
HORIZONTAL SCALE: 1" = 50'

WATER LEVEL

DRAWN BY M. GREEN

DATE: 5-31-90

CROSS-SECTION B-B'

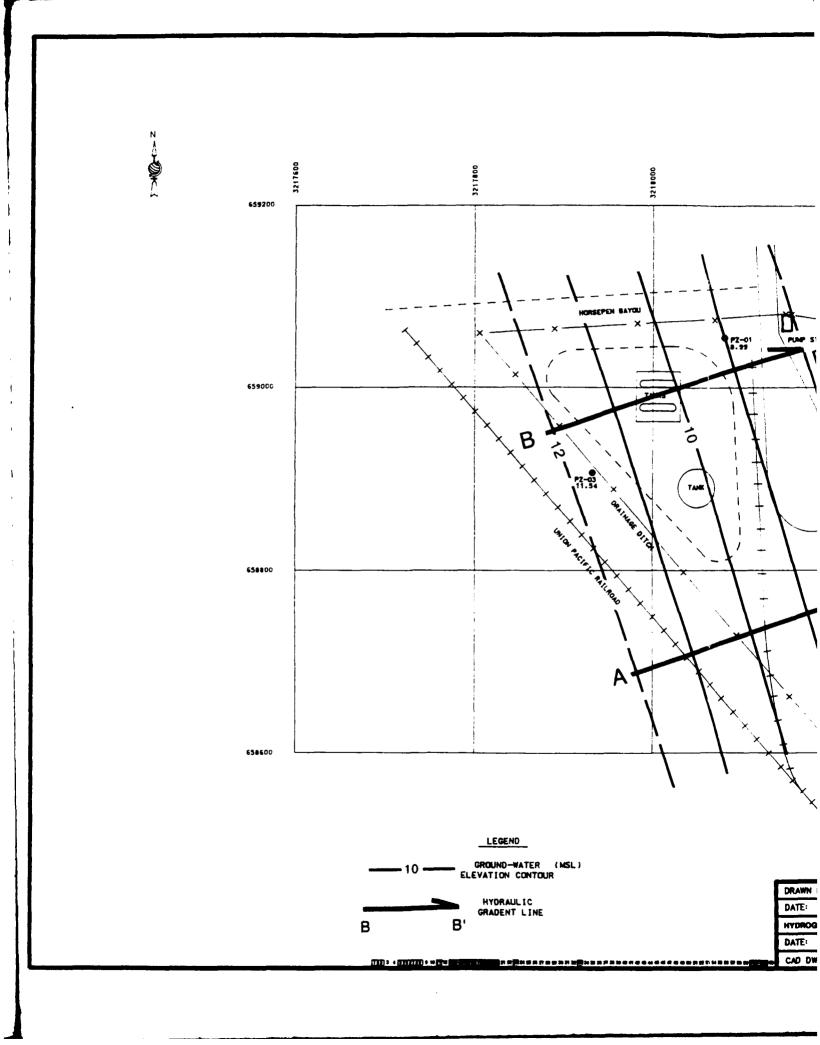
HYDROGEOLOGIST D. UPTHEGROVE

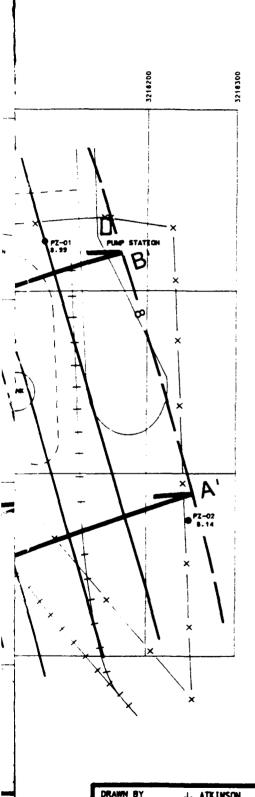
DATE: 6-1-90

CAD DWG. NO. 363M1804.0GN

SCALE: AS NOTED MUS DWG. NO. 363M-184 REV. 0



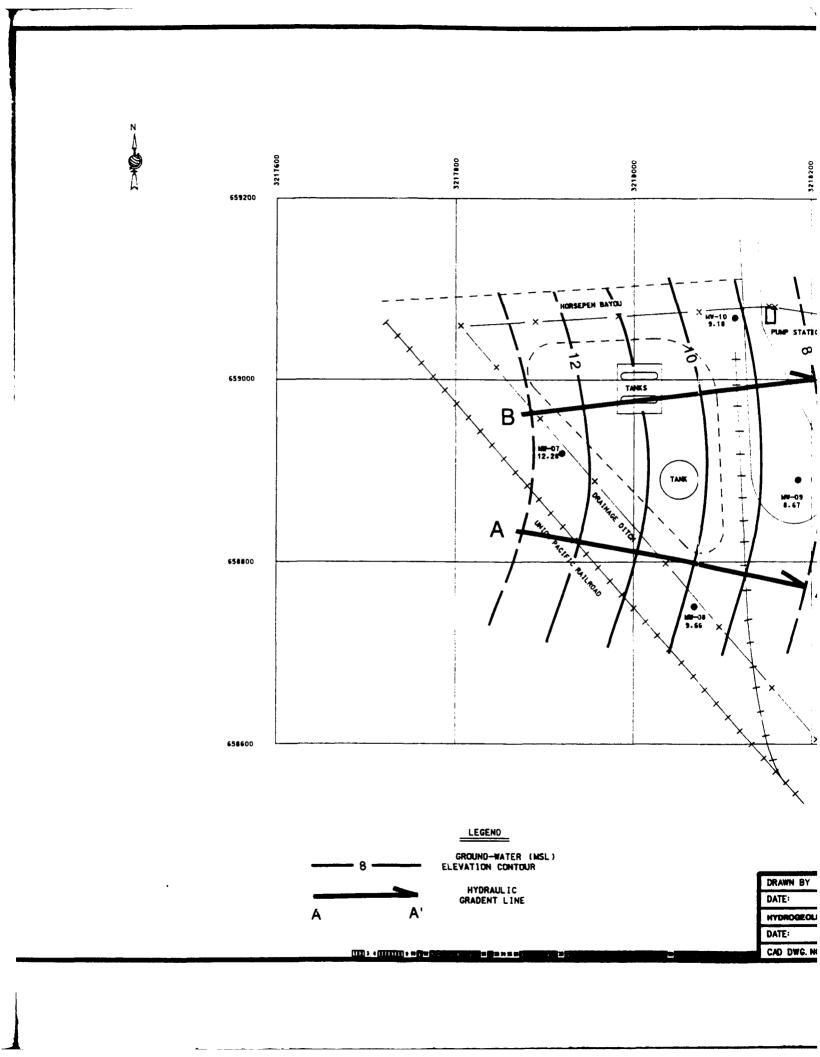


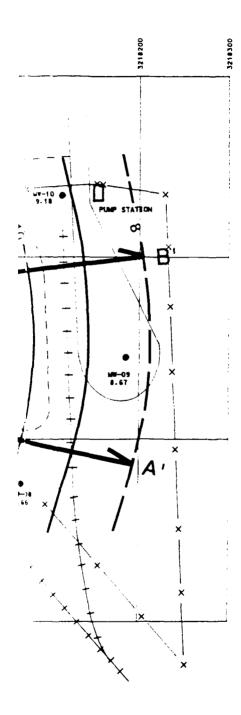


DRAWN BY	J. ATKINSON	FIGURE 3-10
DATE:	6-1-90	GROUND-WATER ELEVATION CONTOUR MAP
HYDROGEOLOGIST	0. UPTHEGROVE	JANUARY 12. 1990 POL STORAGE AREA
DATE:	6-1- 9 0	ELLINGTON FIELD (ANG) HOUSTON. TEXAS
CAD DWG. NO.	363M2802.DGN	SCALE: 1" = 100" NUS DWG. NO. 363M-2802 REV. 1



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DRAWN BY	1 ATV INCOM
DKAWN BY	J. ATKINSON
DATE:	6-1-90
HYDROGEOLOGIST	D. UPTHEGROVE
DATE:	6-1-90

FIGURE 3-11
GROUND-WATER ELEVATION CONTOUR MAP
JANUARY 29, 1990 POL STORAGE AREA
ELLINGTON FIELD (ANG) HOUSTON, TEXAS

-11 DN CONTOUR MAP _ STORAGE AREA HOUSTON, TEXAS	NUS CORPORATION
70714_0000 mm/ 4	A Halliburton Company

4.0 PRELIMINARY RISK ASSESSMENT

A number of hypothetical exposure scenarios are evaluated in this section. In summary, the risk assessment shows that, even under these conservative scenarios, the sites at Ellington ANG present minimal risks to receptors. A summary of the methods used to determine the potential public health and environmental risks posed by contamination at Ellington Field (ANG) are presented in Sections 4.1 through 4.4. Section 4.1 summarizes data evaluation methods. Section 4.2 discusses contaminant mobility and presents a toxicity assessment including hazard identification, toxicological profiles for chemicals of concern, dose-response parameters and selected regulatory standards and guidelines. Section 4.3 identifies potential receptors that may be exposed to site-related contamination. Section 4.4 presents information on contaminant fate and transport and the methods used to characterize human exposures. The results of the preliminary public health risk assessment are provided in Section 4.5.

4.1 EVALUATION OF SITE INFORMATION

The preliminary risk assessment was completed based on the analytical results for samples collected during the NUS field investigation. At the Former Base Landfill, NUS collected three composite surface soil samples (and one duplicate) from the landfill surface, drilled five soil borings and collected a total of nine subsurface soil samples (and one duplicate). NUS also installed five monitoring wells at the landfill and collected one sample from each well and a single duplicate sample.

At the POL Storage Area, eight soil borings were drilled for the collection of environmental samples and 23 subsurface soil samples (and three duplicates) were collected. The ground-water sampling investigation consisted of the installation of four monitoring wells and the collection of a single sample from each well.

All samples were analyzed in fixed-base laboratories and were validated in accordance with guidance provided by:

<u>Laboratory Data Validation Functional Guidelines for Evaluating Organic</u>
 <u>Analyses</u>, EPA, February 1989.

<u>Laboratory Data Validation Functional Guidelines for Evaluating Inorganic</u>
 <u>Analyses</u>, EPA, February 1989.

The validation process involves such tasks as review chain-of-custody forms and proceeds through checks of initial and continuing instrument calibration to calculations of parameters such as percent matrix spike recover. Data which do not meet prescribed QA/QC requirements are qualified, or "flagged", by the following symbols:

- J. The associated numerical value is an estimated quantity.
- [] The analyte was detected at a concentration below the Contract Required Detection Limit (CRDL).

Examples of qualified data may be found throughout the data base (Appendix D).

Additional aspects of data evaluation are discussed in subsequent portions of the preliminary risk assessment. Analytes that were not detected in any environmental samples were treated as absent from site matrices. Averages presented are arithmetic averages calculated using one-half the method detection limit for analytes that were not detected in certain samples of a particular matrix.

Organic and inorganic soil concentrations are compared with reported background concentrations during the selection of chemicals of concern in Section 4.2.2 (Hazard Identification). Ground-water concentrations of naturally-occurring inorganic constituents are also compared with reported background levels in Section 4.2.2.

4.2 PROPERTIES OF CONTAMINANTS OF CONCERN

Information on various chemical and physical properties of site contaminants that affect contaminant mobility is presented in Section 4.2.1. Section 4.2.2 identifies contaminants of concern for the risk assessment. Section 4.2.3 includes a discussion of the toxicity of each of the contaminants of concern and identification of appropriate dose-response parameters.

4.2.1 Chemical and Physical Properties of Contaminants

This section provides a qualitative indication of the potential migration of the organic contaminants found at Ellington Field (ANG). The physical and chemical properties of the organic chemicals found in site soils and ground water are presented in Table 4-1. These parameters were used to assess the behavior of these compounds in the environment.

Empirically determined literature values of water solubility, the octanol/water partition coefficient, vapor pressure, the Henry's law constant, bioconcentration factor and specific gravity are provided in Table 4-1 (as available). Calculated values, which were determined using approximation methods, are presented where literature values could not be found. A discussion of the environmental significance of each of these parameters follows:

<u>Water Solubility</u> - The rate at which a chemical is leached from waste materials or soils by infiltrating precipitation is proportional to its water solubility. More soluble chemicals are expected to reach the water table much more readily and rapidly than less soluble chemicals. The water solubilities presented in Table 4-1 indicate that the volatile organic compounds detected in site media are generally several orders of magnitude more soluble than the base/neutral-extractable compounds (phthalate esters and polynuclear aromatic hydrocarbons) and pesticides. The nature and extent of contamination at the sites is consistent with the anticipated environmental behavior of the various classes of compounds. Volatile organic chemicals were detected in ground water at the POL Storage Area. Relatively water-insoluble compounds, such as phthalate esters, polynuclear aromatic hydrocarbons (PAHs), and pesticides, have not been detected at high concentrations in ground water and appear to be bound to the soil matrix.

Octanol-Water Partition Coefficient - The octanol-water partition coefficient (Kow) is a measure of the equilibrium partitioning of a chemical between a two-phase octanol and water mixture. Polynuclear aromatic hydrocarbons (PAHs), phthalate esters, and pesticides have Kow values several orders of magnitude greater than the various volatile organics detected in site media. The octanol-water partition coefficient is used to estimate bioconcentration factors in aquatic organisms. A linear relationship between the octanol-water partition coefficient and the uptake

of chemicals by the lipid (fatty) tissue of animal and human receptors has been determined (Lyman et al., 1982). PAHs, phthalate esters and pesticides are more likely to accumulate in the tissues of receptors. The octanol-water partition coefficient is also useful for assessing the sorption of compounds by soils containing organic matter where experimental partitioning values are not available.

Soil/Sediment Adsorption Coefficient - The soil/sediment adsorption coefficient is related to the water solubility and the octanol-water partition coefficient. This parameter indicates the tendency of an organic chemical to bind to soil particles containing organic carbon. Chemicals with high soil/sediment adsorption coefficients generally have low water solubilities and vice versa. Chemicals such as PAHs, phthalate esters, and pesticides are relatively immobile in the subsurface environment and are preferentially bound to the soil phase. These compounds are not subject to ground-water transport to the same extent as compounds with high water solubilities and low adsorption coefficients. The analytical results for soil and ground-water samples obtained at the two sites are consistent with the anticipated partitioning of the various compounds detected. The soil-adsorptive PAHs, phthalate esters, and pesticides remain bound in the soil matrix whereas the soluble volatile organics are present in the ground water. The soil/sediment adsorption coefficient may also be used to infer the rates at which contaminants move in ground water using the retardation factor as follows (Javandel et al., 1984):

$$R = 1 + \frac{\rho}{n} K_d$$

Where:

$$K_d = f_{oc} \times K_{oc}$$

Where:

 K_d is the distribution coefficient ($\mu g/kg/\mu g/L$) f_{oc} is the soil organic carbon content (kg/kg) K_{oc} is the soil/sediment adsorption coefficient ($\mu g/kg$ organic carbon/ $\mu g/L$)

The concept of the retardation factor is used in Section 4.4.1 to determine travel times for the primary potential ground-water contaminants at the site (i.e., monocyclic aromatics).

<u>Vapor Pressure</u> - Vapor pressure provides an indication of the rate at which a chemical evaporates from both soil and water. It is of primary significance where environmental interfaces such as surface soil/air or surface water/air are important. Vapor pressures for volatiles are generally many times higher than vapor pressures for pesticides and PAHs. As a result of the combined effects of vapor pressure and water solubility, concentrations of volatile organics in surface soils at the landfill were expected to be very low, and were therefore not analyzed.

<u>Henry's Law Constant</u> - The vapor pressure and the water solubility are of use in determining volatilization rates from surface water bodies. The ratio of these two parameters is used to calculate the equilibrium concentrations of a chemical in air versus water for the dilute solutions commonly encountered in environmental settings. The Henry's law constant is also useful for estimating volatile releases of ground-water contaminants as a result of potable use.

<u>Bioconcentration Factor</u> - The bioconcentration factor (BCF) represents the ratio of concentrations of water contaminants in aquatic species to the concentration in the water body in which they reside. The BCF is both contaminant- and species-specific. When site-specific values are not measured, literature values may be used, or the BCF may be derived from the octanol-water partition coefficient. Several of the classes of compounds detected at the sites are bioaccumulative in nature, particularly the PAHs, pesticides, and phthalate esters, as shown by the relative magnitude of the BCFs presented in Table 4-1.

<u>Specific Gravity</u> - Specific gravity is the ratio of the weight of a given volume of a pure chemical to the same volume of water at a specified temperature. It is of

primary utility in determining whether a chemical will "float" or "sink" in surface water bodies or in ground water. Generally, organic chemicals must be present at concentrations approaching their water solubility for density effects to be important. Based on the minimal observed ground-water contaminant concentrations at the two sites, it is not anticipated that density stratification has had a significant effect on contaminant movement in the subsurface. For example, the most concentrated ground-water contaminant at the POL Storage Area (total xylenes) is present at a maximum concentration of 23 μ g/L, which is only 0.01 percent of its water solubility (187,000 μ g/L).

4.2.2 Hazard Identification

The primary purpose of Hazard Identification is to select organic and inorganic chemicals that will adequately represent the risks posed by site-specific contamination. Tables 4-2 and 4-3 present a complete listing of the chemicals of concern for soil and ground water at Ellington Field (ANG). Chemicals of concern have been identified based on their frequency of occurrence and distribution, concentrations, and toxicity, as well as through comparison with background concentrations (inorganic chemicals). For the purpose of hazard identification, estimated values are treated as real results and are therefore not flagged. All data qualifiers are presented on data tables in Section 3 and Appendix D. Sample concentration data presented throughout Section 4 does not contain the J and [] qualifiers as indicated in analytical data base provided in Appendix D. The risk assessment is based on a conservative approach where all estimated data (J and [] qualified) are assumed to be actual quantitative concentrations. Methods for selecting chemicals of concern are detailed in the following sections.

Chemicals of Concern - Ground Water

A summary of the maximum concentrations of organic and inorganic chemicals detected in ground-water samples collected in the vicinity of the two sites is provided in Table 4-4. No volatile organic chemicals were detected in ground water at the Former Base Landfill. However, two pesticides (alpha-BHC and methoxychlor) were present at very low concentrations in wells MW-01 and MW-05, respectively. Neither of these chemicals was detected in either the surface or subsurface soil samples collected at the landfill. They are relatively insoluble chemicals (similar to

many of the PAHs, DDT, and heptachlor, which were detected in the site soils and not in the ground water). The source of the alpha-BHC and methoxychlor in the ground water cannot be tied to the landfill and therefore they were not selected as indicator chemicals.

Ground water at the POL Storage Area contained low concentrations of several monocyclic aromatics (e.g., ethylbenzene and styrene). These chemicals were also detected in several subsurface soil samples from the site and were therefore selected as indicator chemicals.

Table 4-5 presents a summary of inorganic chemical concentrations in site ground water versus naturally occurring levels identified in the literature and Primary/Secondary Drinking Water Standards. As shown by Table 4-5, only aluminum was detected at a concentration significantly above that reported as background. Aluminum is not considered a toxic chemical and is not currently regulated. Other inorganics such as calcium, barium, chromium and vanadium are present at concentrations slightly above the maximum reported background concentrations. However, these inorganics were either present at concentrations below the Drinking Water Standards (barium and chromium) or are not known to be either toxic (at the low concentrations detected) or carcinogenic. Iron, which is present at a maximum concentration of 3,710 µg/L, exceeds the Secondary Drinking Water Standard, but is within the range of naturally-occurring concentrations. The standard is based on aesthetic reasons (staining) rather than health reasons, and therefore, iron is not of concern at these sites. No inorganics were selected as chemicals of concern in ground water.

Chemicals of Concern - Soil

A summary of the maximum observed organic chemical concentrations in surface and subsurface soil at the two sites is provided in Table 4-6. As shown in Table 4-6 and as discussed in Sections 3.1.4 and 3.2.3 (Contaminant Occurrence and Distribution), soils contain relatively low levels of organic compounds such as monocyclic aromatics, chlorinated aliphatics, polynuclear aromatics and/or pesticides.

4-7

The various polynuclear aromatic hydrocarbons (PAHs) detected in the landfill surface soil samples were found at relatively low concentrations. The presence of low concentrations of these compounds is not considered a threat to human health. For comparative purposes, background total PAH concentrations in the vicinity of highways range from 6,000 µg/kg to 300,000 µg/kg (Santodonato, et al., 1982) and urban soils are reported to contain between 25,000 and 580,000 µg/kg total PAHs (ATSDR, October 1989). Site-specific surface soil results are well within this range of soil PAH concentrations. The Former Base Landfill is located in the vicinity of roads, railroads and airstrips, all of which are sources of contaminants derived from the burning of fossil fuels. However, since no other contamination has been identified, all potentially carcinogenic PAHs will be retained as indicator chemicals. The USEPA has officially revoked the Cancer Slope Factors for PAHs (benzo(a)pyrene); however, several articles have proposed the use of relative potency estimates (based on the slope factor for benzo(a)pyrene). In addition, naphthalene was retained as an indicator chemical because it is known to cause noncarcinogenic health effects.

Surface soils at the landfill also contained butylbenzylphthalate, dibenzofuran and DDT and its metabolites. No health-based standards or dose-response parameters are available for either dibenzofuran or the metabolites of DDT. Furthermore, these substances were detected at concentrations two to three orders of magnitude less than the PAHs. Therefore, these compounds were not selected as chemicals of concern in soil at the landfill. Compounds found only in single subsurface soil samples at the landfill (phenol and heptachlor) were not selected as chemicals of concern for the following reasons: (1) there is no route of direct human or environmental exposure to subsurface soil contaminants, and (2) they are either not highly soluble (heptachlor) or are not highly toxic (phenol).

At the POL Storage Area, several volatile organic chemicals were detected in subsurface soil samples. Several of these compounds have potential carcinogenic effects, whereas most of the remaining volatile organics may cause threshold (noncarcinogenic) effects in human receptors. One compound (1,2-dichloropropane) is a suspected human carcinogen, but it was detected in only one subsurface soil sample at a concentration of 1 µg/kg. This compound was not selected as a chemical of concern. Of the noncarcinogenic chemicals detected at the POL Storage Area, only 4-methyl-2-pentanone (MIBK) was not selected. It was

detected at a maximum concentration of $4 \mu g/kg$ and was not found in any of the ground-water samples.

Table 4-7 presents a summary of metals concentrations in the landfill surface soils and also includes a summary of literature background values. Soil samples at the POL Storage Area were not analyzed for metals. Comparison of the maximum and average concentrations of metals in landfill surface soils to the reported background concentrations shows that arsenic, lead, mercury and zinc are present at concentrations above background. Therefore, they have been selected as chemicals of concern. Although lead has been classified as a possible human carcinogen, a Cancer Slope Factor has not been developed for this chemical as of this date. The Reference Dose for lead is currently undergoing review by the EPA, but will be used to characterize potential noncarcinogenic effects associated with lead exposures. Arsenic is a known human carcinogen via inhalation, and zinc and mercury are toxic via ingestion.

Tables 4-2 and 4-3 present a complete listing of the chemicals of concern for soil and ground water at Ellington Field (ANG). Toxicological profiles for each of the chemicals of concern are provided in Appendix F.

4.2.3 <u>Dose-Response Evaluation</u>

An important component of the risk assessment process is the relationship between the dose of a compound (amount to which an individual or population is exposed) and the potential for adverse health effects resulting from such exposure. Dose-response relationships provide a means by which potential public health impacts may be evaluated. Noncarcinogenic risks may be quantitatively assessed by comparing estimated doses with Reference Doses. Carcinogenic risks may be quantitatively assessed using the Cancer Slope Factor. These parameters, as well as uncertainty factors and weight-of-evidence for carcinogenicity, are discussed below.

Reference Dose (RfD) - The Reference Dose applies to prolonged human exposure to hazardous chemicals (i.e., chronic exposure) and is based solely on the noncarcinogenic effects of chemical substances. The RfD is usually expressed as an "acceptable" dose (mg) per unit body weight (kg) per unit time (day). It is generally derived by dividing a No- Observed-(Adverse)-Effect-Level (NOAEL or NOEL) or a

4-9

Lowest- Observed-Adverse-Effect-Level by an appropriate uncertainty factor. NOAELs, etc. are determined from laboratory or epidemiological toxicity studies. The uncertainty factor (10,100, or 1,000) is based on the availability of toxicity data: 10 is used if appropriate chronic human data are available; 100 is used if sufficient chronic animal data are available; and 1,000 is used if only subchronic animal data can be obtained. An additional uncertainty factor (ranging from 1 to 10) may also be included, depending on the severity of the observed effect, if a LOAEL is used to develop the Reference Dose. Dividing the effect level by an uncertainty factor results in an RfD that is protective of even the most sensitive members of an exposed human population.

RfDs are route-specific and have been developed for both ingestional and inhalational exposures. The United States Environmental Protection Agency (USEPA) has not developed RfDs for dermal exposure routes. Dermal RfDs may be derived from oral RfDs if the absorption efficiency for oral administration is known (USEPA, December 1989). Absorption efficiencies could not be determined for the chemicals of concern identified in the preceding section. It was assumed that 100 percent absorption occurred after ingestional administration, and oral RfDs were used to characterize noncarcinogenic risks associated with dermal contact.

Cancer Slope Factor (CSF) - The Cancer Slope Factor (formerly the Cancer Potency Factor) is developed by the USEPA's Cancer Assessment Group and is applicable for estimating the lifetime probability of human receptors developing cancer as a result of exposure to known or suspected carcinogens. The CSF is generally expressed in units of (mg/kg/day)-1 and is derived through an assumed low-dosage linear relationship and an extrapolation from high to low dose-responses determined from animal studies. The CSF is the upper 95 percent confidence limit of the slope of the linearized dose-response curve. The USEPA weight-of-evidence classification describes the preponderance of evidence regarding carcinogenic effects in humans and animals. The categories are defined as follows:

EPA Category	Description of Group	Description of Evidence
Group A	Human carcinogen	Sufficient evidence from epidemiologic studies to support a casual association between exposure and cancer.
Group B1	Probable human carcinogen	Limited evidence of carcinogenicity in humans from epidemiologic studies.
Group B2	Probable human carcinogen	Sufficient evidence of carcinogenicity in animals; inadequate evidence of carcinogenicity in humans.
Group C	Possible human carcinogen	Limited evidence of carcinogenicity in animals.
Group D	Not classified	Inadequate evidence of carcinogenicity in animals.
Group E	No evidence of carcinogenicity in humans	No evidence of carcinogenicity in at least two adequate animal tests or in both epidemiologic and animal studies.

Values of the noncarcinogenic and carcinogenic dose-response parameters for site chemicals of concern are provided in Table 4-8. In addition, appropriate regulatory standards and guidelines such as Maximum Contaminant Levels, Maximum Contaminant Level Goals, Ambient Water Quality Criteria and USEPA Drinking Water Health Advisories are also presented. The dose-response parameters were used to generate quantitative risk estimates. Site-specific ground-water concentrations were also contrasted with appropriate standards and guidelines to provide an indication of the quality of site ground water.

Appendix F contains brief toxicological profiles for each chemical of concern. The profiles present a summary of available published information on both human health and environmental effects.

4.3 IDENTIFICATION OF RECEPTORS

Based on a review of existing site conditions, current land and water use and sitespecific chemical contamination, potential routes by which human receptors may be exposed to contaminants at the sites have been identified. Exposures may occur directly at the site or as a result of contaminant migration to offsite receptor locations. Potential receptors include local residents as well as military and civilian base personnel.

4.3.1 Land Use

Discussions with Ellington Field (ANG) personnel indicate that the facility will continue in use as a government facility and will not be developed for any residential or commercial purposes. Furthermore, Ellington Field (ANG) personnel indicate that the two sites investigated at the facility (i.e., the Former Base Landfill and the POL Storage Area) will not be developed as either domicile areas (i.e., barracks, officer housing, etc.) or for other uses that will result in increased contact or disturbance of the subsurface.

Based on reported water use in the vicinity of the base, it has been assumed that shallow ground water may be used a potable water source. Although production wells are reported to exist at the base, these wells are believed to be installed in an aquifer that is not threatened by the minimal contamination observed at either site.

4.3.2 Potential Receptors

Potential receptors at Ellington Field (ANG) include both military and civilian base personnel as well as offbase residents. Base personnel could be exposed to residual contamination in soils during activities such as landscape maintenance (lawnmowing at the landfill) or as a result of routine maintenance at the POL (e.g., pump repair, filling/decanting operations). Offbase personnel may be exposed as a result of contaminant migration (fugitive dust emissions or advective transport of dissolved species in ground water). However, the results of the risk assessment indicate that no significant noncarcinogenic or carcinogenic risk are likely to occur during activities such as landscape maintenance, based on the available data.

Potential receptors consisting of base personnel include only adults. Offbase receptors include adults, adolescents, and children.

4.3.3 Exposure Routes

The following exposure routes will be considered for onbase and offbase receptors:

- Incidental ingestion of surface soils (base personnel)
- Dermal contact (absorption) with surface soil (base personnel)
- Ground water use (offbase receptors)
- Inhalation of fugitive dust (offbase receptors)

Ground water use exposure routes include ingestion, inhalation of volatiles during showering and dermal contact during showering or bathing. Inhalation of fugitive dust by offbase receptors includes intake as a result of both respiratory and gastrointestinal tract deposition of respirable particulates.

Several additional exposure routes were not considered as significant mechanisms for human exposure. Such routes included inhalation of volatile emissions from the site surface soils and exposures associated with erosional transport of surficial contaminants.

Sampling and analysis activities at the landfill did not reveal the presence of volatile organics in the shallow subsurface soils. Shallow subsurface soil samples (0 to 2 feet deep) in the drainage swale at the POL Storage Area did not contain volatile organics. The maximum concentration of volatiles (19,100 μ g/kg) was found at a sample depth of 4 to 6 feet in one boring, (SB-13), which is an area covered with concrete, as is most of the site. Therefore, emission of volatiles is not considered a significant contaminant release mechanism for either site.

Erosion of surface soils and transport to offsite locations via surface water runoff is not considered a significant contaminant release mechanism. The landfill is currently vegetated, and the POL Storage Area is covered by concrete. The presence of cover impedes erosional releases. Furthermore, topographic relief is not particularly pronounced, and infiltration and evapotranspiration are probably the primary mechanisms for loss of precipitation in unpaved portions of the landfill. At the POL Storage Area, samples were collected in a drainage swale that leaves the site (samples 01-SB07A-A and 01-SB08A-A). These samples contained no volatile organics, a fact that indicates that contamination may have left the site in the past as

releases of materials stored in the tanks. However, because the tanks had secondary containment and because there is little relief, releases of fuel products have probably not migrated far from the site. Continued offsite migration of these contaminated subsurface soils is unlikely. Therefore, erosion is not considered a significant contaminant release mechanism, and exposures associated with such releases will not be considered.

4.4 POTENTIAL MIGRATION PATHWAYS

Various aspects of contaminant fate and transport and exposure assessment at Ellington Field (ANG) are discussed in this section. Potential contaminant migration routes are identified and discussed in Section 4.4.1. Section 4.4.2 presents a brief discussion of contaminant persistence. The methods used to estimate human exposures to the identified contaminants are presented in Section 4.4.3.

4.4.1 <u>Potential Migration Routes</u>

This section identifies the primary contaminant migration pathway(s) for the two sites investigated. Contaminant release/migration mechanisms were identified through a review of the site-specific analytical data base, various site features and hydrogeologic conditions.

Neither site exhibits a significant amount of contamination. At both sites, subsurface soils exhibit some contamination with volatile organics, base/neutral- or acid-extractables and/or pesticides. The primary release mechanism acting at these sites is the slow downward migration of contaminants through the soil column. Neither site exhibited a major ground-water contamination problem, which is to be expected considering the relatively low concentrations of organic chemicals in the soils.

The potential impact of soil contamination may be estimated using the USEPA's Organic Leachate Model (OLM) (USEPA, November 13, 1986):

$$C_{leachate} = 2.21 \times 10^{-3} \times C_{soil}^{0.678} \times S^{0.373}$$

Where:

Cleachate is the estimated leachate concentration (mg/L)

C_{soil} is the soil concentration (mg/kg)

S is the water solubility (mg/L)

This equation is used to calculate the leachate concentrations in the unsaturated zone. This leachate will eventually enter the saturated zone and be diluted. Dilution is calculated as follows, using a model proposed by Donigian et al. (November 1983):

$$Cgw = \frac{C_1 \times q \times L}{Vd \times m}$$

Where:

Cgw is the contaminant concentration in the saturated zone (mg/L)

C₁ is the contaminant concentration in leachate, as calculated by the

OLM (mg/L)

q is the estimated recharge rate (cm/yr)

L is the length of the source area perpendicular to ground-water flow

direction (m)

Vd is the Darcy ground-water velocity (cm/yr)

m is the effective aquifer thickness in the mixing zone (m)

The most concentrated contaminant found in any soil sample was at the POL Storage Area where ethylbenzene was detected at 13 mg/kg. With a solubility of 152 mg/L, $C_{leachate}$ is determined to be 8.1 x 10^{-2} mg/L. Assuming a recharge rate of 12 cm/yr, a length of 150 m, a Darcy velocity of 3,600 cm/yr and a thickness of 3.5 m, the ground-water concentration is estimated to be 1.2 x 10^{-2} mg/L. Considering that the maximum concentration of ethylbenzene detected in the ground water is 6 μ g/L and using this process (which assumes that the entire site contains ethylbenzene at 13 mg/kg) results in a concentration of 12 μ g/L, it is unlikely that the site soils are a significant source of future ground-water contamination.

An additional aspect of contaminant migration is related to the concept of the retardation factor defined in Section 4.2.1. This factor can be used to estimate contaminant velocities. Based on the following assumptions

foc = 0.01 kg/kg
 ρ = 2.7 kg/L
 n = 0.35

Taking into account contaminant retardation, contaminant velocities range from 0.28 ft/day (acetone and methylene chloride) to 1.6×10^{-6} ft/day (4,4'-DDT). Assuming the nearest receptor well is one mile downgradient of either site, the most mobile contaminants (acetone and methylene chloride) could reach the receptor well in 52 years.

Another potential contaminant release mechanism at the landfill is the atmospheric transport of contaminated particulates as fugitive dust. Although most of the site is currently covered with grass, fugitive dust emissions are considered possible. Surficial soil samples at the site contain low concentrations of various semivolatile organics, pesticides, and various inorganic constituents. These compounds may be released from the site via fugitive dust emissions. Based on the available data, the results of the risk assessment indicated no significant noncarcinogenic or carcinogenic risks appear to exist in light of these release mechanisms.

Overland transport of contaminated soils is not considered a significant migration pathway at either site. The presence of vegetation and various cover materials, as well as the relatively flat topography, will impede erosion of surficial materials.

Volatilization of organic chemicals from either site is also considered a relatively insignificant release mechanism. Surface soil samples at the landfill were not analyzed for volatile organics and would not be expected to contain any because of high ambient temperature and the unconsolidated nature of the surficial material. In addition, only low concentrations of volatile organics were detected in the subsurface soils. The surface soil at the landfill contains a number of semivolatile compounds probably as a result of vehicular traffic at the landfill. The pesticides found in low concentrations at this site are also unlikely to volatilize (see

Section 4.2.1). Shallow subsurface soils at the POL Storage Area contained only low concentrations of volatile organics.

4.4.2 Contaminant Persistence

The persistence of various classes of site contaminants is discussed in this section. The following general classes of compounds are discussed:

- Ketones
- Monocyclic aromatic volatiles
- Chlorinated aliphatic volatiles
- Phthalate esters
- Polynuclear aromatic hydrocarbons (PAHs)
- Pesticides

Ketones are volatile and if they are released to the ground, they will both evaporate and leach into the subsurface unsaturated and saturated soil. Acetone is susceptible to aerobic biodegradation. Ketones are generally very soluble and lipophobic, and, therefore, adsorption to soil or sediment (in aquatic systems) or bioconcentration are not significant fate processes (Howard, 1990).

Monocyclic aromatic compounds, such as benzene and ethylbenzene, are not considered persistent environmental contaminants in comparison to PAHs, pesticides and metals. Such compounds are subject to degradation via the action of both soil and aquatic microorganisms. The biodegradation of these compounds in the soil matrix is dependent on the abundance of microflora, macronutrient availability, soil reaction (pH), temperature, etc. Increasing chlorination of aromatic compounds makes them more resistant to biodegradation. Hence, chlorobenzene is not expected to degrade as readily as nonhalogenated compounds. For example, a reported first-order biodegradation rate constant for benzene in aquatic systems is 0.11 day-1, whereas the corresponding rate constant for chlorobenzene is 0.0045 day-1 (Lyman et al., 1982). Half-lives for these compounds are, therefore, 6 days and 150 days, respectively.

Based on the current extent of contamination at the two sites, it is not expected that significant degradation of the various aromatic compounds will occur.

Contamination is primarily confined to the subsurface soils where limited macronutrient availability and anaerobic conditions are expected to impede such processes. Other potential environmental degradation mechanisms, such as hydrolysis and photolysis, are considered insignificant for monocyclic aromatic compounds (USEPA, December 1982). The aromatic volatiles at the sites are primarily confined to the subsurface soils. Hence, photolytic degradation cannot occur.

Chlorinated aliphatic hydrocarbons, such as methylene chloride, are subject to reductive dehalogenation via the action of anaerobic bacteria. Photolytic degradation is not considered a significant fate process for these types of compounds (USEPA, December 1982). Methylene chloride is contained in the subsurface matrix, which prevents photolytic degradation from occurring. Hydrolysis may occur for saturated aliphatics (i.e., alkanes), but does not appear to be a significant degradation mechanism for unsaturated species (i.e., alkenes [USEPA, December 1982]).

Phthalate esters are considered relatively persistent environmental contaminants. Although numerous studies have demonstrated that such compounds undergo biodegradation, it appears that this is a very slow process in soils. While biodegradation of phthalate esters is an important fate mechanism over the long-term, rapid degradation of such compounds is not expected under existing site conditions. Hydrolysis is not expected to be a significant degradation mechanism for phthalate esters. For example, a reported alkaline hydrolysis half-life for bis(2-ethylhexyl)phthalate in aquatic systems is 2,000 years (USEPA, December 1979). Similarly, photolysis is considered an insignificant degradation mechanism (USEPA, December 1979).

Polynuclear aromatic hydrocarbons (PAHs) are constituents of oil and grease. Landfarming applications have indicated that PAHs are amenable to microbial degradation and studies have demonstrated that PAHs are more readily degraded in soil matrices than aquatic systems (USEPA, December 1979). It is considered possible that degradation of PAHs in site soils has occurred to some extent. PAHs do not contain functional groups susceptible to hydrolytic actions, and therefore, hydrolysis is considered an insignificant degradation mechanism. Photolysis may be a major

degradation path in aquatic systems but is probably insignificant in surface soils at the landfill.

When pesticides and herbicides are used, a large proportion reaches the soil or sediment where they are strongly adsorbed. Bioconcentration of pesticides in the food chain is a potential fate mechanism although this is generally most important in aquatic environments. Hydrolysis, volatilization, oxidation, and photolysis are not generally important fate mechanisms for pesticides in either soil or water (EPA, December 1979).

In conclusion, it is not expected that environmental transformation or degradation of the primary contaminants at Ellington Field (ANG) will occur to any great extent.

4.4.3 Exposure Assessment Methods and Assumptions

The methods and models used to assess human intakes via each of the potential exposure routes are summarized in this section. For the most part, United States Environmental Protection Agency (USEPA) risk assessment guidance outlined in <u>Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)</u> was employed to assess exposures (USEPA, December 1989).

Ground-Water Exposure Concentrations

Exposure estimates associated with potable use of ground water were generated using the analytical results from the field investigation. Maximum observed ground-water concentrations were used for one scenario, and a second exposure scenario examines the potential effects of leachate generated from subsurface soils at each site. Each scenario assumes there is no attenuation or degradation of contaminants prior to reaching an offsite well, or conversely, that wells are installed at the site boundaries.

Exposure estimates developed using field-generated data should be considered worst-case estimates, since drinking water wells do not exist in the shallow aquifer in the immediate vicinity of the base. Risk assessment results based on these data provide an overall indication of the quality of ground water in the vicinity of the site, but do not reflect realistic risks under current site conditions.

Because a potable water supply well may draw water from discrete locations within the aquifer in the vicinity of the site, maximum concentrations of the various chemicals detected were employed for each of the preceding scenarios. Table 4-4 summarizes the ground-water concentrations used under the ground-water exposure scenarios.

The leaching scenario examined for each site is based on the maximum contaminant concentrations in the subsurface soils. Again, this provides a conservative estimate of risk posed under the hypothetical ground water use scenario.

Soil Exposure Concentrations

Exposure estimates for dermal contact and accidental ingestion of soils at each site were generated using site-specific surface soil concentrations (Former Base Landfill) or shallow subsurface concentrations (POL Storage Area). Because the POL Storage Area is covered with concrete, soil samples collected at depths of 0 to 2 feet were used to assess these exposure routes. This approach was used because even though it is unlikely that potential receptors will come into contact with only discrete portions of the site, a conservative approach ensures protection of public health.

Maximum soil concentrations at the landfill also were used to characterize potential exposures as a result of fugitive dust emissions. This approach was used in an effort to be conservative within the defined exposure scenarios. Soil samples collected at depths of 0 to 2 feet will be used to evaluate potential fugitive dust exposures from the POL Storage Area. Table 4-6 summarizes the maximum soil concentrations that were considered to characterize exposures through dermal contact, incidental ingestion, and inhalation of fugitive dust.

Intake Estimation Method

Chronic (longer-term) Reference Doses were ultimately used to characterize potential noncarcinogenic risks. To account for the sporadic nature of the majority of the potential exposures, human intakes through most exposure routes were based on exposure frequency time-weighted concentrations. Furthermore, lifetime incremental cancer risks were generated using Cancer Slope Factors. Exposure

duration and lifetime terms were used to characterize incremental cancer risks, since they are lifetime probability estimates.

Ground-Water Use

Three specific exposure routes associated with ground water use were assessed: ingestion, inhalation of volatiles while showering, and dermal contact. The methods used to assess these exposures are discussed in the following text.

Ingestional exposure was characterized using the following expression (USEPA, December 1989):

$IEX = C \times IR \times EF \times ED / BW / LT / 365$

Where:

IEX is the ingestional exposure dose (mg/kg/day)

C is the estimated ground-water concentration at the receptor point (mg/L)

IR is the water ingestion rate (L/day)

EF is the exposure frequency (days/yr)

ED is the exposure duration (yrs)

BW is the receptor body weight (kg)

LT is the lifetime of the receptor (yrs)

365 is a conversion factor (days/yr)

Ingestion rates (IR) were specified as 2 liters/day, 1.5 liters/day, and 1 liter/day for adult, adolescent, and child receptors, respectively. Since exposures associated with ground water use could occur on virtually a daily basis, the exposure frequency (EF) was specified as 365 days/year. The exposure duration (ED) and lifetime (LT) were specified as 70 years for adult receptors. These terms are used only for characterization of long-term (carcinogenic) risks in this and all subsequent exposure routes. Body weights were set as follows: adults--70 kg. adolescents--35 kg, children--10 kg.

Inhalational exposure during showering was estimated using a mass transfer model developed for this specific exposure route and a dose estimate model. The method employed is as follows (USEPA, December 1989; Foster and Chrostowski, 1987):

IEX =
$$5 \times 1R \times K \times EF \times ED / BW / LT / R_a / 106$$

 $K = D_5 + \exp(-R_aD_t)/R_a - \exp(R_a(D_5-D_t))/R_a$

Where:

IEX is the inhalational exposure dose (mg/kg/day)

S is the volatile chemical generation rate (μg/m³/min)

IR is the inhalation rate (∠min)

EF is the exposure frequency (days-1)

ED is the exposure duration (yrs)

BW is the receptor body weight (kg)

LT is the receptor lifetime (yrs)

R_a is the air exchange rate (min-1)

106 is a conversion factor $(mg/\mu g/m^3/L)$

D_s is the shower duration (min)

D_t is the total duration in the bathroom (min)

The volatile chemical generation rate was estimated using the Foster and Chrostowski mass transfer model, which is based on a two-phase film theory. The model employs contaminant-specific mass transfer coefficients, Henry's law constants, droplet diameter, drop time, viscosity and temperature, etc. Specific details regarding the application of the mass transfer model, as well as sample calculations, are included in Appendix F.

Inhalation rates were specified as 14 liters/min and 11 liters/min for adult and adolescent receptors, respectively. Young children are not expected to shower, and therefore, child exposures were not considered through this route. The exposure frequency was specified as 1 day-1 (i.e., 1 shower per day) for both adult and adolescent receptors. The exposure duration and lifetime terms were set as 70 years for adult receptors. Body weights were specified as follows: adults --- 70 kg; adolescents--35 kg.

The air exchange rate (R_a) was specified as 0.0083 min- ¹ for all receptors. The shower duration (D_s) and total duration in the bathroom (D_t) were set as 15 minutes and 20 minutes, respectively.

Dermal exposure during bathing or showering was estimated as follows (USEPA, December 1989):

DEX = $C \times PC \times AV \times ET \times EF \times ED / BW / LT / 103 / 365$

Where:

DEX is the dermal exposure dose (mg/kg/day)

C is the estimated water concentration at the receptor point (mg/L)

PC is the permeability constant of water (cm/hr)

AV is the skin surface area available for contact (cm²)

ET is the exposure time (hrs/day)

EF is the exposure frequency (days/year)

ED is the exposure duration (years)

BW is the receptor body weight (kg)

LT is the lifetime of the receptor (years)

is a conversion factor (L/cm³)

365 is a conversion factor (days/year)

This approach is based on the assumption that ground-water contaminants are present in dilute form and that percutaneous penetration is controlled by the absorption of water through the skin. The permeability constant was specified as 0.0008 cm/hr (USEPA, December 1989). Skin surface areas available for contact was set as 19,400 cm², 14,900 cm², and 7,280 cm², for male adults, adolescents, and children, respectively (USEPA, December 1989). The exposure time was specified as 0.2 hr/day for all three receptor groups. Exposure frequencies were set as 365 days/year. The exposure duration and lifetime were specified as 70 years for adult receptors. Body weights were set as follows: adults--70 kg; adolescents--35 kg; children--10 kg.

Incidental Ingestion of Surface Soil

It is remotely possible that base personnel may be exposed through incidental ingestion of surface soil. Exposures through this route are expected to occur on an infrequent basis, but could arise as a result of hand-to-mouth contact during activities such as landscaping or mowing. Intakes through this route were estimated using the following expression (USEPA, December 1989):

 $IEX = C \times IR \times EF \times ED / BW / LT / 365 / 106$

Where:

IEX is the ingestional exposure dose (mg/kg/day)

C is the concentration of the contaminant in soil (mg/kg)

IR is the soil ingestion rate (mg/event)

EF is the exposure frequency (events/yr)

ED is the exposure duration (yrs)

BW is the receptor body weight (kg)

LT is the receptor lifetime (yrs)

is a conversion factor (days/yr)

is a conversion factor (mg/kg)

An ingestion rate of 10 mg/event was assumed for adult receptors. This value is one-tenth of the daily ingestion rate reported by the USEPA (USEPA, December 1989) and has been used, since such exposures are expected to occur over brief time intervals. An exposure frequency of 12 events/year (i.e., once per month) was specified. An exposure duration of 40 years was assumed for civilian base personnel. A body weight of 70 kg was be used.

Dermal Contact With Surface Soil

Direct dermal contact with surface soil could occur in the same manner as previously discussed with respect to incidental ingestion. Exposures through this route will be characterized as follows:

 $DEX = C \times SA \times AF \times ABS \times EF \times ED / BW / AT / LT / 106$

Where:

DEX is the absorbed dose (mg/kg/day)

C is the concentration of the contaminant in soil (mg/kg)

SA is the exposed skin area (cm²/day)

AF is the soil to skin adherence factor (mg/cm²)

ABS is the absorption factor (dimensionless)

EF is the exposure frequency (days/yr)

ED is the exposure duration (yrs)

BW is the receptor body weight (kg)

AT is the averaging time (days/year)

LT is the lifetime (yrs)

is a conversion factor (mg/kg)

The exposed skin area was set as 2,948 cm²/day (Schaum, November 1984). This is the exposed surface area of adults wearing short-sleeved, open-necked shirts, pants, shoes, and no gloves or hat. The soil adherence factor was set as 1.45 mg/cm² (EPA, December 1989). Absorption factors were set as follows: volatiles--0.10, semivolatiles and pesticides--0.05, metals--0.0. These factors account for resistance to mass transfer from the soil to the skin surface as well as to transport through the skin. These are considered reasonable estimates, since studies have shown that less than 10 percent of most chemical substances are percutaneously absorbed even upon topical administration (Feldman and Mailbach, 1970; USEPA, May 1986).

The exposure frequency was set as 12 days/year. The exposure duration was set as 40 years (working lifetime at the facility). The receptor body weight was set as 70 kg; the averaging time, 365 days; and the receptor lifetime, 70 years.

Inhalation of Fugitive Dust

Although the emission of fugitive dust is impeded by the presence of cover materials (i.e, concrete and asphalt) and vegetation, this is considered a potential contaminant release mechanism and exposure pathway. Fugitive dust emissions, dispersion, and downwind concentrations were characterized using a particulate emission model developed by the USEPA (Cowherd et al.,1984). The model output is contingent

upon input parameters including the area of the source, the quantity of erodible material, mean wind speed, vegetative cover factors and Thornthwaite's precipitation/evaporation index, etc. Details regarding the emission model are included in Appendix F. Values of the various input parameters were determined from the literature (Cowherd et al., 1984). Inhalational exposures were characterized using the following expression (USEPA, December 1989):

$IEX = C \times IR \times ET \times EF \times ED / BW / LT / 365$

Where:

IEX is the inhalational dose (mg/kg/day)

C is the concentration of the contaminant in air (mg/m^3)

IR is the inhalation rate (m^3/hr)

ET is the exposure time (hrs/day)

EF is the exposure frequency (days/yr)

ED is the exposure duration (yrs)

BW is the receptor body weight (kg)

LT is the lifetime (yrs)

365 is a conversion factor (days/yr)

Potential receptors through this route include persons residing just beyond the perimeter of the base. It was assumed that such individuals could be exposed on a frequent basis and adult, adolescent, and child exposures were considered. Inhalation rates were specified as 20 m³/day (0.83 m³/hr), 10 m³/day (0.42 m³/hr), and 3 m³/day (0.12 m³/hr), for adults, adolescents, and children, respectively. The exposure time was specified as 24 hours/day, since it was assumed that dust was present both inside and outside domiciles. The exposure frequency was set as 312 days/year (6 days/week) to account for times when receptors are outside the exposure zone. The exposure duration was specified as 70 years (worst-case). Receptor body weights were set as follows: adults--70 kg, adolescents--35 kg, children--10 kg. Lifetimes were assumed to be 70 years. Additional input parameters specific to the emission modeling effort are provided in Appendix E.

4.4.4 Exposure Assessment Summary

Exposures through potable use of ground water, dermal contact with surface soil, incidental ingestion of surface soil, and inhalation of fugitive dust were considered. Two distinct receptor groups have been identified: onsite receptors (base personnel) and offsite receptors (local residents). Adults constitute the primary onsite receptors. Offsite exposures were considered for adults, adolescents, and children. Table 4-9 provides a synopsis of the various exposure routes and pertinent assumptions identified in the preceding text.

4.5 RISK CHARACTERIZATION

Potential human health risks resulting from the exposure routes outlined in Section 4.4.3 (Exposure Assessment) are characterized on a quantitative basis in this section. Quantitative risk estimates are generated based on risk assessment methods outlined in USEPA guidance (USEPA, December 1989). Noncarcinogenic risk estimates are presented in the form of Hazard Quotients and Hazard Indices that are determined through comparison of estimated doses with published Reference Doses. Incremental cancer risk estimates are provided in the form of dimensionless probabilities based on published Cancer Slope Factors and time-weighted average doses. Section 4.5.1 summarizes the estimated human intakes (doses) for each of the exposure routes. Section 4.5.2 summarizes the results of the noncarcinogenic risk assessment. Carcinogenic risk estimates are provided in Section 4.5.3. Section 4.5.4 contrasts observed ground-water concentrations with applicable standards or guidelines.

4.5.1 Dose Estimates

Estimated intakes were developed for each of the specific exposure routes discussed previously. Complete calculations and methods are provided in Appendix F. Table 4-10 summarizes the estimated intakes (doses) for the routine domestic use of onsite ground water by local residents. Table 4-11 summarizes the doses based on a scenario that includes leachate generation from contaminated soil with subsequent dilution in the water table aquifer.

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Table 4-12 presents the estimated doses associated with inhalation of fugitive dust by offsite receptors. Estimated doses from dermal contact and incidental ingestion of surface soils by onsite receptors are provided in Table 4-13.

Each table presents the average annual doses for each receptor. The average annual doses are used to calculate noncarcinogenic health risks. To calculate lifetime incremental cancer risks, a time weighting factor is used, as explained in Section 4.4.3. The time weighting factor consists of an exposure duration as part of a lifetime. For onsite receptors this factor is 40 yr/70 yr, which is a conservative assumption for a career employee. For offsite receptors, this is 70 yr/70 yr, or alternatively 1.0 (an entire lifetime).

4.5.2 Noncarcinogenic Risk Assessment

Noncarcinogenic risk is assessed using the concept of Hazard Quotients and Hazard Indices. The Hazard Quotient is the ratio of the estimated dose and the Reference Dose for a selected indicator chemical, as follows:

Hazard Quotient = Dose/Reference Dose

A Hazard Index is generated by summing the individual Hazard Quotients for the chemicals of concern. If the value of the Hazard Index exceeds unity (1.0), there is a potential noncarcinogenic health risk associated with exposure to that particular chemical mixture (USEPA, September 1986). The Hazard Index is not a mathematical prediction of the severity of toxic effects; it is simply a numerical indicator of the possibility of the occurrence of noncarcinogenic (threshold) effects. If the ratio of the dose and the Reference Dose for a selected chemical exceeds unity, it is likely that noncarcinogenic effects would occur as a result of the exposure.

Tables 4-14 and 4-15 summarize the Hazard Quotients associated with domestic use of onsite ground water and ground water affected by leachate, respectively. The results presented in these tables may be considered to be conservative estimates, for the following reasons:

 The Hazard Quotients are based on the maximum detected or predicted ground-water concentrations.

• The exposure scenario assumes that the contaminant concentrations observed on site will migrate to an offsite/offbase receptor location with no further dilution or attenuation.

Even under these conservative assumptions, no Hazard Index exceeds unity. The maximum estimated Hazard Index (0.10) is for small children under the leaching scenario. Under current site conditions, therefore, potential receptors are not expected to incur an unacceptable noncarcinogenic health risk as a result of the routine domestic use of ground water (even if a potable water well were installed in close proximity to the sites).

Table 4-16 presents a summary of Hazard Quotients and Hazard Indices for exposure of offsite residents to fugitive dust emissions. The maximum Hazard Indices for the landfill (2.8 x 10-4) and the POL Storage Area (7.5 x 10-9) are well below unity, indicating that fugitive dust emissions would be unlikely to cause any adverse noncarcinogenic health effects under a relatively steady exposure scenario.

Table 4-17 presents Hazard Quotients and Hazard Indices for periodic exposures to surface soils by base personnel (adults only). Incidental ingestion of site soils under the scenario defined in Sections 4.3 and 4.4 results in a Hazard Index of 1.1×10^{-3} at the landfill and 4.5×10^{-8} at the POL Storage Area. Dermal contact results in Hazard Indices of 6.7×10^{-6} (the Former Base Landfill) and 1.1×10^{-6} (the POL Storage Area). This shows that there is little possibility of base personnel suffering adverse health impacts after periodic exposure.

4.5.3 <u>Carcinogenic Risk Assessment</u>

Incremental cancer risk estimates were generated for each of the exposure pathways using the estimated doses and published Cancer Slope Factors, as follows:

 $Risk = Dose \times CSF$

The risk determined using this expression is a unitless expression of an individual's likelihood of developing cancer as a result of exposure to carcinogenic chemicals. An incremental cancer risk of 1×10^{-6} indicates that the exposed receptor has a

3

1 in 1 million chance of developing cancer after a lifetime of exposure. Alternately, such a risk may be interpreted as representing one additional case of cancer in an exposed population of 1 million people. Cancer risks based on Cancer Slope Factors should be recognized as upper-limit estimates. Cancer Slope Factors (CSFs) are the upper 95 percent confidence limit of a dose-response curve generally derived from animal studies. Actual human risk, while not identifiable, is not expected to exceed the upper limit based on CSFs, and, in fact, may be much lower.

Based on the revised National Contingency Plan [40 CFR 300.430 (e)], the range of excess individual lifetime cancer risk used as cleanup goals for Superfund Sites is between 10-4 (1 in 10,000) to 10-6 (1 in 1,000,000). Site-specific cleanup standards are based on reasonable worst-case exposure scenarios.

Table 4-18 presents a summary of the incremental cancer risks for the potential domestic use of contaminated ground water affected by leachate (no carcinogens were detected in actual ground-water samples at either site). The risk at the Former Base Landfill is 3.2 x 10-5, for oral, dermal and inhalational exposures combined, and at the POL Storage Area the risk is estimated to be 6.8 x 10-6, based on the conservative assumptions discussed earlier. The primary contributors to these risks are benzo(a)pyrene at the landfill and methylene chloride at the POL Storage Area. However, considering that at least 50 years will elapse before the first contaminant could reach a receptor well 1 mile downgradient of the base, the risks presented above are currently of little concern. Furthermore, since attenuation mechanisms such as adsorption, molecular diffusion, and hydrodynamic dispersion will act between the source and potential receptor wells, it is considered unlikely that either site poses a threat to downgradient wells.

Table 4-19 presents a summary of incremental cancer risks from potential exposure to fugitive dust emissions. The lifetime incremental cancer risks resulting from exposure to fugitive dust emissions from the landfill is 7.2 x 10-7, which is primarily attributable to the presence of arsenic and benzo(a)pyrene in the surface soil of the eastern portion of the landfill. However, it should be noted that, at the present time, USEPA considers it inappropriate to perform a quantitative carcinogenic risk assessment on benzo(a)pyrene or other PAHs. In addition, the concentrations of PAHs found in these surface soils are well within the range of concentrations reported in developed areas.

Table 4-20 summarizes estimated incremental cancer risks associated with periodic employee exposure to onsite surface soils. The risks at the Former Base Landfill, again, are primarily associated with the presence of benzo(a)pyrene in the eastern portion of the landfill. However, the total risk for both the ingestion and dermal contact scenarios is 1.5×10^{-6} . These scenarios used the maximum contaminant concentrations in an effort to be conservative, and this resulted in a risk well within the "acceptable" risk range (10-4 to 10-6). The potential carcinogenic risk associated with onsite exposures to soils at the POL Storage Area are much lower (6.1 x 10-10), and is attributable to the presence of benzene.

In conclusion, no significant noncarcinogenic or carcinogenic risks appear to exist based on the available data and the exposure scenarios considered. All risks, even under the relatively conservative scenarios used, fall within or below the USEPA range of acceptable risks (10-4 to 10-6).

4.5.4 Comparison of Ground-Water Data with Standards/Guidelines

Comparison of the maximum observed ground-water concentrations (Table 4-2) with the final Maximum Contaminant Levels (MCLs) presented in Table 4-8 reveals that no constituents exceed applicable regulatory criteria. However, lead, which was detected at a maximum concentration of $10.6~\mu g/L$, exceeds the proposed MCL of $5~\mu g/L$, and styrene, which was detected at a maximum concentration of $10~\mu g/L$, exceeds a proposed MCL of $5~\mu g/L$. However, the $5~\mu g/L$ standard for styrene is based on a carcinogenicity classification of B2, while a standard of $100~\mu g/L$ has been proposed if styrene is a Class C carcinogen. This issue has not yet been resolved by the USEPA. No metals were detected at concentrations that exceed Primary Drinking Water Standards (Table 4-5).

No contaminants were detected in ground water at the POL Storage Area that exceeded Drinking Water Health Advisories (Table 4-8).

MOBILITY PARAMETERS FOR ORGANIC CHEMICALS

CAS Number	Chemical	Molecular Weight ⁽¹⁾	Water Solubility (1) (mg/L @ 20°C)	Octanol/Water Partition Coefficient(1)	Soil/Sediment Adsorption Coefficient(1)	Vapor Pressure(1) (mm Hg @ 20°C)	Henry's Law Constant(1) (atm-m³/mol)	Bioconcentration Factor(1) (µg/kg/ µg/L)-1	Specific Gravity(2) (20°C/4°C)
KETONES									
67-64-1	Acetone	58.08(2)	(2)000'09	-0.24(2)	9.2	220(30°C)(2)	2 43.40 514)	13/00	
78-93-3	2-Butanone	72 1(2)	353,000(10°C)(2)	1.82(2)	17	77 5(2)	3.43x10-5/4/	0.19(5)	0 791
108-10-1	4-Methyl-2-pentanone	100 2(2)	19,000(2)	1 68(8)	113	6(2)	4 15×10 5(4)	(c)£9.0	0.805
MONOCYCLIC AROMATICS	AROMATICS						4.104.10 24.7	(6)	0 801/
71-43-2	Benzene	78 12	1.790/0501						
			(2 C3)097'	55	65	95.2(25°C)	5.5×10·3	37	0.879
100-41-4	Ethylbenzene	106.16	152	2,200	1,100	7	6 6x10-3	470	0.867
	Total xylenes(6)	106.17(2)	187(2)	1,195(2)	248(7)	5.8(2)	4 33x 10-3(4)	128(5)	0 960
108-90-7	Chlorobenzene	112.56	488(25°C)	069	330	11.7	3 58×10-3	15.0	0.000
100-42-5	Styrene	104 14(2)	300(2)	490	417	5(2)	2 3 x 10-3(4)	100(5)	0.9045
									(25°C)

USEPA, December 1982 except as otherwise noted. Verschueren, 1983.
Lyman et al., 1982; Eq 4-10 and 4-8, respectively. Lyman; Eq 15-8.
Lyman; Eq 5-2.
Average values for ortho-, meta-, and para-xylene. Lyman; Eq 2-6.

Lyman; fragment analysis, Chapter 1. log Kow MIBK = log KowMEK - fH + 2 fCH3 + fCB Weast, 1982.

Value provided for similar compound 1-methylnaphthalene.

Lyman; fragment analysis, Chapter 1. log Kow2-methylnaphthalene = log Kownaphthalene + f⁶CH3 No data available; assumed same vapor pressure as naphthalene.

TABLE 4-1 (CONTINUED) MOBILITY PARAMETERS FOR ORGANIC CHEMICALS PAGE TWO OF FOUR

CAS Number	r Chemical	Molecular Weight(1)	Water Solubility (1) (mg/L @ 20°C)	Octanol/Water Partition Coefficient(1)	Soil/Sediment Adsorption Coefficient(1)	Vapor Pressure(1) (mm Hg @ 20°C)	Henry's Law Constant ⁽¹⁾ (atm-m³/mol)	Bioconcentration Factor(1) (ug/kg/	Specific Gravity(2) (20°C/4°C)
CHLORINATED ALIPHATICS	ALIPHATICS								
75-09-2	Methylene chloride	84 94	000.00						
78.87.5			20,000	7.01	88	362.4	2.03×10 ⁻³	0.9	1 327(9)
(1/8.8)	i,z-Okhioropropane	112 99	2,700	105	51	42	231×103	90	
PHTHALATE ESTERS	STERS							000	1 16(20/20°C)
85-68-7	Butylbenzylohthalate	[2]	3.0	30, 25					
			6.3	3.6×102	1.7×105	6×10 5	8.3×10·6	47,000	1.1(25/25°C)
PHENOLS	1				i				
108-95-2	Phenoi	17. 50	12020,000,00						
			93,000(25-0)	30	14.2	0.431(25°C)	4.54×10-7	9.4	101
(, ())									

229**2**2**2**28**3**23

USEPA, December 1982 except as otherwise noted.

Verschueren, 1983.
Lyman et al., 1982; Eq 4-10 and 4-8, respectively
Lyman; Eq 15-8.
Lyman; Eq 15-8.
Lyman; Eq 5-2.
Average values for ortho-, meta-, and para-xylene.
Lyman; Fq 2-6.
Lyman; fragment analysis, Chapter 1. log Kow MIBK = log KowMEK - fH + 2 fCH3 + fCB
Weast, 1982.
Value provided for similar compound 1-methylnaphthalene.
Lyman; fragment analysis, Chapter 1. log Kow2-methylnaphthalene = log Kownaphthalene + f^{\$\phi_{\text{CH}_3}\$}
No data available; assumed same vapor pressure as naphthalene.

TABLE 4-1 (CONTINUED)
MOBILITY PARAMETERS FOR ORGANIC CHEMICALS
PAGE THREE OF FOUR

			_						
CAS Number	Chemical	Molecular Weight(1)	Water Solubility (1) (mg/L @ 20°C)	Octanol/Water Partition Coefficient(1)	Soil/Sediment Adsorption Coefficient(1)	Vapor Pressure(1) (mm Hg @ 20°C)	Henry's Law Constant(!)	Bioconcentration Factor(1)	Specific Gravity(2)
POLYNUCLEAR AROMATICS	AROMATICS						(acm-m-/moi)	13/6n	(20°C/4°C)
83-32-9	Acenantitions								
	911911111111111111111111111111111111111	154.4	3 42(25°C)	009'6	4.600	1 55210 3/2000			
1-21-071	Anthracene	178.2	0 045 (25°C)	28 000	3007.	(2.52)c (1.85c)	9.1×10·5	1,800	
56-55-3	Benzo(a)anthracene	228 28	0.0057		14,000	1.7x10·5(25°C)	8.6×10·5	4,700	1.25
205-99-2	Benzo(b) fluoranthene		(500.0	410,000	200,000	2 2x10 B	1×10·6	53,000	
		6263	0 014 (25°C)	1.15×106	550,000	2,10,7		200/22	
6-80-/07	Benzo(k)fluoranthene	252.3	0 0043(25°C)	1 15×106	200 000	0.00	1.22×10·5	140,000	
50-32-8	Benzo(a)pyrene	35.	10020,0000		000,000	5×10-7	3.87×10-5	140,000	
218.01.0			U 62) 9600 0	1 15×106	550,000	5 6×10 9 (25°C)	4 9×10-7	900 001	
7	Ciliysene	2283	0 0018 (25°C)	410 000	000 000			000'0*1	
206-44-0	Fluoranthene	202 3	0.26125°C)	2000	200,000	b.3x10 9 (25°C)	1.05×10·6	53,000	1.274
86-73-7	Fluorene			000'67	38,000	5×10 6 (25°C)	6.5×10·6	12,000	
Τ		7011	1 69(2°C)	15,000	7,300	7 15104			
193-39-5	Indeno(1,2,3-cd)pyrene	2763	5.3×10 4(25°C)	3 2 106		20181	6.4xT0:>	3,800	
91-20-3	Naphthalene	128.2	31.7.155°(7)	20103	1 ox 1 0e	1×10·10	6.95×10.8	350,000	
91-57-6	2-Methylosopithslope	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		066')	940	0.087(25°C)	4 6x10-4	420	1.163
1	an and and and and	142 19(7)	26.28 (25°C)(2)(10)	18,200(11)	5,750(7)	0.087 (2007)			75
85-01-8	Phenanthrene	178.2	1 00 (25°C)	28.000	300 7.	0 001 (23 C)(151	6.02×10 4(4)	1,020(5)	0 994
129-00-0	Pyrene	202.3	0.13738971	200,00	14,000	9 6×10 4 (25°C)	2.26×10-4	4,700	1 025
10000	T		(2 62) 61 0	90,000	38,000	2 5x 10 6 (25°C)	5.1×10·6	12 000	
	USEPA. December 1982 events at all a	20 ath 2	•					2001	

556**5**665**6**65555

USEPA, December 1982 except as otherwise noted.

Verschueren, 1983.

Lyman et al., 1982; Eq 4-10 and 4-8, respectively.

Lyman; Eq 15-8.

Lyman; Eq 2-8.

Lyman; Eq 2-6.

Lyman; fragment analysis, Chapter 1. log Kow MIBK = log KowMEK - fH + 2 f_{CH3} + f_{CB}

Value provided for similar compound 1-methylnaphthalene.

Lyman; fragment analysis, Chapter 1. log Kow2-methylnaphthalene.

Lyman; fragment analysis, Chapter 1. log Kow2-methylnaphthalene.

Lyman; fragment analysis, Chapter 1. log Kow2-methylnaphthalene.

TABLE 4-1 (CONTINUED) MOBILITY PARAMETERS FOR ORGANIC CHEMICALS PAGE FOUR OF FOUR

CAS Number	Chemical	Molecular Weight(1)	Water Solubility (1) (mg/L @ 20°C)	Octanol/Water Partition Coefficient(1)	Soil/Sediment Adsorption Coefficient(1)	Vapor Pressure(1) (mm Hg @ 20°C)	Henry's Law Constant(1) (atm-m³/mol)	Bioconcentration Factor(1) (µg/kg/ µg/L)-1	Specific Gravity(2) (20°C/4°C)
PESTICIDES									
3									
20-73-3	4,4 -001	354 5	0 0055(25°C)	8 1×106	3 9×106	1.9x10-7(25°C)	1.58×10·5	8 0x106	
72-55-9	4,4'-DDE	318	0 04	9 1×106	4 4×106	6 5x 10 6	6 8×10.5	9 0-105	
72,54.8	4 4'.000	355					21.50	0.2XIU?	
	000-1:1	320	0.06(25°C)	1.6x106	7 7×105	1.02×10·6(30°C)	2 2×10·8	1.8×105	
76-44-8	Heptachlor	373.5	0 18(25°C)	26,000	12,000	3 0x10 4(25°C)	4 0x 10 3	4 400	82
319-84-6	Alpha-BHC	791	1.63(25°C)	7,800	3,800	2 5x 10·5	6 0x 10 6	1 500	95
	Methoxychlor		0.040340000					205'	
			0.04(24 €)(2)						141/25/25°C1

USEPA, December 1982 except as otherwise noted. Verschueren, 1983.
Lyman et al., 1982; Eq 4 10 and 4-8, respectively. Lyman; Eq 15-8.
Lyman; Eq 5-2.
Average values for ortho-, meta-, and para-xylene. Lyman; Eq 2-6.

Lyman; fragment analysis, Chapter 1. log Kow MIBK = log KowMEK - fH + 2 f_{CH3} + f_{CB} Weast, 1982.
Weast, 1982.
Value provided for similar compound 1-methylnaphthalene.
Lyman; fragment analysis, Chapter 1. log Kow2-methylnaphthalene = log Kownaphthalene + f[©]CH₃-No data available; assumed same vapor pressure as naphthalene. 22**93**9392**9**322

TABLE 4-2

CHEMICALS OF CONCERN FORMER BASE LANDFILL ELLINGTON FIELD (ANG) HOUSTON, TEXAS

Medium	Chemicals of Concern
Soil	Butylbenzylphthalate
	 Benzo(a)anthracene
	Benzo(b)fluoranthene
	 Benzo(k)fluoranthene
	Benzo(a)pyrene
	Indeno(1,2,3-cd)pyrene
	Naphthalene
	• 4,4'-DDT
	Arsenic
	• Lead
	Mercury
	• Zinc

TABLE 4-3

CHEMICALS OF CONCERN POL STORAGE AREA ELLINGTON FIELD (ANG) HOUSTON, TEXAS

Medium	Chemicals of Concern
Soil	Acetone
	• 2-Butanone
	Benzene
	Ethylbenzene
<u>:</u>	 Total xylenes
	• Styrene
	 Chlorobenzene
	Methylene chloride
Ground Water	Ethylbenzene
	 Chlorobenzene
	 Total xylenes
	• Styrene

TABLE 4-4 MAXIMUM GROUND-WATER CONCENTRATIONS

Chemical	Former Base Landfill (µg/L)*	POL Storage Area (μg/L)
Ethylbenzene	ND (5)	6
Chlorobenzene	ND (5)	6
Total Xylenes	ND (5)	23
Styrene	ND (5)	10
Alpha-BHC	0.037	NA
Methoxychior	0.022	NA
Aluminum	2,910	NA
Barium	517	NA
Beryllium	1.3	NA
Calcium	176,000	NA
Chromium	7.9	NA
Iron	3,710	NA
Lead	10.6	NA
Manganese	498	NA
Nickel	12.1	NA
Vanadium	10.8	NA
Petroleum Hydrocarbons (mg/L)	0.9	ND (0.2)

ND Not detected.
NA Not analyzed.
* Where not detected, method detection limit shown in parentheses.

TABLE 4-5 SITE GROUND-WATER AND BACKGROUND INORGANIC CONCENTRATIONS FORMER BASE LANDFILL

Chemical	Maximum Site Ground-Water Concentrations ⁽²⁾ (μg/L)	Background Ground-Water Concentrations ⁽³⁾ (µg/L)	Primary or Secondary Drinking Water Regulations ⁽⁴⁾ (µg/L)
Aluminum	2,910	<5.0-1,000	NA
Arsenic	ND (1.1)	<1.0-30	50
Barium	517	10-500	1,000
Beryllium	1.3	<10	NA
Cadmium	ND (3.3)	<1.0	10
Calcium	176,000	1,000-150,000	NA
Chromium	7.9	<1-5.0	50
Cobalt	ND (6.5)	<10	NA
Copper	ND (6.9)	<1.0-30	1,000/1,300(5)
Iron	3,710	10-10,000	300
Lead	10.6	<15	50/5(5)
Magnesium	ND (270)	1,000-50,000	NA
Manganese	498	<1.0-1,000	50
Mercury	ND (0.1)	<1.0	2
Nickel	12.1	< 10-50	NA
Potassium	ND (94.2)	1,000-10,000	NA
Selenium	ND (1.7)	<1.0-10	10
Silver	ND (6.9)	<5.0	50
Sodium	ND (500)	500-120,000	NA
Vanadium	10.8	<1.0-10	NA
Zinc	ND (2.0)	<10-2,000	5,000

- Ground-water samples at the POL Storage Area were not analyzed for metals. Maximum concentration detected in all samples obtained in January 1990.
- (2)
- (3)
- Dragun, 1988. 40 CFR 141 and 143. (4)
- (5) Proposed Maximum Contaminant Level (EPA, August 18, 1988).

 ND Not detected above the detection limit shown.

 NA Not available.

TABLE 4-6
MAXIMUM SOIL CONCENTRATIONS

	Former E	Base Landfill	POL Stor	age Area
Chemical	Surface (µg/kg)	Subsurface (µg/kg)	Subsurface (0-2 feet) (µg/kg)	Subsurface (>2 feet) (µg/kg)
Acetone	ND	ND	250	ND
2-Butanone	ND	ND	41	ND
4-Methyl-2-pentanone	ND	ND	ND	4
Benzene	ND	ND	180	ND
Ethylbenzene	ND	ND	210	13,000
Total xylenes	ND	ND	240	12
Styrene	ND	ND	ND	5
Chlorobenzene	ND	ND	ND	1
Methylene chloride	ND	ND	ND	6,1 0 0
1,2-Dichloropropane	ND	ND	ND	1
Butylbenzylphthalate	290*	ND	ND	ND
Acenaphthene	400*	ND	ND	ND
Anthracene	810*	ND	ND	ND
Benzo(a)anthracene	2,350*	ND	ND	ND
Benzo(b)fluoranthene	1,800*	ND	ND	ND
Benzo(k)fluoranthene	1,850*	ND	ND	ND
Benzo(a)pyrene	2,000*	ND	ND	ND
Chrysene	2,250*	ND	ND	ND
Fluoranthene	4,350*	ND	ND	ND
Fluorene	410*	ND	ND	ND

ND Not detected.

NA Not analyzed.

* Average of two duplicate samples using one-half the detection limit for non-detects.

TABLE 4-6 (CONTINUED) MAXIMUM SOIL CONCENTRATIONS **PAGE TWO OF THREE**

	Former E	Base Landfill	POL Stor	age Area
Chemical	Surface (µg/kg)	Subsurface (µg/kg)	Subsurface (0-2 feet) (µg/kg)	Subsurface (>2 feet) (µg/kg)
Indeno(1,2,3-cd)pyrene	930*	ND	ND	ND
Naphthalene	180*	ND	ND	200
2-Methylnaphthalene	ND	ND	ND	640
Phenanthrene	3,250*	ND	ND	ND
Pyrene	3,550*	ND	ND	ND
Dibenzofuran	200*	ND	ND	ND
Phenol	ND	22	ND	ND
4,4'-DDT	10	ND	NA	NA
4,4'-DDD	11	ND	NA	NA
4,4'-DDE	12	ND	NA	NA
Heptachlor	ND	21	NA	NA
Aluminum	11,000*	9,5 9 0	NA	NA
Arsenic	32.4*	5.0	NA	NA
Barium	302	136	NA	NΑ
Beryllium	ND	0.90	NA	NA
Calcium	39,900	38,000	NA	NA
Chromium	16.0	10.1	NA	NA
Cobalt	ND	22.0	NA	NA
Copper	ND	8.9	NA	NA
Iron	8,960*	16,000	NA	NA

ND

NA

Not detected. Not analyzed. Average of two duplicate samples using one-half the detection limit for non-detects.

TABLE 4-6 (CONTINUED) MAXIMUM SOIL CONCENTRATIONS PAGE THREE OF THREE

	Former E	Base Landfill	POL Stor	age Area
Chemical	Surface (µg/kg)	Subsurface (µg/kg)	Subsurface (0-2 feet) (µg/kg)	Subsurface (>2 feet) (µg/kg)
Lead	141	15.8	NA	NA
Magnesium	2,720	3,460	NA	NA
Manganese	152	540	NA	NA
Mercury	0.19	0.34	NA	NA
Nickel	ND	16.2	NA	NA
Potassium	750	1,400	NA	NA
Sodium	253	ND	NA	NA
Vanadium	ND	20.9	NA	NA
Zinc	180	22.0	NA	NA
Petroleum Hydrocarbons	ND	ND	132	9 9

ND Not detected.

NΑ

Not analyzed.

Average of two duplicate samples using one-half the detection limit for non-detects.

TABLE 4-7

9

ONSITE SURFACE SOIL AND BACKGROUND INORGANIC CONCENTRATIONS FORMER BASE LANDFILL

	Former Base Lanc	dfill Surface Soil Concentrations	ıcentrations	Literature Background Surface Soil Concentrations(2)	nd Surface Soil ions(2)
Chemical	Number of Positive Detections/Number of Samples	Range of Positive Detections (mg/kg)	Average Concentration (1) (mg/kg)	Range of Positive Detections (mg/kg)	Average Concentration (mg/kg)
Aluminum	3/3	6,010-11,000	8,090	5,000-100,000	74,000
Arsenic	3/3	3.5-32.4	13.4	<0.1-97	7.0
Barium	3/3	120-302	188	20-5,000	029
Calcium	3/3	006'68-088'6	76,500	900-320,000	33,000
Chromium	3/3	11.3-16.0	13.6	3-2,000	95
Iron	3/3	096'8-002'9	069'2	1,000-100,000	26,000
Lead	3/3	22.5-141	2.96	<10-700	20
Magnesium	3/3	1,480-2,720	2,040	300-100,000	10,000
Manganese	3/3	104-152	122	30-5,000	480
Mercury	3/3	0.07-0.19	0.12	< 0.01-4.6	90'0
Potassium	3/3	492-750	640	1,900-63,000	NR
Sodium	3/3	117-253	201	500-100,000	12,000
Zinc	2/3	2.5-180(3)	111	10-2,100	9

Arithmetic average of concentrations in samples 01-5501-A, 01-5502-A, and 01-5503-A. The result for sample 01-5503-A is the average of it and its duplicate 01-FD05-"A. Shacklette and Boerngen, 1984. For nondetected values, the concentration of the analyte was assumed to be half the method detection limit Ξ

36

(5 mg/kg). Not Reported. Not Detected. Not Analyzed.

R D A

TABLE 4-8

REGULATORY REQUIREMENTS AND DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF CONCERN

Chemical	Safe Dr Water A	Safe Drinking Water Act(1)(2)(3)	Referenc (mg/kį	leference Dose(4) (mg/kg/day)	Ambient W. Crite	Ambient Water Quality Criterial5) (ug/t)	Health Advisory(6)	Cancer Slope Facto (mg/kg/day)-1	Cancer Slope Factor(4X7) (mg/kg/day)-1	EPA Weight of Evidence
	(mg/L)	(mg/L) MCLG	Oral	Inhalation	Drinking Water Only	10 ^{.6} Risk	(1/8m)	Oral	Inhalation	(4)(7)
Acetone			1 x 10-1							
2-Butanone			5 x 10 ²	9×10 ²			1-Day/Child: 80 10-Day/Child: 8 Longer-term/Child: 3 Longer-term/Adult: 9 Lifetime/Adult: 0.2			Q
Benzene	0.005	0			0	0.67	1-Day/Child: 0.200 10-Day/Child: 0.200	2.9 x 10-2	2.9 x 10-2	٧
Ethylbenzene	, (b) 7 (d)	(p) L 0	1 x 10 ¹		2,400		1-Day/Child: 30 10-Day/Child: 3 Longer-term/Child: 1 Longer-term/Adult: 3 Lifetime/Adult: 0.7			

USEPA, August 18, 1988 USEPA, May 22, 1989 USEPA, October 1989 USEPA, April 5, 1989 Chu and Chen, 1984

3 2 5 5 5 6 5

USEPA, July 8, 1987

(a) 0.1 mg/L standard based on Class C weight-of-evidence
 (b) Primary Drinking Water Standard
 (c) Revoked by USEPA
 (d) Proposed MCL/MCLG
 (e) Proposed MCL/MCLG
 EPA Weight of Evidence classification System for Carcinogenicity:

 A Human carcinogen
 B 1 or 82 Probable human carcinogen

B2 indicates sufficient evidence in animals and inadequate or no evidence in humans B1 indicates that limited human data are available

C Possible human carcinogen
D Not classifiable as to human carcinogenicity
EEvidence of noncarcinogenicity for humans

TABLE 4-8 (CONTINUED) REGULATORY REQUIREMENTS AND DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF CONCERN PAGE TWO OF THREE

Chemical	Safe Drinking Water Act(1)(2)(3)	nking t(1X2X3)	Reierence Dose (mg/kg/day)	Reference Dose(4) (mg/kg/day)	Ambient Water Quality Criteria(5) (µg/L)	iter Quality ia(5) /L)	Health Advisory(6)	Cancer Slop (mg/kg	Cancer Slope Factor(4X?) {mg/kg/day}-1	EPA Weight of Evidence
	MCL (mg/L)	(mg/L) MCLG	Oral	Inhalation	Drinking Water Only	10-6 Risk	(a.g.u.)	Oral	Inhalation	(4)(7)
Chlorobenzene	0 1(9)	(p)1 0	2×10 2	5 x 10 ³	488		1-Day/Child: 2 10-Day/Child: 2 Longer term/Child: 2 Longer-term/Adult: 7 Lifetime/Adult: 0 1			
Total Xylenes	10(d)	10(9)	20	7 x 10 ²			1-Day/Child: 40 10-Day/Child: 40 Longer-term/Child: 40 Longer-term/Adult: 100 Lifetime/Adult: 10			
Styrene	0 005/0 1(4)(d)	(P)(e)1 0/0	20				1-Day/Child: 20 10-Day/Child: 2 Longer-term/Child: 2 Longer-term/Adult: 7 Lifetime/Adult: 0/0.1(a)	(4		B2/C
Methylene chloride			6 x 10-2	9 x 10·1	0	0.19	1-Day/Child: 10 10-Day/Child: 2	7.5 x 10 ⁻³	1.2 x 10-7	82

USEPA, July 8, 1987 USEPA, August 18, 1988 USEPA, May 22, 1989 USEPA, October 1989 USEPA, April 5, 1989 Chu and Chen, 1984

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(a) 0.1 mg/L standard based on Class C weight-of-evidence
(b) Primary Drinking Water Standard
(c) Revoked by USEPA
(d) Proposed MCL/MCLG
EPA Weight of Evidence classification System for Carcinogenicity:
A Human carcinogen
B I or B 2 Probable human carcinogen
B 2 indicates that limited human data are available
B 2 indicates sufficient evidence in animals and inadequate or no evidence in humans

C Possible human carcinogen
D Not classifiable as to human carcinogenicity
EEvidence of noncarcinogenicity for humans

TABLE 4-8 (CONTINUED)
REGULATORY REQUIREMENTS AND DOSE-RESPONSE PARAMETERS FOR CHEMICALS OF CONCERN
PAGE THREE OF THREE

Chemical	Safe D Water /	Safe Drinking Water Act(1\(2\(3\))	Referenc (mg/k	ference Dose(4) (mg/kg/day)	Ambient Wate Criteria (µg/L)	Ambient Water Quality Criteria(5) (µg/L)	Health Advisory(6)	Cancer Slop (mg/kg	Cancer Slope Factor(4X7) (mg/kg/dav)-1	FPA Weight
	MCL	MCLG	Te do	a distribution	Drinking	1	(J/Gw)			of Evidence
	(mg/L)	(mg/L)	5		Water Only	Risk		Oral	Inhalation	(Ve)
Butyibenzyiphthalate			2 x 10·1							
Benzo(a)anthracene					6	2 1 2 10 2				
Benzo(b)fluoranthene					,	501 715		1.5 x 10 l	8.2 x 10-2	82
Renaultifloranthone					0	3.1 x 10 ⁻³		9.2 x 10-1	4.9 x 10-1	E 2
Series Capital Control of the Contro					0	3.1 x 10 3		5 1 2 10.3		
Benzo(a)pyrene					c	3 1 2 10 3		201 4 1 5	2.01 × 7.7	82
Indeno(1,2,3-cd)pyrene								11.5	6 1	82
Namhthalone					٥	31×103		2.0 x 10·1	1 0 x 10·1	82
المراس ال			4 x 10·3							
4,4'-DDT			5 x 10·4							
Arsenic	(9)50:0	0.05(b)	1 x 10 3		c	2000		3.4 x 10°°	3.4 × 10:1	B2
	0.05(b)				,				5.0 x 10-1	4
ובקם	0.00\$(4)	(p)O	1.4 x 10-3(c)		05					82
Mercury	(q)Z00 ⁻ 0	0.002(b)	3 × 10-4		02		Longer-term/Adult: 0.002			
Zinc			2 x 10·1		2 000		cireume/Adult: 0.002			-
l					2001					
(1) LISEDA Lutura 1007										

USEPA, July 8, 1987 USEPA, August 18, 1988 USEPA, May 22, 1989 USEPA, October 1989 USEPA, April 5, 1989 Chu and Chen, 1984

2000000

(a) 0 1 mg/L standard based on Class C weight of evidence
 (b) Primary Drinking Water Standard
 (c) Revoked by USEPA
 (d) Proposed MCL/MCLG
 EPA Weight of Evidence classification System for Carcinogenicity:

A Human carcinogen B1 or B2 Probable human carcinogen B1 indicates that limited human data are available B2 indicates sufficient evidence in animals and inadequate or no evidence in humans.

C Possible human carcinogen
D Not classifiable as to human carcinogenicity
EEvidence of noncarcinogenicity for humans

TABLE 4-9 EXPOSURE ASSESSMENT SUMMARY(1)

Exposure Route	input	Parameters	
OTABLE USE OF GRO	OUND WATER - OFFSITE (LOCAL RESIDEN	TS)
Ingestion	Ingestion Rate:	Adults: Adolescents: Children:	2 L/day 1.5 L/day 1.0 L/day
	Exposure Frequency:	365 days/year	
	Exposure Duration:(2)	Adults:	70 years
	Lifetime:(2)	Adults:	70 years
	Body Weight:	Adults: Adolescents: Children:	70 kg 35 kg 10 kg
Inhalation(3)	Inhalation Rate:	Adults: Adolescents:	14 L/min 11 L/min
	Exposure Frequency:	1/day	
	Exposure Duration:	Adults:	70 years
	Lifetime:	Adults:	70 years
	Body Weight:	Adults: Adolescents:	70 kg 35 kg
Dermal Absorption	Permeability Constant:	0.0008 cm/hr	
	Skin Surface Area:	Adolescents: 14	400 cm ² 1,900 cm ² 280 cm ²
	Exposure Time:	0.25 hr/day	
	Exposure Frequency:	365 days/year	
	Exposure Duration:	Adults:	70 years
	Lifetime:	Adults:	70 years
	Body Weight:	Adults: Adolescents: Children:	70 kg 35 kg 10 kg

See text for parameter references.
 Exposure and lifetime terms for long-term (lifetime or working lifetime) risk estimates only (adults) for all exposure routes.
 Children not exposed through shower/inhalation route.

TABLE 4-9 (CONTINUED) EXPOSURE ASSESSMENT SUMMARY(1) PAGE TWO OF TWO

Exposure Route	Input Parameters

SURFACE SOIL - OFFSITE (LOCAL RESIDENTS)

Inhalation of Fugitive Dust	Inhalation Rate:	Adults: Adolescents: Children:	0.83 m ³ /hr 0.43 m ³ /hr 0.12 m ³ /hr
	Exposure Time:	24 hours/day	
	Exposure Frequency:	312 days/year	·
	Exposure Duration:	70 years	-
	Lifetime:	70 years	
	Body Weight:	Adults: Adolescent: Children:	70 kg 35 kg 10 kg

SURFACE SOIL - ONSITE (BASE PERSONNEL)

Incidental Ingestion	Ingestion Rate:	10 mg/event	
of Surface Soil	Exposure Frequency:	12 events/year	
	Exposure Duration:	40 years	
	Lifetime:	70 years	
	Body Weight:	70 kg	
Dermal Contact	Skin Surface Area:	2,948 cm ²	
With Surface Soil	Soil Adherence Factor:	1.45 mg/cm ²	
	Absorption Factor:	Volatiles: Semivolatiles: Pesticides: Metals	0.10 0.05 0.05 0
	Exposure Frequency:	12 days/year	- · · · · · · · · · · · · · · · · · · ·
	Exposure Duration:	40 years	· · · · · · · · · · · · · · · · · · ·
	Lifetime:	70 years	
	Body Weight:	70 kg	

See text for parameter references.
 Exposure and lifetime terms for long-term (lifetime or working lifetime) risk estimates only (adults) for all exposure routes.
 Children not exposed through shower/inhalation route.

TABLE 4-10

DOSE ESTIMATES-OFFSITE RECEPTORS DOMESTIC USE OF GROUND WATER POL STORAGE AREA

		Dose Es	timate (mg/k	g/day)(1)	
Chemical	Ingestion	and Dermal A	Absorption	Inhal	ation
	Adult	Youth	Child	Adult	Youth
Ethylbenzene	1.7 x 10-4	2.6 x 10-4	6.0 x 10-4	7.4 x 10 ⁻⁵	1.2 x 10-4
Xylenes	6.6 x 10-4	9.9 x 10-4	2.3 x 10-3	2.8 x 10-4	4.4 x 10-4
Styrene	2.9 x 10-4	4.3 x 10-4	1.0 x 10-3	1.2 x 10-4	1.9 x 10-4
Chlorobenzene	1.7 x 10-4	2.6 x 10-4	6.0 x 10-4	7.1 x 10-5	1.1 x 10-4

⁽¹⁾ Calculations provided in Appendix E.

TABLE 4-11

DOMESTIC USE OF GROUND WATER (BASED ON SOIL CONTAMINATION)

	Former Base L		andfill Dose Estimates (mg/kg/day)(1)	nates (mg/k	(g/day)(1)	POL Stor	POL Storage Area Dose Estimates (mg/kg/day)(1)	ose Estima	ites (mg/kg	/day)(1)
Chemical	Ingestion Abso	ition and Derma Absorption	ermal	Inhalation	ation	Inges	Ingestion and Dermal Absorption	rmal	Inhalation	tion
	Adult	Youth	Child	Adult	Youth	Adult	Youth	Child	Adult	Youth
Acetone	۸ A	NA	AN	AN	٩N	5.3×10-4	7.9×10-4	1.8×10-3	4.8×10-5	7.5×10-5
2-Butanone	NA	NA	AN	NA	AN	1.2×10-4	1.8×10-4	4.2×10-4	6.4×10-6	1.0×10-5
Benzene	٩Z	AN	AN	ΑN	ΔN	3.5×10-6	5.2×10-6	1.2×10-5	1.7×10-6	2.6×10-6
Ethylbenzene	ΝΑ	NA	AN	ΝΑ	AN	3.4×10-4	5.0×10-4	1.2×10-3	1.4×10-4	2.3×10-4
Xylenes	AN	NA	AN	AN	AN	2.4×10-5	3.6×10-5	8.4×10-5	1.0×10-5	1.6x10-5
Styrene	AN	NA	AN	AN	AN	2.1×10-6	3.1×10-6	7.3×10-6	8.6×10-7	1.4×10-6
Chlorobenzene	AN	NA	AN	AN	NA	8.5×10-7	1.3×10-6	3.0×10-6	3.5×10-7	5.5×10-7
Methylene Chloride	AN	AN	AN	AN	AN	8.9×10-4	1.3×10-3	3.1×10-3	3.9×10-4	6.2×10 ·i
Butylbenzylphthalate	7.5×10-5	1.1×10-5	2.5×10-5	8.1×10-8	1.2×10-7	QN	ΟN	ND	QN	ND
Benzo(a)anthracene	3.0×10-6	4.5×10-5	1.0×10-5	4.8×10-9	7.5×10-9	ND	ND	QN	QN	QN

Calculations provided in Appendix E. Based on maximum soil concentrations. Not detected. Not analyzed. 222¥

TABLE 4-11 (CONTINUED)
DOSE ESTIMATES - OFFSITE RECEPTORS(2)
DOMESTIC USE OF GROUND WATER (BASED ON SOIL CONTAMINATION)
PAGE TWO OF TWO

	Former Base Lai		ndfill Dose Estimates (mg/kg/day)(1)	nates (mg/k	(g/day)(1)	POL Stor	POL Storage Area Dose Estimates (mg/kg/day)(1)	ose Estima	ites (mg/kg	/day)(1)
Chemical	səbul.	Ingestion and De Absorption	nd Dermal otion	Inhalation	ation	Ingest	Ingestion and Dermal Absorption	rmal	Inhalation	ation
	Adúlt	Youth	Child	Adult	Youth	Adult	Youth	Child	Adult	Youth
Benzo(b)fluoranthene	3.5×10-6	5.3×10-6	1.2×10-5	6.1×10-8	9.6×10-8	Q.	QN	QN	QN	Q.
Benzo(k)fluoranthene	2.3×10-6	3.5×10-6	7.7×10-5	1.1×10-7	1.8×10-7	Q.	S	QN	QN	S
Benzo(a)pyrene	2.3×10-6 3.5×	3.5×10-6	7.7×10-6	1.7×10-9	2.7×10-9	Q	Q.	QN	QN	QN
Indeno(1,2,3-cd)pyrene	6.6×10-7	9.9×10-7	2.2×10-6 6.6×10-11 1.0×10-10	6.6×10-11	1.0×10-10	Q	Q	ND.	QN	Q
Naphthalene	1.3x10-5	2.0×10-5	4.4×10-4	3.8×10-6	6.0×10-6	1.1×10-5	1.6×10-5	3.8×10-5	3.2×10-6	5.0×10-6
4,4'-DDT	7.3×10-8	1.1×10-7	2.5×10-7	1.4x10-9 2.2x10-9	2.2×10-9	NA	ΑN	NA	NA	AA

Calculations provided in Appendix E. Based on maximum soil concentrations. Not detected. 2228 2823

TABLE 4-12

DOSE ESTIMATES - OFFSITE RECEPTORS(2) FUGITIVE DUST EMISSIONS

Chemical	Former Base	Former Base Landfill Dose Estimates (mg/kg/day)(1)	e Estimates	POL Stora	POL Storage Area Dose Estimates (mg/kg/day)(1)	Estimates)
	Adult	Youth	Child	Adult	Youth	Child
Acetone	NA	AN	NA	5.1×10-10	5.3×10-10	5.1×10-10
2-Butanone	NA	AN	AN	8.3×10-11	8.6×10-11	8.4×10-11
Benzene	NA	NA	NA	3.6×10-10	3.8×10-10	3.7×10-10
Ethylbenzene	NA	NA	NA	4.3×10-10	4.4×10-10	4.3×10-10
Xylenes	NA	NA	AN	4.9×10-10	5.0×10-10	4.9×10-10
Styrene	NA	NA	AN	QN	QN	QN
Chlorobenzene	NA	NA	AN	ND	QN	QN
Methylene Chloride	NA	NA	AN	QN	QN	QN
Butylbenzylphthalate	9.4×10-10	9.8×10-10	9.6×10-10	Q	QN	QN
Benzo(a)anthracene	7.6×10-9	7.9×10-9	7.7×10-9	QN	QN	QN
Benzo(b)fluoranthene	5.9×10-9	6.1×10-9	5.9×10-9	ND	QN	QN
Benzo(k)fluoranthene	6.0×10-9	6.2×10-9	6.1×10-9	ND	ND	QN

Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. Not detected. Not analyzed.

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TABLE 4-12 (CONTINUED)
DOSE ESTIMATES - OFFSITE RECEPTORS⁽²⁾
FUGITIVE DUST EMISSIONS
PAGE TWO OF TWO

ne cd)pyrene		(mg/kg/day) ⁽¹⁾	(mg/kg/day)(1)		(mg/kg/day)(1)	
pyrene		Youth	Child	Adult	Youth	Child
cd)pyrene	10-9	6.7×10-9	6.6×10-9	QN	QN	QN
	10-9	3.1×10-9	3.1×10-9	QN	QN	QN
Naphthalene	-	6.1×10-10	5.9×10-10	QN	QN	QN
4,4'-DDT 3.2x10-11	 	3.4×10-11	3.3×10-11	NA	NA	NA
Arsenic 1.0x10-7	10-7	1.1×10-7	1.1×10-7	NA	NA	NA
Lead 4.6x10-6	9-01	4.7×10-7	4.6×10-7	NA	NA	NA
Mercury 6.2x10-10	-	6.4×10-10	6.3×10-10	NA	NA	NA
Zinc 5.8x10-7	10-7	6.1×10-7	5.9×10-7	NA	NA	NA

Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. Not detected. Not analyzed.

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TABLE 4-13

DOSE ESTIMATES - ONSITE RECEPTORS(2) SURFACE SOIL EXPOSURES

	Former Base Land (mg/kg	rmer Base Landfill Dose Estimates (mg/kg/day)(1)	POL Storage Area Dose Estimates (mg/kg/day)(1)	a Dose Estimates /day)(1)
	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils	Incidental Ingestion of Onsite Surface	Dermal Contact with Onsite Surface Soils
Acetone	ΝĀ	VIV	SILOC	
2-Butanone		¥N.	1.2×10-9	5.0×10-8
Ronzoo	AN	NA	1.9×10-10	8.2×10-9
חבוולפוופ	AN	NA	8 4x10-10	26-10.8
Ethylbenzene	Ϋ́	\dagger Z		3.0x10-8
Xylenes	V.V.		9.9X10-10	4.2×10-8
	421	NA	1.1x10-9	4.8×10-8
Styrene	NA	AN	CN	0 4 4
Chlorobenzene	AN	VV	2	S
Methylene Chloride	AN		ON I	ND
Butvibenzylphthalate	007:07	42	QN	QN
a control of the cont	1.3X10-9	2.9×10-8	QN	GN
Benzo(a)anthracene	1.1×10-8	2.4×10-7	GN	CIV
Benzo(b)fluoranthene	8.4×10-9	1 8×10-7		ON S
Benzo(k)fluoranthene	0 7210-0		Ç.	ON
	6.7 x 10-3	1.9×10-7	QN	QN

Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. Metals in soil are not dermally absorbed. Not detected. Not analyzed.

PA2333

TABLE 4-13 (CONTINUED)
DOSE ESTIMATES - ONSITE RECEPTORS(2)
SURFACE SOIL EXPOSURES
PAGE TWO OF TWO

	Former Base Landfill Dose (mg/kg/day)(1)	mer Base Landfill Dose Estimates (mg/kg/day)(1)	POL Storage Area Dose Estimates (mg/kg/day)(1)	a Dose Estimates /day)(1)
Chemical	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils
Benzo(a)pyrene	9.4×10-9	2.0×10-7	QN	QN
Indeno(1,2,3-cd)pyrene	4.4×10-9	9.3x10-8	QN	QN
Naphthalene	8.4×10-10	1.8x10-8	QN	QN
4,4'-DDT	4.7×10-11	1.0x10-9	NA	ĀN
Arsenic	1.5×10-7	(3)	AN	ΑN
Lead	6.6×10-7	(٤)	NA	ΑN
Mercury	8.9×10-10	(3)	NA	٩N
Zinc	8.4×10-7	(٤)	NA	NA

Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. Metals in soil are not dermally absorbed. Not detected. Not analyzed.

PA 3333

TABLE 4-14

HAZARD QUOTIENTS-OFFSITE RECEPTORS DOMESTIC USE OF GROUND WATER POL STORAGE AREA

		На	zard Quotien	t(1)	
Chemical	Ingestion	and Dermal A	Absorption	Inhai	ation
	Adult	<u> </u>			Youth
Ethylbenzene	1.7 x 10-3	2.6 x 10-3	6.0 x 10-3		
Xylenes	3.3 x 10-4	4.9 x 10-4	1.1 x 10-3	7.0 x 10-4	1.1 x 10-3
Styrene	1.4 x 10-3	2.1 x 10-3	5.0 x 10-3		
Chlorobenzene	5.7 x 10-3	8.6 x 10-3	2.0 x 10-2	1.4 x 10-2	2.2 x 10 ⁻²
Total (Hazard Index)	9.2 x 10 ⁻³	1.4 x 10-2	3.2 x 10-2	1.5 x 10-2	2.3 x 10 ⁻²

⁽¹⁾ Calculations provided in Appendix E.

⁻⁻ No reference dose available for this route of exposure.

TABLE 4-15

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HAZARD QUOTIENTS - OFFSITE RECEPTORS(2) DOMESTIC USE OF GROUND WATER (BASED ON SOIL CONTAMINATION)

	Former	1	Base Landfill Hazard Quotient(1)	d Quotier	14(1)	PO	POL Storage Area Hazard Quotient(1)	Area Hazar	d Quotient	ε
Chemical	Inges	Ingestion and Dermal Absorption	ermal	Inhal	Inhalation	Inges	Ingestion and Dermal Absorption	ermal	Inhalation	ation
	Adult	Youth	Child	Adult	Youth	Adult	Youth	Child	Adult	Youth
Acetone	NA	NA	AN	NA	NA	5.3×10-3	7.9×10-3	1.8×10-2	:	:
2-Butanone	ΑN	NA	NA	AN	NA	2.4×10-3	3.6×10-3	8.5×10-3	7.1x10-5	1.1×10-4
Benzene	ΝΑ	NA	AN	AN	NA	-		-	:	:
Ethylbenzene	ΑN	AN	ΑN	AN	NA	3.4×10-3	5.0×10-3	1.2×10-2	-	:
Xylenes	NA	AN	AN	AN	NA	1.2×10-5	1.8×10-5	4.2×10-5	2.6×10-5	4.0×10-5
Styrene	ΔN	AN	AN	AN	NA	1.0×10-7	1.6×10-7	3.6×10-7	n de	:
Chlorobenzene	AN	AN	ΑN	AN	NA	4.2×10-5	6.4×10-5	1.5×10-4	7.0×10-5	1.1×10-4
Methylene Chloride	AN	NA	۸N	NA	AN	1.5×10-2	2.2×10-2	5.2×10-2	4.4×10-4	6.9×10-4
Butylbenzylphthalate	3.7×10-5	5.6×10-4	1.2×10-4			ΟN	QN	DN	QN	Q
Benzo(a)anthracene		••	:	-		QN	QN	ND	ΠN	ON

Calculations provided in Appendix E. Based on maximum soil concentrations. Not detected. Not analyzed. No reference dose available for this route of exposure. 224 :

TABLE 4-15 (CONTINUED) HAZARD QUOTIENTS - OFFSITE RECEPTORS(2) DOMESTIC USE OF GROUND WATER (BASED ON SOIL CONTAMINATION) PAGE TWO OF TWO

	Former		ase Landfill Hazard Quotient(1)	d Quotie	nt(1)	8	L Storage	POL Storage Area Hazard Quotient(1)	d Quotien	£
Chemical	Ingestion Abs	tion and Dermal Absorption	ermal	Inhal	Inhalation	Inges	Ingestion and Dermal Absorption	ermai	Inhal	Inhalation
	Adult	Youth	Child	Adult	Youth	Adult	Youth	Child	Adult	Youth
Benzo(b)fluoranthene		:	:	;		QN	QN	QN	QN	S
Benzo(k)fluoranthene	;	-	;	;		QN	QN	QN	QN	Ę
Benzo(a)pyrene	;		:	-	:	QN	QN	GN	S	2 2
Indeno(1,2,3-cd)pyrene	:	+	;		;	QN	QN	QN C	S S	2 2
Naphthalene	3.3×10-3	4.9x10-3	1.1×10-2	:	:	2.7×10-3	4.1×10-3	6	2	<u> </u>
4,4'-DDT	1.5×10-4	2.2×10-4	4.9×10-4		:	AN	AN		AN	ΔN
Total (Hazard Index)	3.5×10-3	5.2×10-3	1.2×10-2	:	:	2.9×10-2	4.3×10-2	1.0x10-1	6.0×10-4	6

SESA :

Calculations provided in Appendix E. Based on maximum soil concentrations. Not detected. Not analyzed. No reference dose available for this route of exposure.

TABLE 4-16

HAZARD QUOTIENTS - OFFSITE RECEPTORS(2) FUGITIVE DUST EMISSIONS

Chemical	Former	Former Base Landfill Hazard Quotient(1)	Hazard	POL St	POL Storage Area Hazard Quotient(1)	azard
	Adult	Youth	Child	Adult	Youth	Child
Acetone	NA	NA	NA	3.2×10-9	3.3×10-9	3.2×10-9
2-Butanone	NA	NA	NA	1.2×10-9	1.2×10-9	1.2×10-9
Benzene	NA	۷N	AN			
Ethylbenzene	NA	NA	NA	2.7×10-9	2.8×10-9	2.7×10-9
Xylenes	NA	۷N	AN	3.0×10-10	3.2×10-10	3.1×10-10
Styrene	NA	NA	NA	ND	ND	QN
Chlorobenzene	NA	VN	NA	QN	QN	QN
Methylene Chloride	NA	۷N	NA	ND	ND	QN
Butylbenzylphthalate	2.9×10-9	3.0×10-9	3.0×10-9	ND	ND	QN
Benzo(a)anthracene				ND	ND	QN

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Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. Not detected. Not analyzed. No reference dose available for this route of exposure.

TABLE 4-16 (CONTINUED)
HAZARD QUOTIENTS - OFFSITE RECEPTORS(2)
FUGITIVE DUST EMISSIONS
PAGE TWO OF TWO

Chemical	Former	Former Base Landfill Hazard Quotient(1)	Hazard	POL S1	POL Storage Area Hazard Quotient(1)	lazard
	Adult	Youth	Child	Adult	Youth	Child
Benzo(b)fluoranthene		:	-	QN	ND	Q
Benzo(k)fluoranthene	1		:	QN	QN	QN
Benzo(a)pyrene	1	:		ND	QN	QN
Indeno(1,2,3-cd)pyrene	-	:	-	QN	QN	QN
Naphthalene	9.1×10-8	9.5×10-8	9.3×10-8	QN	QN	QN
4,4'-DDT	4.1×10-8	4.2×10-8	4.1×10-8	NA	NA	AN
Arsenic	6.6×10-5	6.8×10-5	6.7×10-5	NA	NA	ΑN
Lead	2.0×10-4	2.1×10-4	2.1×10-4	NA	NA	AN
Mercury	1.3×10-6	1.3×10-6	1.3×10-6	NA	NA	ΑN
Zinc	1.8×10-6	1.9×10-6	1.8×10-6	NA	NA	AN
Total (Hazard Index)	2.7×10-4	2.8×10-4	2.8×10-4	7.3×10-9	7.6×10-9	7.4×10-9

Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. Not detected. Not analyzed. No reference dose available for this route of exposure.

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TABLE 4-17

HAZARD QUOTIENTS - ONSITE RECEPTORS(2) SURFACE SOIL EXPOSURES

	Former Base Landfill Hazard Quotient(1)	Hazard Quotient(1)	POL Storage Area l	POL Storage Area Hazard Quotient(1)
Chemical	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils
Acetone	NA	AN	1.2×10-8	5.0×10-7
2-Butanone	NA	NA	3.8×10-9	1.6x10-7
Benzene	NA	۸N		
Ethylbenzene	NA	AN	9.9×10-9	4.2×10-7
Xylenes	NA	AN	5.6×10-10	2.4×10-8
Styrene	AN	NA	ND	QN
Chlorobenzene	NA	AN	QN	QN
Methylene Chloride	AN	NA	QN	QN
Butylbenzylphthalate	6.8×10-9	1.4x10-7	QN	QN
Benzo(a)anthracene	1	1	QN	QN

Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. Metals in soil are not dermally absorbed. Not detected. Not analyzed.

: \$20 GE:

TABLE 4-17 (CONTINUED)
HAZARD QUOTIENTS - ONSITE RECEPTORS(2)
SURFACE SOIL EXPOSURES
PAGE TWO OF TWO

	Former Base Landfill	er Base Landfill Hazard Quotient(1)	POL Storage Area	POL Storage Area Hazard Quotient(1)
Chemical	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils
Benzo(b)fluoranthene		1	ND	ND
Benzo(k)fluoranthene		•	QN	QN
Benzo(a)pyrene	:	1	QN	QN
Indeno(1,2,3-cd)pyrene		•	QN	QN
Naphthalene	2.1×10-7	4.5×10-6	QN	QN
4,4'-DDT	9.4×10-8	2.0×10-6	NA	AN
Arsenic	1.5×10-4	(3)	ΑN	AN
Lead	4.7×10-4	(3)	ΑN	AN
Mercury	3.0×10-6	(3)	AN	₹Z
Zinc	4.2×10-6	(3)	ΝΑ	AN
Total (Hazard Index)	6.3×10-4	6.7×10-6	2.6×10-8	1.1×10-6

Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. Metals in soil are not dermally absorbed.

Not detected. : \$20 as:

Not analyzed. No reference dose available for this route of exposure.

TABLE 4-18 INCREMENTAL CANCER RISKS-OFFSITE RECEPTORS (ADULTS)
DOMESTIC USE OF GROUND WATER (BASED ON SOIL CONCENTRATIONS)
POL STORAGE AREA

	Former Ba Increment Risi	tal Cancer	POL Store Increment Ris	age Area tal Cancer k ⁽¹⁾
Chemical	Ingestion and Dermal Absorption	Inhalation	Ingestion and Dermal Absorption	Inhalation
Acetone	NA	NA		
2-Butanone	NA	NA		
Benzene	NA	NA	1.0x10-7	4.9x10-8
Ethylbenzene	NA	NA		
Xylenes	NA	NA		
Styrene	NA	NA		•-
Chlorobenzene	NA	NA		
Methylene Chloride	NA	NA ·	6.7x10-6	4.7x10-11
Butylbenzylphthalate	••		ND	ND
Benzo(a)anthracene	4.5x10-7	3.9x10-10	ND	ND
Benzo(b)fluoranthene	3.2x10-6	3.0x10-8	ND	ND
Benzo(k)fluoranthene	1.8x10-6	4.6x10-8	ND	ND
Benzo(a)pyrene	2.7x10-5	1.0x10-8	ND	ND
Indeno(1,2,3-cd)pyrene	1.3x10-7	6.6x10 ⁻¹²	ND	ND
Naphthalene				**
4,4'-DDT	2.5x10-8	4.7x10-10	NA	NA
Total Risk	3.2x10-5	8.7x10 ⁻⁸	6.8x10 ⁻⁶	4.9x10-8

Calculations provided in Appendix E. Not detected. (1)

ND

NA

Not analyzed
No cancer slope factor available for this route of exposure.

TABLE 4-19 INCREMENTAL CANCER RISKS - OFFSITE RECEPTORS(2) **FUGITIVE DUST EMISSIONS**

Chemical	Former Base Landfill Incremental Cancer Risk(1)	POL Storage Area Incremental Cancer Risk ⁽¹⁾
	Adult	Adult
Acetone	NA	
2-Butanone	NA	
Benzene	NA	7.9x10-12
Ethylbenzene	NA	
Xylenes	NA	
Styrene	NA	ND
Chlorobenzene	NA	ND
Methylene Chloride	NA	ND
Butylbenzylphthalate	••	ND
Benzo(a)anthracene	8.0x10 ⁻¹⁰	ND
Benzo(b)fluoranthene	3.7x10 ⁻⁹	ND
Benzo(k)fluoranthene	· 3.2x10-9	ND
Benzo(a)pyrene	5.2x10 ⁻⁸	ND
Indeno(1,2,3-cd)pyrene	4.2x10 ⁻¹⁰	ND
Naphthalene		ND
4,4'-DDT	8.3x10 ⁻¹²	NA
Arsenic	6.6x10 ⁻⁷	NA
Lead		NA
Mercury		NA
Zinc	••	NA
Total Risk	7.2x10 ⁻⁷	7.9x10 ⁻¹²

⁽¹⁾

Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. (2)

Not detected. ND

NA

Not analyzed No cancer slope factor available for this route of exposure.

TABLE 4-20

INCREMENTAL CANCER RISKS - ONSITE RECEPTORS SURFACE SOIL EXPOSURES

Chemical of Onsite Surface Soils Incidental Ingestion Soils Dermal Contact with Soils Soils Incidental Ingestion Soils Dermal Contact with Soils Incidental Ingestion Soils Dermal Contact with Soils Incidental Ingestion On Soils Dermal Contact with Soils		Former Base Lan	ormer Base Landfill Incremental Cancer Risk(1)	POL Storage Area Incremental Cancer Risk(1)	ea Incremental Risk(1)
NA NA NA NA NA NA 1.4x10-11 NA NA NA NA NA NA ND NA NA ND NA NA ND NA NA ND PSX10-10 2.0x10-8 ND	Chemical	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils
	Acetone	NA	NA		•
NA NA ND ND ND ND ND ND ND ND <	2-Butanone	AN	NA	:	
NA NA NA NA NA NA ND NA NA ND NA NA ND e 9.5x10-10 2.0x10-8 ND	Benzene	NA	AN	1.4×10-11	6.0x10-10
NA NA NA NB ND NA NA ND e 9.5x10-10 2.0x10-8 ND	Ethylbenzene	NA	AN	:	1
NA NA ND NA ND ND e ND 9.5x10-10 2.0x10-8 ND	Xylenes	NA	AN	:	•
NA NA ND NA ND e ND 9.5x10-10 2.0x10-8 ND	Styrene	NA	AN	QN	QN
e ND	Chlorobenzene	NA	NA	ND	ND
e ND 9.5x10-10 2.0x10-8 ND	Methylene Chloride	NA	AN	QN	QN
9.5×10-10 2.0×10-8 ND	Butylbenzylphthalate	1		QN	ND
	Benzo(a)anthracene	9.5×10-10	2.0×10-8	QN	QN

: \$20 GE:

Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. Metals in soil are not dermally absorbed.

Not detected. Not analyzed No cancer slope factor available for this route of exposure.

TABLE 4-20 (CONTINUED)
INCREMENTAL CANCER RISKS - ONSITE RECEPTORS
SURFACE SOIL EXPOSURES
PAGE TWO OF TWO

	Former Base Landfill Incremental Cancer Risk(1)	dfill Incremental Risk(1)	POL Storage Area Incremental Cancer Risk(1)	age Area Incremental Cancer Risk(1)
Chemical	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils	Incidental Ingestion of Onsite Surface Soils	Dermal Contact with Onsite Surface Soils
Benzo(b)fluoranthene	4.4×10-9	9.5×10-8	QN	QN
Benzo(k)fluoranthene	3.8x10-9	8.1x10 ⁻⁸	QN	QN
Benzo(a)pyrene	6.2×10-8	1.3×10-6	ON	QN
Indeno(1,2,3-cd)pyrene	5.0×10-10	1.1x10-8	QN	QN
Naphthalene	•	1	ON	QN
4,4'-DDT	9.1×10-12	1.9×10-10	NA	NA
Arsenic		(3)	NA	NA
Lead		(3)	NA	AN
Mercury	-	(3)	NA	۷N
Zinc		(3)	NA	AN
Total Risk	7.1×10-8	1.5x10 ⁻⁶	1.4x10-11	01-01×0.9

Calculations provided in Appendix E. Based on maximum surface or near-surface soil concentrations. Metals in soil are not dermally absorbed. Not detected. Not analyzed No analyzed

5.0 SUMMARY AND CONCLUSIONS

The following sections summarize the results of the SI and present conclusions and recommendations for further actions. A meeting was held at Ellington Field (ANG) on October 3, 1990 to review comments on the draft SI Report from regulatory agencies involved with the SI activities. Minutes from the meeting are provided in Appendix G. Also contained in Appendix G is a letter from the National Guard Bureau to the Texas Water Commission (TWC) advising them of the meeting outcome and requesting comments on the SI Report, as a TWC representative was not present at the review meeting.

5.1 FORMER BASE LANDFILL

5.1.1 Summary

A geophysical survey utilizing magnetometry and electromagnetic conductivity techniques was conducted at the Former Base Landfill. The resulting data allowed for the characterization of shallow subsurface soils and the identification of areas where waste disposal activities had occurred. Two possible locations for the UST at the former incinerator site were also determined.

Three distinct stratigraphic zones were identified through the soils investigation conducted at the landfill. Zone 2, a layer of brown clayey silt and silty sand, was the first zone of saturated sediments beneath the site with sufficient permeability to yield ground water to a borehole during drilling. Nine subsurface soil samples and three surface soil samples were collected during the investigation and sent to a fixed-base laboratory for chemical analysis.

It was determined through water level measurements that the direction of ground-water flow in shallow sediments beneath the landfill is generally to the east-northeast, or toward the commercial sand pit adjacent to the site. Slug tests performed at the wells installed at the site allowed for the estimation of hydraulic conductivities of the Zone 2 sediments. Five ground-water samples were collected and sent to a fixed-base laboratory for chemical analysis.

5-1

No volatile organic compounds were identified through laboratory analysis in soil or ground-water samples collected from the site. Several pesticides were detected in soils and ground water at low concentrations, and several BNAs were present in surface soil samples. However, the analytical data does not appear to indicate a gross contamination problem associated with disposal of wastes at the Former Base Landfill

5.1.2 Conclusions

A preliminary risk assessment was performed and concluded that there did not appear to be any significant risks to human health based on the available data and the exposure scenarios considered.

5.1.3 Recommendations

Based on the findings of the SI activities, it is recommended that a Decision Document be prepared substantiating that no further action is necessary at the Former Base Landfill.

5.2 POL STORAGE AREA

5.2.1 Summary

A soils investigation conducted at the POL Storage Area indicated that the soil profile beneath the site was extremely similar to the profile beneath the Former Base Landfill. As at the landfill, Zone 2 was the first zone to yield ground water to a borehole during drilling. However, water level data suggest that the overlying silty clays of Zone 1B may be saturated, but are not permeable enough to rapidly transmit water. Twenty-three subsurface soil samples were collected and sent to a fixed-base laboratory for chemical analysis.

Ground-water flow direction in shallow sediments beneath the site is predominantly to the east. Estimates of hydraulic conductivity, transmissivity and seepage velocity were calculated based on slug test results and site-specific hydrogeologic data. Four ground-water samples were collected and sent to a fixed-base laboratory for chemical analysis.

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Contamination was detected in soil samples collected from three of the borings drilled at the POL Storage Area. The most contaminated boring, SB-13, is located within the diked area, just west of the railroad spur. It is adjacent to a portion of the former remediation trench in which petroleum hydrocarbons are known to exist in remaining soils at levels above TWC criteria for clean closure. Another of these borings, SB-10, was drilled through the trench backfill at the north end of the spur. The well installed at that location (MW-10) yielded the only ground-water sample in which contamination was detected. Gross contamination at the POL Storage Area is not apparent based on the results of the SI. However, samples collected from the walls and floor of the former remediation trench prior to backfilling indicate that petroleum hydrocarbons are present in remaining soils and fill material at concentrations above 100 ppm (TWC criteria for clean closure).

5.2.2 Conclusions

A preliminary risk assessment was performed and concluded that there did not appear to be any significant risks to human health based on data generated during the SI and the exposure scenarios considered. However, the extent of soil contamination in the immediate vicinity of the former remediation trench should be further delineated prior to reaching a decision regarding further action at the site. Also, there is a lack of ground-water quality and usage information for the uppermost permeable sediments encountered at Ellington Field (ANG).

5.2.3 Recommendations

To further delineate the extent of soil contamination adjacent to the former remediation trench, a series of soil borings should be installed along the western edge of the concrete driveway at the POL Storage Area. If substantial contamination exists in soils at or near the top of ground water, monitoring wells should be installed to determine whether ground-water quality has been affected by the vertical migration of fuel through soils. A ground-water well survey should be conducted as part of the follow on remedial investigation tasks planned at the POL Storage Area.

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6.0 ACRONYMS

ANG - Air National Guard

BCF - Bioconcentration Factor

BHC - Benzene Hexachloride

BNA - Base Neutrals/Acid Extractables

BTEX - Benzene, Toluene, Ethylbenzene, and Xylene

CLP - Contract Laboratory Program

DDD - Dichlorodiphenyldichlorothane

DDE - Dichlorodiphenyldichloroethylene

DDT - Dichlorodiphenyltrichloroethane

DOE - Department of Energy

FID - Flame Ionization Detector

FIG - Fighter Interceptor Group

HAZWRAP - Hazardous Waste Remedial Actions Program

IRP - Installation Restoration Program

JP-4 - Jet Petroleum Number 4 Fuel

MS/MSD - Matrix Spike/Matrix Spike Duplicate

MSL - Mean Sea Level

NUS - NUS Corporation

PA - Preliminary Assessment

PAHs - Polynuclear Aromatic Hydrocarbons

PID - Photoionization Detector

POL - Petroleum, Oils, and Lubricants

QA/QC - Quality Assurance/Quality Control

RfD - Reference Dose

SAP - Sampling and Analysis Plan

SI - Site Investigation

TAL - Target Analyte List

TCL - Target Compound List

TPH - Total Petroleum Hydrocarbons

TWC - Texas Water Commission

UST - Underground Storage Tank

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APPENDIX A
FIELD DATA

BORING LOGS

=======================================		1								FIELD	LO	G	OF BORING SHEET ST Z
LOC No.	ation _fL	OF 8	DRING	i. P	land	fill,	مادا ہ	osi to	na f	el4			PROJECT: Ellington Field BORING NO.MU-01 Site Investigation TOTAL DEPTH: 29.5
101	fm	-		when	4	تحدر	, , , , ,	osi to	4	640			408 NO.: 3634 LOGGED STID. Unther over
					4		٠ ر			•		ĺ	PROJ. MGR. L. Steakles EDITED BY:
1													ORILLING CONTRACTOR : Custom Grine, Inc.
1										٠,			DRILL RIG TYPE: ATV (BUASA) R
1										·			DRILLERS NAME: Zone Perfin
													SAMPLING METHODS: Hollow Stem Augers
1													Split Spoon (SS) Ishalk Tule (ST)
										• •			STARTED, TIME 1500 DATE: 12-17-85
													COMPLETED TIME: 1130 DATE: 12-13-21
<u></u>							,						BORING DEPTH (IL) 29.5
		2	4		ع	HEADSPACE (PPM)							
		AMALYS 55 (Y/N)	25.	<u>e</u>	HEADSPACE (PR	£ (1				• •		.	WATER DEPTH (11.) 16-12
=	w	155	>	/E.B.	ZYC.	V				-			TIME: 950
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9	ER		o s	S R	£E.	=======================================			S.	=	2170		BACKFILLED. TIME: 1300 DATE: 17-13 BY: Towing
SAUPLE DEPTH	SAMPLER TYPE	LAB.	INCHES DRIVEN/TUSHED	INCHES RECOVERED	ANO.	3			SCS	DEPTH IN FEET	1		SURFACE ELEV.: 35.40 DATUM: Natoral grandy
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1 1						1			!	••		H	calcaneous metter to Loca
										2		hracklet	
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16	7	<u>'</u>	C7	50	(ر 		M	$\downarrow \mid$	y" rone of calcanous matter
			1									1	then 4" of RUST STUTY CLAY
			1			1					T	$ \downarrow $	med stiff
6.8	55	N	54	20	-	.,,				1			RUST V. STITY CLAY, coft-mad.
0.0	1	1	-	W	7	NA			CL	,	1	1	stiff iron steming abundant
			1					1		'	M	$\downarrow \downarrow$	calcureous matterly to " in
													dianeter)
2-10	(.,	- ·	70	^	.,,			~	''	7	\downarrow	^
2.10	"	N	24	70	0	MA			CL		M	1	
										"	M	1	RUST AND BROWN V. STLTY CLAY
											1	1	soft damp come v. fine sanda
			l					T		0	7	U)	Lace
													

ENUS FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SI INO 363 WI BORING NO MW. BROWN CLAYEY STLT, damp, con CL-24 10.12/55 mL RUST VERY STUTY CUAY BROWN AND 4. Ay 0 55 125 4 12-14 55 ML CLAYEY FINE-GRAINED BROWN SC 14-16 SS N 24 27 0 MA semi-consolidated CL- . Y/CLAYEY STLT. 16-13 SS 4 Z4 Z4 0 0 ML: saud. Same در-25 12-7055 N 24 10 0 ML 9 CL-Same as above 2020 52 N SA SA SO S. ML BROWN STITY FINE-GRATHED SAM 25.24 SS N 24 24 SM Come 45 ilore 24.26 55 N 24 24 Sm-26-28 55 Y 24 24 20 18/10 26.92LN RUST MOTTLED

ENUS FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SI INO 367 WI BORING NOME - 07 1 DY SW N 24 10-12 55 22 Same as above 17-14 55 24 24 1.5 PA bu damper 1244 Same as above 14.16 SS N ZY ZZ Z MA Sm IAN FINE TO MEDIUM SAND 6-18 55 Y ZY ZY 1 MA 57 wet: Collect 01-5BOZA-A 1410 above, schunded Same 12-7055 24 DIMA 57 9 : Same as 7677 SS N 24 10 SP Same as a ove; rust clay laminae 22-74 55 N 24 24 SP GRAY AND RUST CLAY. 2476 55 N Et. 24 24 MA Some as gloce 74-78 55 N 74 74 MA MA

										FIELD	LC	: 26	OF BORING	SHEE	- 1	~ 2
LOC So.	the ther	of s	ORING	f (end f	GII.	10'	nort	ί,				PROJECT Ellington Field Site Investigation		BORING	NOTHING SA
Sou	Her	.	المادو	devy	fai		101	666	- 0	t			408 NO.: 363M			Uptherou
fee	~L	44	wnd	W	wn: f	i~;	19	long	•			ı	PROJ. MGR.: L. Steakles		TED BY:	1 1
							V	Ì				į	ORILLING CONTRACTOR Cus			Tuc.
													DRILL RIG TYPE: ATVL 644			1
													DRILLERS HAME: ZAME RJ			
													SAMPLING METHODS: Hollow			ν ς
														_		e (ST)
												I	STARTED, TIME (515"			
													COMPLETED, TIME: 0900			
					_								BORING DEPTH (IL) Z4			7
		2	A		25	3				į	Ī			1	/	1
		LAB. AMALYS ISCYN	INCHES DRIVEN/TUSHED	ا م	HEADSPACE (PR	HEADSPACE (PPM)							WATER DEPTH (11.) (7-14			1
_		\£	5	I BE))	2							TIME: 1615			1
E	E	7	2	5	250	25				EET	ا ا	100	DATE: 17-13-	291		Ì
SAUPLE DEPTH	SAUPLER TYPE	3	5	INCHES RECOVERED	3	ter				DEPTH IN FEET			BACKFILLED. TIME: LOSO		: 12-14	BY: Pour L
3	1 2	2	ĘS	Ę		1 1			CS	E		GRAPHIC				Al 6-000
SAL	3	LA	Ş	Î	AND.	400			Ş	1			CONDITIONS:	<u>-</u>		
	1//			~>		1.4			CH-		K		6" DARK PROUN CLI	ty	soft -	10 5
0.5	155	N	29	22	0	MA			Ci			\			shift	
	l	ĺ	ĺ							i '1			strinic abundant a			
	1											\	friglie			<u> </u>
	1./		1 .,	,		i .			CH-	2		`.				
7.4	55	7	24	18		M/4			CL		\mathbb{H}		Same as a we			· · · · · · · · · · · · · · · · · · ·
}	`	<u> </u>	1	<u> </u>		!	<u> </u>	, ,		3	\mathbb{H}	`				
									cl .					_		
-	<u> </u>	<u> </u>	<u> </u>		-	1				4	H			1		7
4.6	155	N	124	150	MA	MA			CH.	'	H		some as above w/	<u> </u>	me a	$\overline{}$
-	1	<u> </u>	<u>!</u>	-	-				Cı	5	W.	<u>\</u>	grave (upto 1/2"	į bų	dique	<u>le-1</u>
ļ	1		1	1	1						W.					
<u> </u>	1	}	1	!	1					6	W)	`			1	
164	55	الم	24	10	7	MA			CH-		W)		Same as above in	<u> </u>	5 M.n.h	4
0	1//	11-	-		1 /	ļ'			CL	7	<u>W</u> `	\	moist			<u> </u>
		1										\.				
	1	<u> </u>										_				
	100	Y	24	7.1	21	24			01		F	T	BROWH AND GRAY	T	cty C	LAY
127(355	11		CO	100	11414			CL		业	1		ect	01-5	BOSA-A
	1									9	T	\downarrow	@ 100			
	1			1							1	1				
	1	I		1		Ī				10	Ħ'					

FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SE INO 367 WI BORING NO MW-OLD 150 DVA CL 101255 N 24 6 MA SM 12-1455 24 27 Sm-mL CL 14.1655 N 24 20 4 NA 16-18 55 N Z4 ZZ 1 NA CL 18-2955 N 24 27 1 MA 2 20.7755 N 24 20 10 NA CC 2 2724 SS N ZY ZO NA MA CL 3

LAB. AMALYSTSCYM

SAMPLER TYPE SAMPLE DEPTH

0.2 55

INCHES DRIVEN/PUSHED

NCHES RECOVERED

24

											IJ	
Z-4	55	Ŋ	24	24	0	h		CL	2			\ \ \
											1	_
4-6	55	4	24	22	6	MA		CL	4			<u>C</u>
											1	<u>/</u>
6-6	55	7	24	20	0	NY		sċ	,			- \
												_
2- W	55	7	24	22	D	M		sc				2
										1		
									10		\le	_

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MA

ONA HEADSTACE (PILL)

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TAN AND ORANGE CLATEY 1. FINE Same as above

ollect o1-SBOYA-A CAL

NUE FIELD LOG OF BORING (CONTINUED) PROJECT: Ellington SE NO 367 MA BORING NOWL-04 Prsited VSCS より TYPE ANO Same as above moist 12/5-01 24 16 SC 0 MA BROWN CLASEY FING SAND, WEF 10 12-1455 0 50 24 INA 01-513048-1 Same as above 1 14.1655 24 8 DINA 5 6 BIZOWH STLIY 16-1855 N 24 SW 8 MA ٥ FINE SAND , saturated Recover 7 24 16-20155 D NA NA ٢ would sam ple remein Spach 0 Recover No 20-71 55 74 7 D MA MA 2 No Becover 7 25-24 25 MA MA N 0 3 4 5 6 7 9 0

FIELD LOG OF BORING PROJECT: Ellington Field LOCATION OF BORING: BORING NOMLY-05 10' from east Loudary fence, 50' from north Loundery fence, former Lace landfill Site Investigation TOTAL DEPTH:30 JOB NO.: 3634 LOGGED BYID. Upther our PROJ. MGR. L. Sterkles EDITED BY: DRILLING CONTRACTOR : Custom Gring . Inc. DRILL RIG TYPE: ATV (BUGGA) R: 4 ORILLERS NAME: Zue Zuffin SAMPLING METHODS: Hollow Stem Augers Solit Spoon (55) Ishally Tile (ST) STARTED. TIME: 430 DATE: 12-21-81 COMPLETED, TIME: (115 DATE: 17-21-89 BORING DEPTH (ft) | 30 LAB. AMALYSTSCY/N HEADSTACE (PPM) NCHES DRIVEN/PUSHED OUA HEADSPACE (PIL WATER DEPTH (11.) | 12-20 INCHES RECOVERED TIME : 11015 SAUPLE DEPTH 12-71-46 DATE: BACKFILLED. TIME: (230 DATE: (7-7) BY: Pourin USCS DATUM: NAT. Groved SURFACE ELEV. : 34.71 CONDITIONS: GRAY- BLACK STUTY CLAY 1-2/55 CL 0 0 10 Stzihing GRAY CLAY LIGHT time grained casu (2-4/55 24/12 2 CL ipe Same as above now iron steiling 4.6 55 CL 20 above friall Same as 6-8 55 124 120 clove: next 21055 N 1241 GRAY SANDY & STUFF CLAY; STITY CLAY

FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SI INO 367 WI BORING NOMW-65 DE PTH 150 July 1 TAN CLAYEY FINE SAND, some SANDY SC-10.12 55 10 24 16 100 01-5B05A-A @ 450 CL BROWN & RUST STUTY FINE Sm N 24 24 100 1244 55 CRACHED SANI Same is about 14-1655 N 24 Sun ্ঠ 0 RUST AND GRAY SELTY CLAY CL 16-1855 N 24 6 3 soft, moist sandy sound BROWN STLTY SAMD, wet fine 12.2055 4 24 17 Sm UDAS for OZ-SBOSB-A five to 202055 14 24 10 Sm D 0 Collect samples for venaining BULLY MED GRATUED SAMD 22-2422 h 71/15 SP 51:4htl <1 tz 24.56 EX 124 Same 45 14 D 0 57 above Same 66 2678 55 N 24 10 0 SP 2630 55 N 24 10 0 Same as above D SP

ENUS SHEET_Z FIELD LOG OF BORING (CONTINUED) PROJECT: Ellington SI INO 367 WI BORING NO 72-01 USCS まって ANO GRAY AND FUST MOTTLED (LAY abondant calcaveous gravel CL NA 13 WIST D 2 ST Dush CL MA 12-14/55 45 T redominant ly Sane rust Same 65 above no calcaveous 14-16 ST N 13 18 4 MA CL matter Same as above becoming 16.18 ST N 18 18 20 NA CL RUST CLAY . u stiff iven nodules CL 12-705 FN 18 13 7 MA calc. matter siltier 9 as above siltier friable 18 18 O MA ZOZZSTN CL iron staining HUST BROWN same as above: 12" V. CLAYEY Y TSISS 14 18 18 ML STIT WRT 3 18 18 Same as above saturated. 24-26/55 41 ML 5 13/13/1 Same as above 26-28-55 N mL MA 7

		100	ATIO	j					FIELD	L	05	OF BORING	SHEET	<u> </u>	<u>~ Z</u>
LOC	ATION	of Bo	RING	: cd-d	e-80		PAL	store	a A	~46		PROJECT: Ellington Fig Site Investigation	(d		NO.PZ-07
		•	-,			•	(00	, , , ,	٠,	•	'	108 NO.: 363M	LOGS		Ustherove
												PROJ. MGR. L. Steck!		ED BY:	T V
												DRILLING CONTRACTOR			Tuc
												DRILL RIG TYPE: Diegel &	ne na i	Malila Y	2:11 R.67
												DRILLERS NAME: Zame			<u> </u>
												SAMPLING METHODS: Holla			~S
												Sylit Syoon (SS)	15/10	14 71	e (ST)
												STARTED, TIME: 0445		E: 12-20	
												COMPLETED, TIME: 1110		E: 12.76	
												BORING DEPTH (ft) 79			
	}	2	49		عر	3	1			Ī					
		AMALYSTS (Y/N)	INCHES DRIVEN/PUSHED	٥	HEADSPACE (PR	HEADSPACE(PPW)	1					WATER DEPTH (11.) ZO	'		
-	w	(15	1	INCHES RECOVERED	PAC	70			_			TIME: 03	0		1
SAWPLE DEPTH	TYPE	457	2	8	SQ	2			DEPTH IN FEET		100	DATE: 17.7	1.29		1
<u> </u>			5	3	3	ŧ			=		2	BACKFILLED, TIME: 1570	DATE	17-70-24	or: Nat. Lebifi
4	SAUPLER	LAB.	N.	<u> </u>	AND	3	1	S	H		GRAPHIC	SURFACE ELEV.: WA	DAT	UM:	
3	3	77	ž	3	8	3		\	3		3	CONDITIONS:			
\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	1		18	14	_	0		CH			\	DARK BROUP CLAY	stiff	- to he	ind.
0.5	ST	٦	0	۱۶	D	0		KIT			\ .	abundant worts	and f	fill ma	terale
											\	(Shell grave ate			2-58
	1										\				
[-	7	, ,	10			Ī	101	2 (\	Same as glove	1285	t:11	
2-4	55	15	13	18	0	0		CH			\				
			1		}				3		\	=			i
			1	1							\				
. ,		,	1	10				CII	4	1	\	GRAY CLAY, sof	- 43	med	
4-6	ST	۲	18	18	0	0		CH			\	stiff :-on nodu	es a		ining
	1	1						<u> </u>	5	 		21.1	<u>-, , ,,,</u>	- 10 ·	
	1	ļ			•				[*	Ì				
			1.	. 4				ci	6	1	Ì	100 14" Same as	G and	: [.]	2m
6-8	51	۲	18	18	7	111		af] .	H	\	Y'T' RUST AND L	244	1 6 7	1.11
	i	<u> </u>	<u> </u>					- 	7	₩			- N I		57171
									1	*	Ì		on s	itzinih.	3 64/
	<u> </u>	1		1				_	8	卜	`	nodules	, T	mag : 1	
8-10	55	7	2	18	4	0	}	C4		\mathbb{H}	`	To 4 same	<u> </u>	11 1	- Com
	<u>;</u> [i	 		<u> </u>				,	州	<u> </u>	14 · - 541	<u>~ , w</u>	uch le	55
										*	`.	calc matter.			
	<u> </u>	<u>! </u>	<u>!</u>	-	<u> </u>	! !		- ·	10	H	`				
	•	1	1	1	!			<u> </u>	<u> </u>	11	>	l			,

ENUS SHEET Z FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SE INO 367 WI BORING NO ZOZ DEPTH 150 DVA Same as about CH 18 buz ST 2 RUST CLAY, & stiff to hard CL 12-14 5 1 2 13/18 von Steining some calc. gravel ecoming slightly silts able siltier toward 14-16 STN 18 14 34 20 CL BROWN V. STLTY CLAY 1618 ST N 18 18 36 0 CL moist (6 9" same as above bottom 12-70 ST N 12 18 9" V. CLATEY STLT, WATER ML some v. fine sand Same as above saturated 207155 10 18 13 MU Sanc as about some on somi-227155 N 18 10 D mL 3 consolidated as above letter 4" mc 21.76 55 N 18 10 0 0 CL Brown Stity SAMD, saturated 26-28 55 16 16 0 SM 0 ants milor

		TO	ATION	•						FIELD	LO	G OF BORING SHEET OF Z
100	ATION	OF BI	PINE Vight	; t-of-	ung	de	اسرح	e d	1fel	· (PROJECT: Ellington Field BORING NO. PZ-03 Cite Investigation TOTAL DEPTH: 23
\$ "T	لانسود	. (ock t	ion	of	197	3 8	spill				JOB NO.: 363M LOGGED BYID. Uptherson
								•				PROJ. MGR: L. Sterklen EDITED BY:
ļ												ORILLING CONTRACTOR : Custom Grine, Inc.
Į												DRILL RIG TYPE: ATV (Buggy) Rig
												DRILLERS NAME: Zane Puffill
												SAMPLING METHODS: Hollow Stem Augers
1												Sylit Spoon (SS) Ishalk Tule (ST)
l												STARTED, TIME LOTS . 230 DATE: 1-11-90
1												COMPLETED TIME: (400 DATE: 1-(1-90
1												BORING DEPTH (ft) Z3
		2	Δ		3	3					Ī	
1		AMALYS TS CY/N)	INCHES DRIVEN/PUSHED	۾	ONA HEADSPACE (PPL.	HEADSPACE (PPW)						WATER DEPTH (tr.)
_		\$35	\$	RE	3	3		}				TIME: 1330
E	Ž	2	\ \frac{1}{2}	5	150	150				EET	90	
ă	E	3	5	REC	3	E] ;		2		
SAMPLE DEPTH	SAMPLER TYPE	2	Ē	NCHES RECOVERED	4	ì			CS	DEPTH IN FEET	GRAPHIC	SURFACE ELEY.: DATUM:
3	3	LAB.	귳	Ž	3	425			NS	9	1	CONDITIONS:
		,							ابما		K	GRAY- BLACK CLAY soft iron staining
0.7	ST	۲	18	10	0	0			CH			and nodules, vods
										′		
}	•				١.							
<u> </u>		,				1				2		Jame as above soft to med stiff
2-4	ST	1	13	12	U	0			CH		サ╮	28 24975 \$711 AS WEEK 3111F
				<u>. </u>			<u></u>	<u> </u>	<u>'</u>	3	\mathbb{H}	
								1			H	
	<u>. </u>	<u> </u>		 	 	-		<u>!</u>	<u> </u>	4	\downarrow	CDAY (PRELIX TAIL (184)
4.6	ST	ام	18	14	0	0		ļ	CH			GRAY - GREEN & TAN CLY MOD
-	1		1	-	<u> </u>	<u>!</u>	!	<u> </u>	· ·	5	\mathbb{H}	stiff iron staining & new les
•		}		}			}				\mathbb{H}	\ <u>\</u>
-	<u> </u>	<u> </u>	1	-	-	<u> </u>		-	<u> </u>	6	\downarrow	7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1.8	ST	١	18	17	0	0		1	CH		L)	GRAY CLAY med stiff to stiff
ب	1.,	! '	!	<u> </u>	<u> </u>	!				7	\mathbb{L}	Celc. matter
				Ì					1		T)	\
<u></u>				ļ							1	
2010	ST		18	12	0	0				1 1		RUST AND GRAY (LM med)
	1"	117	110	116	10	0			CH	•		stiff to stiff calc gravel up
1	1			1	1					•		to " in diameter
	<u> </u>							1	.			
	i	l	i		T	i				10	*	

PROJECT: Ellington SI INO 367 WI BORING NO PZ-7 OUA IRUST AND GRAY CLAY soft to stiff silts @ bece CL 10-RISTN 13 13 D RUST STUTY CURY shift to Cl 17-14 ST N 13/16 mingr Same as alove soft stiff CL 14-16 ST N 18 17 0 0 C6-RUST AND BROWN SCLTY CLAY 6-18 STN 18 18 0 0 med stiff moist, clases soft To ML BROUN CLAYEY AND STUTY U. 12-705T N Sm 18 18 0 FENE SAND, WET ROTTROUN STLTY SAND, Saturated. 18 16 0 SW-NTSSFOS ettem 6" GRAY AND ZUST V. STITY CLAY 3 |-

ENUS FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SEINO 367 MI BORING NO SB-11 BROWN AND GRAY CLAY, soft to stiff ion staining, some silt 10-1255 N 24 18 100 MA CL AND GRAY CLAY SAFF 171955 N 24 20100 MA CL ron strining, minor auts Top 2" same 45 above; Before M-16 STN 18 13 260 NA 2" BROWN STUTY CLAY, frichle BROUP V. CLAYEY SOLT iven CL 1618KT N 18 18 15 MA mL: stain, mg BROWN CLAYEY STLT stursted 12-7055 24 16 17 MA ml fine sand. Collect 1200 and or-FDOI-A above This comple ZUT 55 4 24 16 10 MA ML also used for oz-SBIIC-Al aud 07. FD01-A 3 5

	7							٠	FIELD	LOG	OF BORING SHEET ST Z
M:	בדוסוו ליקלי	at .	of	the	243	tern	side of sta	. of	the		Site Investigation Field BORING NO.50-12 TOTAL DEPTH: 22
1 9.	lo de	4	ec,	at	the	. P	ol sta	reve .	معد		UDB NO.: 363M LOGGED BYID. Untherwel
											PROJ. MGR.: L. Steekles EDITED BY:
											DRILLING CONTRACTOR : Custom Coine, Inc.
1											DRILL AIG TYPE: Diesel Engine M. Lil Rig B-53
1											DRILLERS NAME: Zane Ruffin
l											SAMPLING METHODS: Hollow Stem Augers
						•					Sylit Spoon (SS) Ishalk Tile (ST)
											STARTED, TIME: 1430 DATE: 17-14-89
											COMPLETED TIME: 1645 DATE: 17-18-89
											BORING DEPTH (ft) 72'
	1	2			2	3		1			
		AMALYS IS CYM)	HINCHES DRIVEN/PUSHED	۵	HEADSPACE (PPL)	HEADSPACE (PPW)		-		1	WATER DEPTH (11.) Zo'
l _	[<u></u>	5.7.5	*	NCHES RECOVERED) / (70					TIME: 1645
Ē	4	ורל) <u> </u>	ò	lsq	JS6			[2]	901	DATE: 17-12-29
0	5	124	8	ME	3	ten			=		BACKFILLED. TIME: 1705 DATE: 17-18 BY: Poring
SAUPLE DEPTH	SAMPLER TYPE	LAB.	HES	HES		. 1		5	DEPTH IN FEET	GRAPHIC	SURFACE ELEV.: NA DATUM:
1 5	3	4 7	Ž	Ş.	SV A	400		12	90	18	CONDITIONS:
, 5	100	V	71					1011			BLACK CLAY soft to med stiff,
2-2	155	7	24	20	10001	TO H		CH			iron nodules, strong haday carbon
								Ī	, ,		oder. Collect oz. StorzA-A @
]											(545
			,						2		Same as above
24	55	N	24	18	170	MA		CIT	 		3444 65 46244
<u> </u>		<u></u>	<u>'</u> 		<u>'</u> ì				3		
l	ĺ	1									
 	<u> </u>	1	 						4	\mathbf{k}	GRAY. CREEN CLAY SOFF #
4-6	55	N	24	16	190	MA]	CH	1	lacksquare	
 	!	! -							5		med stiff iron modules landro-
1	1									\mathbb{K}^{\sim}	carlon oder
-	!	<u>!</u>	1					-1 -	6	+	Dura Lab (Difference)
16-8	55	14	24	15	100	MA		CH		\mathcal{L}	RUST AND GRAY-CRÉEN CUIT
		! '	! - '			, ,			7	\mathbb{L}^{\sim}	abundant calc. gravel (up to i"
}								1		W/	in disnater , and stiff to stiff,
		<u>!</u>								1/	iron staining and nodules. Collect
210	CT	N	13	18	50	NA		CH		1	02 5 B 12 B- A Q 1610
	121	117	,,,,,	10	100	' '		Jen.	9		Pet Same as above loss calc.
											,
								1.			
	1	1							P	7	

FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SE INO 363 WI BORING NOSB-17 GRAPHIC LOG DE PTH USCS いる Same as above CH 10-12/5T N 74/18/55 MA CLAY U. stiff 12-14 ST N 24 18 90 MA CL ale matter, iron stainly above, siltier @ 14-16 ST N 24 18 40 MA CL 1618 ST N ZE 18 12 NA CL Sine CS about 12-20/55 N 24/6 5 NA CL RUST V. CLAYEY SELT saturated 2672 55 4 24 24 6 ML Pollect 07-5BIZC-A @ 1645 3 9

										FIELD	L	05	OF BORING SMEET 37 2
150.	ATION Her	st	(orb)	ii ev d	of a	انامور	م ا	es i	a `	PAL			FROJECT: Ellington Field BORING NO. S. R. S. Site Investigation TOTAL DEPTH: ZZ
56	regi	LA	~ 4			,	<i>(</i> ,	, (<u> </u>	100			NO. : 3634 LOGGED BYID. Uthlerow
	1												PROJ. MGR.: L. Steckles EDITED BY:
Ì													DRILLING CONTRACTOR : Custom Coving, Inc.
ļ													DRILL RIG TYPE: Viese Engine Moli 1 1:4 3-53
}													DRILLERS NAME: Zame Ruffin
1													SAMPLING METHODS: Hollow Stem Augers
}													Split Spoon (SS) Shelly Tile (ST)
ļ													STARTED, TIME: 940 DATE: 12-14-89
-													COMPLETED TIME: (130 DATE: (2-19-89
<u></u>													BORING DEPTH (ft.) ZZ'
	ŀ	3			3	3							
		2	950.	۾ ا	(()	(<u>)</u>							WATER DEPTH (IL) ZO'
=	w .	151	7	Ĕ	ž	2		1		_			TIME: 1130
5	TVPE	AMALYS SS (Y/N)	Š	Š	HEADSPACE (PILL)	HEADSPACE (PPW)				7		100	DATE: 17-14-24
SAUPLE DEPTH	SAMPLER	₹	INCHES DRIVEN/PUSHED	INCHES RECOVERED	3	重	!		u	DEPTH IN FEET			BACKFILLED. TIME: 1200 DATE: 12-19 BY: Puril
3	3	LAB.	3	N. S.	AND	450			SS	1		GRAPHIC	SURFACE ELEY.: NA DATUM:
2	1 3	-1	2	1	P	士			2	8	Į;	5	CONDITIONS:
0.2	55	Y	24	100	100	MA			CH		L`	\setminus	BLACK CLAY soft to med stiff,
<u> </u>	1				(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			<u> </u>	"		L)	\	iron hodules strong hadrocarlon
												\ .	odor. ollect 02-5813A-A @ 940
_					-		<u> </u>	<u> </u>	!	2			
2-4	55	N	24	6	350	MA			CH		\downarrow		Sque as abone little recovery
-	<u> </u>	<u>' </u>	1	 	<u> </u>	<u>!</u>	<u>!</u>	<u> </u>	<u> </u>	3	\mathbb{H}		
											K		
. ,	11	· ·		,		 		}	11	•	1		GRAY AND BLACK CLAY SOFF to
4-6	>>	7	24	16	1000	MA			CH				med stiff iron string strong
	1									5			hydrocarlan odor- Collect 02-SD13A-A
								<u> </u>] _[1		£ 1000
1.0	11	A.I		1					CH	6	T		Too 4" same as about the
6-8	<u> </u>	N	24	16	140	MA			14	7			12" GRAY CLAY mad stiff with
	1	1							(i 'I		\	a seem of coasse brown sand,
												\	abundant calc metter, iron staining
QJA	55	7	10	10	100	\ /A			OI.	•		\	Too 4" GRAY- CREFN CLAY, med)
010	121	15	10	10	100	141			CH	9		\	stiff, then RUST AND GRAY
}	_	}										\	CLAY soft to stiff, calc zone,
	1	<u> </u>								10	r	\	iron hodules.
i	ł	l	1	i i	i	(i	ı		۲ ت. ر	1		

ENUS FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SEINO 367 WALBORING NOSB-13 GRAPHIC LOG soft to wind, CHto med stiff N 13 18 140 MA CL 2 12-14 ST M 18 18 140 MA 14.16 ST N 13 18 120 NA CL Ci-1618 ST N 18 18 284NA mL CLAYEY STLT WET RROW N 12-7055 1 24/18 mL matter, wet 0 BROWN U. CLAYEY FINE SAND 207055 4 24 18 6 NA mL AND STLT, saturated. Collect 02.5813C-A @ 1130 3

LOC	ATION Thur	of 81	DRING	ii uqut	- 0	ę "	برمعانا	1 4-	46 /	<u>ි</u>		PROJECT: Ellington Field BORING NO. SB. 141 Site Investigation TOTAL DEPTH:
170	رج	tores	ا يو	avel	,	. ,	lihes		٠, ر	عو		NOS NO.: 363M LOGGED BYID. Uptherouse
1		` }	,		•							PROJ. MGR. L. Stackles EDITED BY:
												ORILLING CONTRACTOR : Custom Gring, Inc.
												DRILL RIG TYPE: Wesel Engine Mali [DAL B-53
												DRILLERS NAME: Zone Ruffin
												SAMPLING METHODS: Hollow Stem Augers
												Sylit Syson (SS) Ishally Tule (ST)
												STARTED. TIME 1330 DATE: 12-19-90
												COMPLETED. TIME: 510 DATE: 12-14-40
												BORING DEPTH (ft) ZO'
		2	49		3	3						
		AMALYS IS CY(N)	INCHES DRIVEN/PUSHED	0	HEADSPACE (PPL)	HEADSPACE (PPW)						WATER DEPTH (11.) (3'
-	w	515	4/1	ERE	PAC	74				_		TIME: SO
E	TYPE	17	<u> </u>	200	8	150				נננ	200	DATE: 12-14-70
1 2	5	7	5	36	3	fe				=	2	BACKFILLED. TIME: 15-14-40 DATE:17-14-40 BY: Touring
SAMPLE DEPTH	SAUPLER	LAB.	HE	INCHES RECOVERED	AN.	٦			CS	DEPTH IN FEET	PHC	SURFACE ELEY.: NA DATUM:
8	3	7	3	Ž	る	3	<u> </u>		VS	DE	SR	CONDITIONS:
0-2	6	Y	24	20	80	٦			CH			BLACK (Lty, med stiff, i-on hodsles.
0-6	127	'	<u> </u>	20	00	2			Cη	,		Collect 02.5BNA-4 @ 1410
										,		
										1		
_ ,,	10	U	,	.,	71	1			C11	2		Some as alone
2-4	>>	۲	24	16	24	5			CH			
										3		
	,											
	100			,			i			1	K	GRAY GREEN CLAY, mad stiff
14-6	55	Į,	24	16	30	11			CH		/ \	to stiff, iron staining & nodules
		1	ì				 			5	\mathbb{N}	The state of the s
1	1											
1.		1,7					i			6	人`	TAN AND CRAY CUTY, SOFF to
6-8	55	14	ZY	16	10	1			at		\mathcal{K}	med stiff iron nadules and staining,
	<u>: </u>	<u> </u>		 		_	-			7	\mathbb{H}	
											K	abundant calcareous matter. Collect
-		1 .	-	_			<u> </u>		(1)	8	hì	
8-10	ST	M	18	16	5	7			CH-		1	RUST AND GRAY CLAY stiff
-	1	<u>!</u>	<u> </u>	<u> </u>		_	1	1	CL	9		Iron staining and hodules, some
											1	silt and bala matter
	<u>!</u>	<u> </u>					<u> </u>		-	ю	41	
	<u> </u>	<u> </u>	<u> </u>			<u> </u>					11,	

ENUS SHEET_Z_OF_ FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SE INO 367 WI BORING NOSB-14 REC'V'D VSCS FUL BUT alove, no calc. matter CH-N 18 18 ZNA 0-12/ST CL Same as above silier 10 حر 18 ZNA 12-14 5T STUTY CUAY Stiff to soft 14-16 ST N 18 18 CL cale metter iron staning V. STLTY CLAY avadity CC-RUST 16-18 ST N 18 18 MA mlsun CLAYEY ML SM BROWN SILT saturated 12-2055 7 29 19 07-5B14C-A 1510 0 2 5

Loc	ATION	OF 80	DRING	tch	# L	<u>ح</u> ل	⊳ ≥	المائما	1 - C	· · · · · · · · · · · · · · · · · · · ·		PROJECT: Ellington Field SORING NOMW-07 Cite Investigation TOTAL DEPTH: 78
امام	بار جار	re Gu		Ĺ.	-ain+	، ئ بار	e. ±	4)	16	- WK4	i	JOB NO.: 3634 LOSSED BYID. Uptherave
spi	ll			' (0 1 - (((-1			PROJ. MGR.: L. Stack(en EDITED BY:
17												DRILLING CONTRACTOR : Custom Grine, Inc.
												DRILL RIG TYPE: ATV (B/444) T.4
												DRILLERS HAME: Zane Buffin
												SAMPLING METHODS: Hollow Stem Augers
												Split Spoon (SS) Ishalk Tule (ST)
												STARTED, TIME 940 DATE: 1-12-90
												COMPLETED TIME: (130 DATE: (-17-40
<u></u>							,					BORING DEPTH (ft) 7%
		<u>E</u>	4		2	(3)						
		AMALYS IS CYAN,	INCHES DRIVEN/PUSHED	9	HEADSPACE (PPL)	HEADSPACE (PPW)		j				WATER DEPTH (ft.)
Ξ	W.	151	EN /	INCHES RECOVERED	Z.	X				-		TIME: USO
E	1	74	2	ECO	A DS	SQ ¥:				FEE	18	DATE: 1-12-40
131	LER	*	8 0	8		#			V	=		BACKFILLED. TIME: (300 DATE: (- (2 BY: Powing
SAMPLE DEPTH	SAWPLER TYPE	LAB.	SE	CHE	Ju/	400			USCS	DEPTH IN FEET	GRAPHIC	SURFACE ELEY .: 23.27 DATUM: Mat. Ground
8	3	<u> </u>	=	3	0	±			<u>ر</u>	8	13	
0.2	55	4	24	19	MY	0			CA			DARK GRAY CLAY, soft moist
-		'		_					'	,		roots and iron modules collect
						İ			e			sample 02-5B07A-A @ 945
-		!	!		 	<u> </u>			_	2		
2-4	55	N	24	20	MA	0			CH		\mathcal{L}	Same as above iron staining
-]	<u> </u>	!		<u> </u>	-	<u> </u>			3		
						İ			·		\mathbb{L}	
-	!	!	<u> </u>			<u> </u>	<u> </u>	<u> </u>		4	\mathbf{L}	Carrie Cian II
14.	55	N	74	16	MA	0			CH			GREEN-GRM CLAY solt to mad.
-	177	<u> </u>	<u> C </u>					<u> </u>	<u> </u>	5		Stiff iron staining and modules
'	1											
-	!		1		1	<u> </u>				6	1	
6.8	55	N	24	16	MA	D	İ		CH		1	RUST AND GRAY CLAY SOFT
	17	<u>, </u>	! - !						>त	7	W >	to med stiff iron staining &
	ļ				1		1			'		modules come calc. matter
	<u> </u>	<u> </u>									1	,
2-15	55	4	24	18	NA	0			CH		Γ	RUST AND GRAY CLAY mad stiff
100	1//	<u> </u>	'	6,1	ויין				1	,		to stiff iron modules. Collect
1						_						02.5B07\$B-A @ 1010
	<u> </u>											
										Ю		
											4.1.	

≅NUS SHEET_Z_OF_ FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SE INO 367 MI BORING NO MILOS VSCS DEPTH 5×5 ANO IRUST AND GRAY CLAY \$ N 18 13 0 strining Leconing न्र CL 16.12 ST 44 RUCT STLTY CLAY U still to 19 13 D CL 12-14 ST N silt. 18 18 0 CL-RUST CLAY/CLAYEY STLT 14.165TN mL Etaining, calc 4-18 55 4 54 55 D GRAY U. CLAYEY STLT ML. UZ-5B07C-A 1050 BROWN CLATET AND SPLTY SAND 12-20 ST N SM 13 18 NA 0 saturated BROWN STLTY SAND, five grajued 2077 SS N Z4 18 NA 0 Sm Saturated Same ac 22715T N 13 18 NA 0 5M 3 su-0 AN 42 12 N 55 124 N v. stiff CLAY. Strining Saudi hard inou 2678 ST N 18 18 NA 0 CL 7

FIELD LOG OF BORING (CONTINUED) REC'V'D PROJECT Ellington SI INO 367 WI BORING NO MV-04 DE PTH VSCS Ano alove, siltier Same CL 16-1257 4 18 19 14 AND GRAY RUSTASTITY CLAY 18 18 NA 473115 matter 19.65TN 18 18 NA U CLSTLT AND SAM) MC 16-18 55 Y ZY ZO NA O Sm seturcted 122055 To 24 20 MA 0 SM here required ud 40 tine v. 0 A4 8 1 91 4 72 5500 SM grind alove 65 227455 N 24 120 MA 0 Sh 3 H N 55 12-12 24 18 MA 0 Suy Same as 26-28 SS N 24 18 NA Sm BROWN V. SANDY CLAY hand, inon 2431155 N 54 16 MA O

Middle of cul de-cac @ the Pol Storage Site Investigation was no.: 3634	TOTAL DEPTH: 33"
108 NO.: 363M	I MINE RELIGIO
	LOGGED STID. Watherous
PROJ. MGR.: L. Stackley	EDITED BY:
DRILLING CONTRACTOR :V	ustom Grine, Inc.
DRILL RIG TYPE: Diesel E.	igine Ubbil Pta B-53
DRILLERS NAME: Roland	Veldez
SAMPLING METHODS: Holl	w Stem Augers
Solit Soon (SS)	Ishally Tile (ST)
STARTED, TIME 1030	DATE: 1-15-90
COMPLETED. TIME: 1400	DATE: 1-15-40
BORING DEPTH (ft) 33	
SAUPLE DEPTH LAB. AUALYSTSCYA LAB. AUALYSTSCYA LAB. AUALYSTSCYA SAUPLE DEPTH CAR. AUALYSTSCYA SAUPLE DEPTH CAR. AUALYSTSCYA SAUPLE DEPTH CAR. AUALYSTSCYA COVERED COVA HEADSPACE (PPL) CAS. SAUPLE DEPTH CAS. AUALYSTSCYA COVA CAS. SAUPLE CAS. AUALYSTSCYA CAS. SAUPLE CAS. AUALYSTSCYA CAS. SAUPLE CAS. SAUPLE CAS. AUALYSTSCYA CAS. SAUPLE CAS. AUALYSTSCYA CAS. CAS. CAS. CAS. CAS. CAS. CAS. CAS.	
TIME 170	
DATE: ICIS	
A S S S S S S S S S S S S S S S S S S S	
SAUPLE ITYPE LAG. AULTSTS OUTE: 11-12 OUT	DATUM: Natural Ground
CONCRETE, 10.17	" Hhick
1-3 55 Y 24 6 0 NA Top 6-8" fill w	reterial/stabilizing
CIL 2 DARK CRAY C	LAY, med stiff,
Cit ivon stringing an	
31	collect 07-SEOFA-A
3-5 55 4 24 16 0 MA CIH Same 45 above	
trom 1-3 and	3.5' samples @ 1070
	<u>'</u>
	s alove
6 N Softon 4 CICAT	
med stiff, vort	staining !
GRAY GREEN CL	AY soft to stiff.
7-955 M 24 18 0 MA) CIH GIGAT GREEN CL	d hodules sandy
Sphm's Calcareous	grave (up to
CHI PAY AND THE	CLAY - IL
9-11 SS N 29 18 0 NA CH. GRAY AND PUST	CUIT SOFT to V.
Stiff, iven Staini	uc, calà matter
1 1 1 1 1 1 1 Lecomina 5 14ty @	Lase. Collect

SHEET Z FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SEINO 367 WI BORING NO ML 29 GRAPHIC LOG Puled REC'V'D VSCS DEPTH 40 ove siltier CL 18 18 0 MA 11-13 ST 2 3 6R14 STUTY 13 18 MA CL Ŋ 13155 ٥ 4 10 15-17 ST N 18 18 0 MA CL ŝ 18 0 NA 17-19 STN 18 CL sand/silts 8 RUCT 18 18 MA 19-71 ST 0 ML v. FIME 21.2755 24 14 SM D NA 2 1300 3 23:25 ST N 18 AY 18 SM 0 51/7 4 . v. fine 14 BROWH STLTY SAND 25-27 SS N MA 18 SM 0 6 7 Sans 24 27-79 SS N 14 MA D SM 8 नुष्ट्रम् के दिल्ला 4 22 15.55 24 JY4 D SM M 17

ENUS PROJECT: Ellington SE NO 367 M BORING NOW LOOP FIELD LOG OF BORING (CONTINUED) GRAPHIC AEC'V'D ОЕРТН VSCS これ BROWN STLTY SAND saturated N 24 15 A SM 4 ó 8 9 0 2 3 5 6 8

1



FIELD LOG						OF BORING SHEET STE						
LOC Bett	ATION LLEEN	of 8	ORING 	i Clas	d .6	Ri	CPU	V 4	nd i	h.a.	era	PROJECT: Ellington Field BORING NO. MW-10 Site Investigation TOTAL DEPTH:
Bey	٦ ، ٥٠	OL.	Stor	ry	ave	í	-{	_	- VI	Horsep	•	JOB NO.: 363 cm LOGGED STID. Uptherave
'				,								PROJ. MGR.: L. Stenklen EDITED BY:
-												DRILLING CONTRACTOR : Custom Grine, Inc.
1												DRILL RIG TYPE: Diesel Engine Mobile Drill B-13
1												DRILLERS NAME: Roland Valder
												SAMPLING METHODS: Hollow Stem Augers
												Split Spoon (SS) Ishalle Tile (ST)
1												STARTED, TIME DAIS DATE: 1-16-90
												COMPLETED, TIME: (105 DATE: 1-16-90
					, ,							BORING DEPTH (ft) 37%
		AMALYSTSCYM	4		HEADSTACE (PPL)	HEADSPACE (PPW)						
		1) 5	3	8	\mathcal{C}	£ (1						WATER DEPTH (tt.) 70'
Ξ	.	15}	INCHES DRIVEN/PUSHED	INCHES RECOVERED	ž	V				<u>-</u>		TIME: 1015
SAMPLE DEPTH	SAWPLER TYPE	74	1	EC0	2	A 13 S				DEPTH IN FEET	9	DATE: 11-16-90
1 2 1	LER	*	8	8		l i			8	E	呈	BACKFILLED. TIME: 1730 DATE: 1-16 BY: Town &
3	4	LAB.	3	CHE	AND	+ N			USCS	EP TI	2	SURFACE ELEY: 75.07 DATE: 1-16 BY: 700- CONDITIONS:
S	<i>S</i>	1	1 =	<u> </u>		+	1		>	<u> </u>	13	·
0.7	51	N	13	6	9	0				}	ł	BACKFELL - SANDY AND STITY
<u> </u>		,		_	1					1	┨	CLAY, compected, contains shell
										-	┨	fragments and grave
-				<u> </u>	 	1	!			2	┨	
7-4	ST	N	18	2	7	0					┨	Sane as above
					-		! !			3	-	
								ł			4	
-		<u> </u>		<u> </u>			!			4	4	
4-6	ST	N	18	1	0	0					Į	Same as about
	<u> </u>		1,,	0						5	4	
]						4	<u>'</u>
-		<u> </u>	<u> </u>	<u> </u>	-					6	-	
68	ST	N	12	10	76	70					4	Same as above hydrocarten odor
	<u> </u>		1	<u> </u>	-	,				7	4	a Lase
											4	
	<u> </u>	<u> </u>	<u> </u>		<u> </u>		<u> </u>				\downarrow	The state of the LINE
210	45	11	24	16	22	MA			CH		$T_{/}$	RUST AND CRAY CUY, STIFF to
-	1	,	<u> </u>	0'!	-	, , ,			~'\	9	1/	ven stiff we iven staining
											1/	Ing the carbon oder. Collect or & SBIOKIN
	<u> </u>		<u> </u>					70		ю	1/	and oz. FDOY-A @ GYO
1	1	1	ì	j	l l	1	l ī			1 ~ T		

ENUS FIELD LOG OF BORING (CONTINUED) PROJECT Ellination SE INO 367 WILL BORING NOWLY-LO 10EPTH VUR 07-FD04-A 9 24/16 CH 10-1255 2 CH SH-N 18/14 1214 5 CL AND CRAY RUST SILTY CLAY CL nadules 14-16 ST N 18 16 3 6 Lave 45 CL 1618 STN 13 16 7 CL matier 1 51/5 9 12.70 ST N 13/16 ٥ MUSSE ml-Sh 02-5B10B1-A 1015 24 20 2 20-27 SS Y CLAYEY AND n wast SULTY SM SAND caturated 18 22 0 25-5455 N Same 45 Shy N 29.76KT 18 18 0 SAND saturated STLTY 54 26-28 ST N 18 18 NA D Sm-CL REAST N 12 18 10 INA

1

FIELD LOG OF BORING (CONTINUED) PROJECT Ellington SE INO 367 WI BORING NOMU-10 CAR Pusifeb USCS ОЕРТН ONA IFUU SM. 12/14 CL 3 8 9 0 2 3 4 5 6 7 8 9

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SAMPLE LOG SHEETS

	-		** ** ** ** ** ** ** ** ** ** ** ** **		
	ي المحادث	Soli	C 1A		
	Secime	ace Soii	Case ≠ <u>NA</u>		
		nt I / Pond	By NUS CON		
	Cther	1/Fone	24 1002 (202		
	0c		,		
Project Site Name Ellington Field	The Truestistic	Project Site Ni	IMPR 7/714		
NUS Squees No. AL CO. 74 - A	90115	ca Location R		Col	
NUS Source No. 01.5307A-A		es cocation Da	ing too MW-07 land	Fill	
Sample Method:		Composi	te Sambie Data		
Duersized Stit Spoon Sampler	Sample	Time	Color / Description		
Depth Sampleri	1	j			
16-18'					
Sample Date & Time:					
1440 17-14-89/1410					
Sambled By:					
D. Uztlegrove / L. Bas. 110]			
Signatura(s):/	1	<u> </u>			
1. 64		1			
Type of Sample	<u> </u>	1			
Low Concentration					
High Concentration		1			
₹ Gran		·	ne Data		
Composite	Color Descr		, Ory, Moist, Wet, etc.)	Je -	
Grap - Composite			. graited sand, sate		
			- ANTICEDI SANDI	70K. Opp.	
Analysis:	Observations: N	, ,	/ A . A		
TCL Volatiles	Headspace u	reading of	· ppm w/ OUA		
TCL BNAS		•	• •		
TCL Resticides	<u> </u>				
TPH	!				
TAL Inorganics	<u> </u>				
	!				
	1				
					
	Ì	Ì			
·					
	Lab	\\ \rac{1}{\chinnt{\ch			
	Lab				
	Lab		14.02		

SOILS



	. .			" 	
	Surface		Case ≠ NA		
	Subsur Secime				
		n. n/Pond	By NUS (.	. .	
	Cther		o, 1-03 ()		
				•	
Project Site Name Ellington Field		Project Site Alice			
AUG Communication of the Control of					
NUS Source No. 01-5001A-A		cs rocation	y for inW-01 las	afill	
Sample Method:	 _	Composito	Sample Data		
Duersized Solit Span Samuler	Sample	Time			
Depth Samples:	, semble	i time i	Calor / Descrip	tion	
	ļ			 -	
16-18	<u> </u>	<u> </u>			
Sample Date & Time:					
12-13-89/915	<u> </u>				
Sambled By:		1			
D. U. Hierard / L. Basilio		1			
Signaturals)/	1				
N. 2-1-		1			
Type of Sample	<u> </u>	i i			
		1			
Low Concentration		!			
High Concentration Grap	ļ	1			
Composite		Sambi	e Data		
Gran - Composite			Dry, Maist, Wet. etc.)		
	Brown Ve	ry Silty clay,	setunted		
Analysis:	Observations: N	lotes			
TCL Volatile	Some very f				
TCC BMAI	1				
	-				
TCL Posticides TPH	<u></u>				
1 ((+					
TAL Inoquies	1				
<u> </u>	<u> </u>				
	1				
	 	 			
					
		 			
	Lab	204			
	Valume	1 6" liver, 1	4 02	•	
		16" liver, 1 Jan, 16 0	ijar		
					



	Surface Subsurf Subsurf Sedime Lagoon Cther	aca Soii nt	Case = NA
Project Site Name Ellington Field S NUS Source No. 01 - 58 61 B-A	Site Turestigation	Project Site Nu te Location کرمکا	imper 363m
Sample Method:		Composit	e Sample Data
Duersized Split Spoon Sampler	Sample	Time	Caiar / Description
Depth Samples:			
26-76			
Samble Date & Time:		1	
12-13-89/1055			
Samples By: D. Ustresone / L. Basilio			
Signature(s)			
ype of Sample		1	
☑ Low Concentration			
High Concentration			
☑ Grab		Samo	ile Data
Composite	Color Descri		, Dry, Maist. Wet, etc.)
Grab - Composite		fine-grains	
Analysis:	Observations: N		
TCI Urlefiles			, headspace reading
TCL BMAI	of 20 ppm	W/ DVA	
TCL Pesticides	101 25 [[201	·
1514	i		
THE THORSENIES	i		
	1		
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	1		
	1		
		1	
		İ	
	Lab	צטא	
	Valume	1 6" 1; car,	7 14-7



LIS SAMPLE LOG SHEET

COPPORATION			235	e(si		
	Surface		Case = NA			
		ace Soii				
	☐ Sedime ☐ Lagoon		Ev A	JUS Con		
	Cther	, , , , , ,	-, <u>r</u>			
Project Site Name Ellington Field	site Investigation	AProject Site N	umber 3/34	Λ		
NUS Source No. 01. SRY 34A	Source	e Location B.	in for WW	· 03 6. 1611		
Sample						
Sample Method:	ļ		te Samble Dat			
Duersized Sit Span Sampler	Sample	Time	Coior	/ Description		
Depth Sampleb:						
8-10	1	<u> </u>	<u> </u>			
Sample Date & Time:			!			
17-13-84/1600	<u> </u>	<u> </u>	<u> </u>			
Sampled By:			!			
D. Uztleg-out / L. Bas. 110			[
Signature(s)		1	!			
4. 4/		1	!			
Type of Sample			<u> </u>			
Low Concentration			!	·		
High Concentration			<u> </u>			
Composite	Sample Data					
Grap - Composite	Color Description: (Sand. Clay, Dry, Moist, Wet, etc.)					
	Observations N	ilty Clay				
Analysis:	Observations, N	otes		^		
TCL volatiles	Ton-string; N W OVA	eg, headspa	ce reading	of 30 7pm		
ICL BNAS	I W/ DVA	4	Ý	11		
TCL Posticidos	! `					
TPH	<u>!</u>					
TAL Impravios	!					
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COPPERATION	Surface Subsurf Sedime Lagoon Cther	face Soli nt	==ge cf Case = NA =y NUS (
NUS Source No. 01 - 5180 3 P-A		se Location B:		EIL_	
Sample Method:	<u> </u>	Composite	Sample Data		
Duersized Slit Span Sampler	Sample	l Time	Calar / Description		
Depth Sampleb:					
17-14'					
Sample Date 🕹 Time:					
17.13-90/1615					
Sampled By:					
D. U>Hiegond / L. Basilio	<u>}</u>	1			
Signatura(s):/		<u> </u>			
Δ. 4//	[
Modof Sample		1			
Low Concentration High Concentration		1			
Gran	<u> </u>	<u> </u>			
Composite		Samoi			
Grap - Composite	Brown Si	Ity very fix	e grained sand, Enter	reted	
Analysis:	Observations: N	otes	•		
TCL Volatiles	Headspace ve	ecding of 1	ppm w/OVA		
TCL BNAS	<u> </u>	V	11		
TCL Posticides TPH	<u> </u>				
IPH	<u> </u>				
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	Volume	16 liner, 1	in		



SAMPLE LOG SHEET

COPPORATION			2300	l cf l
	Surfac			
		rface Soii	Case	= NA
	Secim Lagoo	ent 19. / Pond	av N	US Con
	Cther	m/Ponc	3, <u>F</u>	03 (30)
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Project Site Name Ellington Field	Sike Twesticati	ہے۔ Proiect Site Nu	mier 7/7W	1
NUS Source No. 01 - STOYA - A	Sau	rce Location B.	no for Wh	1-04 10 11-11
Sample Method:			e Samble Data	
Duersized Solit Spoon Sampler	Sample	Time	Caiar /	Description
Depth Sampled:				
4-6'		<u> </u>		
Sample Date & Time:		! !		
12-12-89 440 1010		! !		
Sampled By:		! !		
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Type of Sample		1 1		
Low Concentration]		
High Concentration Grap				
Composite			ie Data	
Grap - Composite		motion: (Sand, Cay,		etc.)
	Brown, arme	Dry, very 5	119 264	
Anaivsis:	Observations:	Notes'	•	
TCC Volatiles	Med stift,	some alconeou	us granel o	and very
TCI TXVAG	_time schol.	Headspece vea	iding of 6	ppun w/ AOI;
TCI Posticides	_	`	V	(1
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		ace Scii	Case = NA			
	Sedime Lagoon Cther		By NUS (-		
Project Site Name Ellington Field	Sike Investigation	Project Site N	umper 363W	1 . A .)		
NUS Source No. 01-58848-A		ca rocation	ing for MW-04,	land fill		
Sample Method:		Composi	te Sample Data			
Duersized Slit Span Semaler	Samo:e	Time	Calar / Descri	istian		
Depth Sampled:						
17.14				· · · · · · · · · · · · · · · · · · ·		
Sample Date & Time:		1				
17.12.89/1050	<u> </u>					
Sampled By: D. U. H. Egrand / L. Basilio				-		
Signaturals:				- -		
ype of Sample	1	1				
Z Low Concentration			i -	-		
High Concentration				-		
Gran	Sample Data					
Composite Grap - Composite	Color Description: (Sang, Clay, Dry, Moist, Wet, etc.)					
	Brown We	t clease	fine sand	_		
Analysis:	Observations: N			_		
TCL Volatiles	10 ppm w/	herdspece i	reeding w/ OVA			
ICL BNAS	1	l l	4			
TCL Pasticidas	!					
TPH	<u> </u>					
TAL Inagenics						
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		1	 -			
		i				
	 	1	<u> </u>			
	Lab	אטן				
	Volume	1 6" liver, 1 16 d	1407 12 jar			



SAMPLE LOG SHEET

Surface Soil Subsurface Soil Subsurface Soil Subsurface Soil Subsurface Soil Subsurface Soil Sectiment Lagoon / Pond Other Project Site Name Ellington Field Site Twestington Project Site Number 767M NUS Source No. 01-5885A-A Sample Method: Depth Sample Sample Sample Data Depth Sample Sample Time Color / Description Depth Sample Date & Time: 10-17 Sample Date & Time: 12-71-84/450 Sample Date & Time: 12-71-84/450 Sample Date & Time: 12-71-84/450 Sample Date & Time: 13-71-84/450 Sample Date & Time: 14-71-84/450 Sample Date & Time: 15-71-84/450 Sample Date & Time: 16-17 Sample Date & Time: 16-17 Sample Date & Time: 16-17 Sample Date & Time: 16-18 Composite Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.) Rush & Fill Side of the grained Sample Date Color Description: (Sand. Cay, Dry, Moist, Wet, etc.)	COPPGRATION			Fage(c:	: 1		
Project Site Name Ellington Field Side Two trading Project Site Number 363M NUS Source No. 01-58858-A Sample Method: Sample Method: Sample Method: Sample Method: Sample Method: Sample Method: Sample Method: Sample Data Color / Description Description Description Description Sample Data To 12-12-14-14-50 Sample Data Sample Data Sample Data Composite Town Concentration Figna Composite Color Description: Sample Data Composite Color Description: Composite Color Description: Sample Data Composite Color Description: Composite Color Description: Composite Color Description: Composite Color Description: Composite Composite Color Description: Color		Subsur	face Soii				
Source No. 01-5835 A-A Sample Method: Sample Method: Destrised Sit Spool Sample Sample Deata Destrised Sit Spool Sample Sample Time Color/Description Denti Sample Destribution Sample Destribution Signature Str. Destribution Destribution Grap Composite Color Description: (Sample Data Composite Grap Composite Rust Fr. Clayen five graph sand Analysis: Observations: Notes Source sand chap, leadspace redding of TML Thoraspics TOL Destribus TOL Destribus TOL Pestricious THE Thoraspics THE Thoraspics THE Thoraspics			n / Pand —————	Ey NUS (ou	-		
Sample Method: Depth Sample Sample	Project Site Name Ellington Field NUS Source No. 21-5BACA-A	Sike Investigation	Project Site Nun	noer 363M	101		
Depth Sampled: (0-17) Sample Date & Time: (2-71-84/450 Sample Date & Tim			<u> </u>	1 122 144-05 164	atill		
Depth Sample Date & Time: 10-17 Sample Date & Time: 17-71-94/450 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-17 Sample Date & Time: 19-18 Sample D			Composite	Sample Data			
Sample Date & Time: 12-71-84/450 Sample By: 1	Duersized Solit Spoon Sampler	Samble	Time	Calor / Descripti	an		
Sample Date & Time: 12-71-84/450 Sample By: 1	Depth Sampleti:						
12-71-94/450 Sample 39: J. Ushing and L. Basilio Signaturalisis Jaw Cancentration High Cancentration Grap Composite Color Description: (Sand. Cav. Dry. Moist, Wet. etc.) Rush & Em. Clay five grained send Analysis: Observations: Notes Some sand, clay, headspace reading of TCL BNAS TCL Pash dids TML Thomanics Lab MUS Lab	(0-17						
Sample 3y: July Lagrand / L. Bas, 10 Signaturalist Low Concentration High Concentration Grap Composite Color Description: (Sano, Cav. Dry, Moist, Wet. etc.) Rost Fin. Clay to five grained sand Observations: Notes TCL Julatius TCL Pasticiaus TRI Thomasics Lab IVIS Lab IVIS							
J. Usticaroul (L. Basilio) Signaturalisis Videof Samole I Low Concentration High Concentration Grap Composite Grap - Composite Analysis: TCL Veletius TCL BNAS TCL BNAS TCL Pesticius TRIL Theraphics Lab Lab NUS Lab Nus Lab NUS Lab Nus		 					
yderof Sample Voler of Sample	D. Urthegrave / L. Basilio						
Low Concentration High Concentration Grap Composite Grap - Composite Analysis: Observations: Nortes Some sand: Clay in five grained sand Observations: Nortes Some sand: Clay, leadspace reading of 100 ppm w/ OVA, 3 ppm u/ HVV. The Thomasics Lab IVIS Lab IVIS	Signaturalsi						
Low Concentration High Concentration Grap Composite Grap - Composite Analysis: Observations: Nortes Some sand: Clay in five grained sand Observations: Nortes Some sand: Clay, leadspace reading of 100 ppm w/ OVA, 3 ppm u/ HVV. The Thomasics Lab IVIS Lab IVIS	voe of Sample	1					
High Concentration Grap Composite Grap - Composite Analysis: Observations: Notes TCL Unlaftics TCL BMAS TCL Pesticides TM Thoracics Lab MUS Lab M							
Grap - Composite Grap - Composite Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) Rust Fr. Clayer five grained sand Analysis: Observations: Notes Some sand oby, become veeding of 100 ppm w/ OVA, 3 ppm w/ HVV. THE Thoracinics Lab MUS	High Concentration						
Color Description: (Sand. Cav. Dry. Moist. Wet. etc.) Rust & Fam. Clayer fine grained sand Analysis: Observations: Notes Some sandy olar, head-space reading of TCL PNAS TCL PESTICIOS TPH TM Thoraginics Lab NUS Lab NUS	☑ Grap		Sample	Data			
Pust 8 Few Clayer five grained sand Analysis: TCL Volatiles TCL BNAS TCL Pesticides TPH TML Thoracics Lab NUS Lab NUS							
Anaivsis: TCL Uslatiles TCL BNAS TCL Pesticides TPH TAL Thoragonics Lab Diservations: Notes Some sandy clay, beconspace veeding of 100 ppm w/ OVA, 3 ppm u/ HNV.	Grab - Composite	Rust & 15 (lucu fine so	a hed sand			
TCL Volatiles TCL BNAS TCL Pasticides TCL Pasticides TPH TAL Thoraconics LAD VUS Some sandy clay, headspace veeding of 100 ppm w/ OVA, 3 ppm v/ HNV.	Analysis:	Observations: N	lotes V	_			
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THE Thorganics		70000	/ 2/1	/ / / . /			
THE Thorganics Lab NUS		-100 ppm u	1 PA 2 1	m b/ mbb.			
Lab NUS	TPH	- i	·				
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		urface Soii	Case = NA
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	Cthe	ion / Pond ir	= 4 602 (20)
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Project Site Name Ellington Field	I CLOT LAS	h Brainer Sira Nue	minor 7/71.
MISSOURE NO. OF THE PARTY	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	in succession in the successio	112E: 363M
NUS Source No. 01 - SBBSB.A/	01-1002.4 30	ince rocation in	y to MU.05, [and fill
Sample Method:		Composite	Sample Data
Duersized Split Span Sample	Sample	Time	Caiar / Description
Depth Sampled:	i summer		Color / Seathblion
(8-27'			
Sample Date &,Time:			
12-71-84/1015			
Sampled By:			
		<u> </u>	
D. UzHiegrove / L. Basilio			
Signaturals:/			
10.			
Type of Sample			
Low Concentration			
High Concentration		1	
☑ Grab ☐ Composite		Sampi	e Data
Grap - Composite	Color De	scription: (Sand, Clay,	
	B-wu	Silty fine coni	ned sand
Analysis:	Observations	Notes	
TCL Volatiles	Headspace	reading of -	3 ppm w/OVA
TCL BNAS			11 27 000
TCL Particides	-		
174			
BTAL Thorsesics	- 		
m 17 [[[[[]]]]]	- 		
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	Lab	NUS	
	Volume	87 L" (1000	24
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	Surface		Cara	 • • • • •
	Subsuri			≠ <u>NA</u>
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	Cther	/ Fond	3, <u>10(</u>	73 (00)
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Project Site Name Ellington Field	CIL T LA LA	Ornine Site N	lumbar 3/31.	
TUIS COURT NO.				\
NUS Source No. DZ - SEIL A-A		e Location 5	15-11, POL	·
Sample Method:	1	Compos	ite Sampie Data	
Dursized Solit Spor Sampler	Sample	Time		
Depth Samples:	i Jennare	i inite	Colori	Description
		<u> </u>	 	
8-2	<u> </u>	<u> </u>	<u> </u>	
Sample Date & Time:			 	
12-18-29/1050	<u> </u>			
Sampled By:		<u> </u>	1	
D. Uztregowe / L. Basilio			1	
Signatura(s):				
A. 14		1		
Mpe of Sample				
☑ Low Concentration				
High Concentration				
☑ Grap		Sam	pie Data	
Composite	Color Descri		v, Dry, Moist, Wet,	are \
Grap - Composite	Gray brown C	la saft	t mad stif	<u>[</u>
Amaina	Observations / N	222	1	
Analysis:	TObservations in	otes 1		
TCL Volatiles	Tron nonves	, hydrocarl	in , odor , moi	st, headspace
TPH	weeding of	20 ppm	U/ HNU. OU	A.'
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	Valume	6" :-e-8	11402	
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COPPORATION	Surface Subsurf Sedime Lagoon Cther	face Soil nt	Case = NA			
NUS Source No. 27-5811 B-A	Sike Investigation	sa Focation <u>≷B</u> ∙l	iber 363m			
Sample Method:	1	Composite	Sample Data			
Duersized Split Span Sampler	Sample	Time	Caiar / Description			
Depth Sampleti:						
Sample Date & Time:						
17-18-89/1105						
D. Uztheroul / L. Basilio		1				
Signaturals/						
Type of Sample		1				
☑ Low Concentration						
High Concentration Grap		Sample	Data			
Composite Grap - Composite	Color Description: (Sand. Cav. Dry. Moist, Wet, etc.)					
Grab - Composite	Greenigray C	lay, soft to	med stiff			
Anaivsis:	Observations: N	otes	1			
TCC Volation	- un staining	& nodules, mo	ist, strong hydrocarby			
TCL BYAS TCC Perticides or	lodor, heads	ace reading a	ist, strong hydrocarb-n of 280 ppm w OVA			
TPH	1	•	·			
FAE Imagories Der]					
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	Lab	has				
	Valume	1 4" line 2"	loz			
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Surface Soil Sectiment Lagoon / Pond Cother Project Site Name Ellington Field Site Tourn Project Site Number 363M NUS Source No. 07-080-A-02-F0al-A Source Location SB-IL, POL Sample Sample Method: Sample Sample Sample Time Color: Description Description Composite Sample Data 19-72 Sample Data Tourn Color: Description Section of Sample Data Low Concentration Fig. 12-18-19-12-20 Sample Data Composite Grab - Composite Grab - Composite Sample Data Composite Grab - Composite Grab - Composite Sample Data Composite Grab - Com	COPPERATION	<u> </u>	. ₹ = d	Page	cf
Segment Pana Sy NUS Composite Name Ellington Field S. Toward Indiana Project Site Name Ellington Field S. Toward Indiana Project Site Number 367MM NUS Source No. 07-0810-16 10-1- FD 01- A Source Location SB-11, PDL Sample Method: Composite Sample Data Composite A Time: 17-18-89/1200 Sample Date & Time: 17-18-89/1200 Sample D				Case ≠ N	JA
Project Site Name Elliption Field Silve Tures fighting Project Site Number 363MM NUS Source No. 07-081/C-A 02-1001-A Source Location SB-11, PDL Sample Method: Sample Method: Descrized Chit Speck Sample Descrized Single Time Color Description Sample Data Trib 99 Tao Sample Data Trib 99 Tao Sample Data Composite Grap Composite Grap Composite Grap Composite Town Concentration Figh Concentration Figh Concentration Sample Data Color Description: Sample Data Color Description: Color Description Description: Color Description: Color Description Analysis: Observations: Nords Head Speck Medium of 12 ppm w/ OVA		🔲 Sedime	ent		
Project Site Name Elliption Field Silve Tures fighting Project Site Number 363MM NUS Source No. 07-081/C-A 02-1001-A Source Location SB-11, PDL Sample Method: Sample Method: Descrized Chit Speck Sample Descrized Single Time Color Description Sample Data Trib 99 Tao Sample Data Trib 99 Tao Sample Data Composite Grap Composite Grap Composite Grap Composite Town Concentration Figh Concentration Figh Concentration Sample Data Color Description: Sample Data Color Description: Color Description Description: Color Description: Color Description Analysis: Observations: Nords Head Speck Medium of 12 ppm w/ OVA		☐ Lagoor	n/Pond	By NUS	Con
NUS Sample Sample Method: Sample Met		Li Other_			1
NUS Sample Sample Method: Sample Met	Project Size Name Filt. for Field	Clo Tueto to	Project Site No	miner 7/7144	
Sample Method: Depth Sample Color / Description	NUS Squees No. 07 - C-A (A)	7- ED AL- A SOUR	relocation ()	Pall Day	
Deets Sample Time Color: Description Dents Sample Date & Time: 13-12-89/ (200 Sample Date & Time: 17-18-89/ (200 Sample Date & Time: 17-18-89/ (200 Sample Date & Time: 19-20-1-1-1-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-	>ampt_	<u>C (701 / 7</u> 366.	78	-11,100	
Depth Sample Date & Time: 18-72 Sample Date & Time: 17-18-89/1200 Sample Bay: 1					
Sample Date 2 Time: 17-18-89/1200 Sample Date 3 Time: 17-18-89/1200 Sample Date 3 Time: June Concentration	Duersized Split Span Sampler	Samble	Time	Calar / De	scription
Sample Date 3 Time: 17-18-89/1200 Sample Date 3. Time: 19-90 of Sample Low Concentration High Concentration Grap Composite Color Description: (Sand, Cay, Dry, Most; Wet, etc.) Town Clarge sit, some v. fine send, satting ted Analysis: Observations: Notes! Head Space veeding of 12 ppm w/ OVA Volume 7-6" [i.ex, 7-4-7]	Depth Sampled:				
Sample 3 y: . Unit record L. Basilio Strature Sample Z Low Concentration High Concentration Grap - Composite Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) 3 mun Claret silf, some v. file sand, saturated Analysis: Observations: Notes PH Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) 3 mun Claret silf, some v. file sand, saturated Analysis: Observations: Notes PH Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) 3 mun Claret silf, some v. file sand, saturated Analysis: Observations: Notes PH Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The color Color Description: (Color Descriptio	13.77				
Sample 3 3v: Dyther and L. Bas. 10 September	,				
Just Lab NUS Valume 7 6" (Lucy 7 4 22)		1			
Sematurals: Jupe of Sample					
Type of Sample Z Low Concentration High Concentration Grap Composite Color Description: (Same, Cay, Dry, Moist, Wet, etc.) 3 rown Clayer silt, some v. five sand satirated Analysis: Observations: Notes PH Lab VUS Volume Z 6" (iver, Z 4 - 2)		1	1 1		
Z Low Concentration High Concentration Grap Composite Grap - Composite Analysis: TCL Valatiles Observations: Notas Head space reading of 12 ppm w/ OVA Lab VUS Volume 126" (i.e., 24-2)	X 7/A	ļ 	· · · · · · · · · · · · · · · · · · ·		
Z Low Concentration High Concentration Grap Composite Grap - Composite Analysis: TCL Valatiles Observations: Notas Head space reading of 12 ppm w/ OVA Lab VUS Volume 126" (i.e., 24-2)	Type of Sample	<u>-</u>			
High Concentration Grap Composite Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) Town Claude silf, some v. fine sand, satirated Analysis: Observations: Notes Head space veeding of 12 ppm w/ OV4 Lab MUS Volume 2 6" linev, 2 4 - 2			<u> </u>		
Composite Grap - Composite Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The Composite Color Description: (Sand, Cay, Dry, Moist, Wet, etc.) The Color Description: (Sand, Cay, Dry, Moist, Cay, Dry, Moist, Cay, Dry, Moist, Cay, Dry, Moist, Cay, Dry, Moist, Cay, Dry					
Grap - Composite Color Description: (Sand, Cay, Dry, Moss, Wet, etc.) Simum Clayer silt, some v. film sand, sating ted Analysis: Observations: Notes Tex			Samo	ie Data	
Analysis: Observations: Notes TCL Valatiles TPH Lab MUS Volume 26" (i.e., 24.7)		Calar Descr	notion: (Sand, Clay,	, Dry, Maist, Wet, etc.	; , ,
Analysis: TCL Valatiles TPH Head space reading of 12 ppm w/ OVA Lab PUS Volume 26" (iner, 24-2)		Brown (lana silt, s	ione v. fine su	ud saturated
Lab VUS Volume 2 6" (:wev, 2 4 - 2	Anaivsis:	Observations: N	lotas I		
Lab VUS Volume 2 6" (:wev, 2 4 - 2	TCL Volatiles	Head space	recoling of	12 ppm w/	04
Valume 2 6" (:wer, 2 4 -2)	174		¥	, ,	•
Valume 2 6" (:wer, 2 4 -2)		!			
Valume 2 6" (:wer, 2 4 -2)		<u> </u>			
Valume 2 6" (:wer, 2 4 -2)		4			
Valume 2 6" (:wer, 2 4 -2)		-{			
Valume 2 6" (:wer, 2 4 -2)	<u> </u>	+			
Valume 2 6" (:wer, 2 4 -2)		┪			
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Valume 2 6" (:wer, 2 4 -2)					
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Valume 2 6" (:wer, 2 4 -2)					
Valume 2 6" (:wer, 2 4 -2)					
Valume 2 6" 1: her, 2 4 -2		Lab	YUS		
		Valume	Z 6" liner,	24-2	

NUS

SOILS SAMPLE LOG SHEET

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	Subsuri	aca Soii	Case = NA	
	Sedime Lagoon Cther_		By NUS COU	
Project Site Name Ellington Field	ile Investigation	garaject Site Nu	umber 363W	
NUS SOURCE NO. DZ. SBIZA-A	Šaure	ce Location <u>5</u>	3-17 POL	_
Sample Method:		Composit	te Sampie Data	_
Duersized Slit Span Sampler	Samble	Time	Calor / Description	
Depth Sampled:				
Sample Date & Time:				
12-18-89/1545				
Sampled By: D. U. H. L. Basilio				
Signaturals				
Type of Sample	<u> </u>			
Low Concentration High Concentration				
Z Gran		Same	ne Data	
Composite	Color Descri		, Dry, Moist, Wet, etc.;	
Grap - Composite	Black Cla	4 soft to	med stiff	
Analysis:	Observations: N	otes		
TCL Volatiles	Tron nodules	, strong has	hoscater odor, headspece	
TCL BUAS	reeding of	locot p	pm u/0v4	
TPH	1	1		
	ļ			
	<u> </u>			
	1			
				
			i i	
		İ		
	Lab	hus		
	Volume	1 6" liner, 1 jan, 1 16 02	4 or	



				_ =:
	Surface Soil Subsurface Soil		C252 = 4.1Å	
			Case = NA	
	Secime			
	Lagodn Cther	r/Pand	24 1002 V	-
				,
Project Site Name Ellington Field	Sike Investigation	م Project Site Nur	mber 363W	
NUSSOURCE NO. 67. CRIZZ Z-A	Jour	ce Location 58	· 17. Pal	
Sample		<u></u>		
Sample Method:		Composite	Sample Data	
Oversized Solit Spoon Sampler	Samble	Time	Calar / Descr	notion
Depth Sampled:				
6-9				
Sample Date & Time:		!		
17-18-24/1610				
Sambled By:	<u> </u>			_
D. U. H. egrove / L. Basilio				-
Signaturalsin		1		
A. 4		1		_
Type of Sample				_
☑ Low Concentration		1		=
High Concentration		i		-
Z Gran	Sample Data			
Composite	Calaa			-
Grap - Composite			Dry, Maist, Wet, etc.)	p
	Observations N	Clay in	ed stiff to stiff	
Analysis:	Observations / N	otes		,
TCL volatiles	1. A Lundant a	alcaveous mat	ter, iron staining	ν ξ
TPH	Inodules, here	dspace read	ter, iron staining of 100 pp	# w/OV.
	1	l	1	•
	1			
,	7			
	1			
	<u> </u>	T		
				
				
		İ		
		<u> </u>		
		<u> </u>		
	Lab	hus		
	Valume	1 6" liver, 1	4 07	
		ja-		
	<u></u>			

NUS

SOILS SAMPLE LOG SHEET

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	Subsur	face Soil	Case ≠ NA
	Secime Lagoor Other_	int 1 / Pond 	By NUS CONT
Project Site Name Ellington Field	Sike Investigation	ېءcoject Site Nu	imber 3/3M
NUS Source No. 07 . 5812C-A	9our	cs Focstion 2	3-17 POL
Sample Method:	T T	Composit	e Sample Data
Duersized Solit Span Sampler	Sample	Time	Color / Description
Depth Sampled:			
Sample Date & Time:			
12-18-84/1645		1 .1	
Samples By: D. U. H. eg-ove / L. Basilio			
Signaturals):			
12.			
Type of Sample	ļ	 	
Low Concentration			
High Concentration Grap		<u>!</u>	
Composite	Calas		ne Data
Grap - Composite		classy sil	, Dry, Maist, Wet, etc.) L
Anaivsis:	10hannaa A	lasse	
TCL volatiles	I Herden in	ecoline of	6 ppm WOVA
TPH	11(-4013)	7	s fra al con
		•	
	1		
]		
			
		 	
		<u> </u>	
	Lab	Hus	
	Valume	1 6" live-,	140



SAMPLE LOG SHEET

CORPORATION			Page(cf	1
			C::0 = 11	
	Sedime	face Soii	Case = NA	
		n/Pand	BY NUS CON	
	Cther_			}
=11 / = 11	-1 1 1.			
Project Site Name Ellington Field	site Jusestigation	್ವಾ roject Site Nur	icer 363W	
NUS Source No. 07.58 134-A		ce Location SD-	13, POL	
Sample Method:	1	Composite	Sample Data	
Duersized Solit Spoon Sampler	Sample	Time	Calar / Description	
Depth Sampled:			20.0.1 3636110110	
0.2				
Sample Date & Time:				
17-19-89/940				
Sambied By:				
D. Uztrearove / L. Basilio		1		
Signaturalsy		1		
D. 5/1		1		
Type of Sample				
✓ Low Concentration				
High Concentration				
☐ Grap		Sample	Data	
Composite Grap - Composite	Color Descr	notion: (Sand, Clay, D	ry, Maist, Wer, etc.)	
	Black C	lag soft to	med stiff	
Analysis:	Observations: N	lotes .		
TCL Volatios	I Iron nodule	is, strong zh	godoscarbon odor,	
T?H	Leadence v	ecolina of	NOVA mer as	
	1	1		
	<u> </u>			
· · · · · · · · · · · · · · · · · · ·				
		<u> </u>		
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		1. 10.6		
	Lab	has		
	Makes	1 / 11 1 4	<u> </u>	
	Valume	+ 6" -liter 2	7 00	
	<u> </u>	jars		

SAMPLE LOG SHEET

SOILS

			- # g # c :
	Surfaci		Casa - 11
	Sedime	face Soil ent	CESE - NA
		n/Pond	Case = NA
	Cther_		
/	-		
Project Site Name Ellington Field	Site Investigation	جم ² roject Site Num	cer 363W
NUS Source No. 02-5B13B-A	<u></u> 9au	rce Location 53 -	13. POL
Sample Sample Method:			
Duersized Slit Spon Samples	Sample	Composite S	
Depth Samples:	<u>Jamule</u>	Time	Calor / Description
4-L'			
Sample Date & Time:			
12-11-89/1000		 	
Sampled By:			
D. Uzthegrove / L. Basilio		1	
		1 1	
Signature(s):		1 1	
1. 14/			
Type of Sample		1 1	
Low Concentration		 	
High Concentration Grab			
Composite		Samble	
Grap - Composite	Color Desc	notion: (Sand, Clay, Dr	ry, Maist, Wet, etc.;
		cy, soft to me	a stiff
Analysis:	Observations:	Votes,	, .
TCL volatiles	_ Ivon strinin	y, strong hiples	octopu u/OVA
TCL BURS	_ leadspace v	recoling of 10	00+ ppm u/ OVA
TPH		V	11
	İ		
	-		
		T T	
	Lab	NUS	
	Valume	ا معانا ۱	30 P
	Adiditis	1 60 liver, 1	160
	i		4.1 7



	-		- <u>-</u>
	Surrace		Casa = 11A
	Subsurface Soil Sediment		Case ≠ NA
			ay NUS Con
	Cther	1/75114	1, 1-03
			`
Project Site Name Ellington Field	ila Tab b	Project Site Nu	miner 7/71.4
NUSS CONTRACTOR OF THE CONTRAC	ONE THIS TIGHT	M. Diegrand	2 26 3 W
NUS SourceMo. 02.5373C-A	your your	ce Location SV	13, POL
Sample Method:	}	Composite	Sample Data
Duersized Stit Span Samuler	Sample	Time	Calor / Description
Depth Samples:	1	1	Color / Describitan
		 	
70.77	1		
Sample Date & Time:		1	
12.19-89/1130	1	!!	
Sampled By: D. Urtherme / L. Basilio		1	
Signatura(s)			
N. 1971	<u> </u>	!	
Type of Sample	<u></u>	1	
High Concentration		1	
≧ Gran		Samoi	e Data
Composite Grap - Composite	Caiar Descr	riction: (Sand, Clay,	Dry, Maist, Wet, etc.)
Can-Camposite	Bown V.	Cleary fine	sand and silt, saturated
Anaivsis:	I Observations / N	lotes"	•
ICI Udaties	leadown a	edin of b	ppm u/ 004
TOIL	Heavy Shere		((,),
	-		
	1		
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	<u> </u>		
		 	
		!	
			1
		<u> </u>	
		1	
		1	
	Lab	NUS	
		1	
	Volume	ا الما انتصر ا	4 02
	10.0	1.20	
	<u> </u>	44	

NUS

Project Site Name Ellington Field on NUS Source No. 07.5814A.A	Surface Sucsurf Sectione Lagoon Cther Source	aca Soil nt / Pond 	Case ≠ By <u>N</u> U	NA Cov
Sample Method:	Site Investigation	a ^p roject Site Nu	- /	
Sample Method:		te Location SI	3-14 76L	
Duersized Solit Span Samuler	Sample	Time	Color (escription
Depth Sampled:	1		<u> </u>	rescribtion
D-7'				
Sample Date & Time:				
12-19-89/1410	ļ			
Sampled By:				
D. Uzthegrove / L. Basilio	1)	<u> </u>	
Signaturals:		<u>'</u>		
Pyde of Sample	<u>. </u>			
				
Low Concentration High Concentration Gran				
Composite			ne Data	
Grap - Composite			, Ory, Maist, Wet, e •[/	:c.)
		4, med st	145	
TCL Volchiles	Observations: No	otes Cl.l.	0	A .
TCL BYAS	Iron nodules w/ ovA, z	- manspice	Was. Le of	20 ppm
TPH	i wi oun , E	proof with	DU	
	Ī			
	Ì			
	1			
		<u> </u>		
		l		
	Lab	לטא		
	Volume	1 6" liver, 1	y se	



		Scii	(353 :	1A
	Subsuri Secime		C=36 -	- NA
	Lagoon		EY NL	S Cour
	Cther_		- 1	
Project Site Name Ellington Field	Site Investigation	ے۔ مادم اور Site N	umber 363W	
NUS Source No. DZ . SBIYB-A	Sour	ce Location S	B-14 ADI	
Sample				
Sample Method:			te Sampie Data	
Duersized Slit Spoon Sompler	Samble	Time	Calor/	Description
Depth Sampled:				
6-8'	<u> </u>	<u> </u>	<u> </u>	
Sample Date,& Time:		<u> </u>	<u> </u>	
12-19-99/1425		<u> </u>		
Sambled By:		1		
D. U. Hierone / L. Basilio			1	
Signaturals/				
<i>∆</i> , '47/->				_
Type of Sample				
☑ Low Concentration			1	
		1	1	
High Concentration	1	1	· F	
High Concentration Grab		Sam	cie Data	
High Concentration Grab Composite	Cajar Descr	notion: (Sano, Ca	ti Die Data y, Ory, Moist, Wet,	e:c.)
High Concentration Grab	Color Descri	notion: (Sano, Ca	v. Orv. Maist. Wet.	etc.)
High Concentration Grap Composite Grap - Composite	Color Descri	notion: (Sano, Ca	v. Orv. Maist. Wet.	etc.)
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet,	
High Concentration Grab Composite	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet,	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet,	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet,	
High Concentration Grap Composite Grap - Composite Analysis:	Color Descr Tand gray C Observations: N Two modules with head	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet,	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet,	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet,	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet,	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet,	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet.	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet.	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet.	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet.	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet.	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet.	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet.	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	rotion: (Sana, Ca leg. soft to lotes & & Staining legace read malfunctioning	y, Dry, Moist, Wet.	
High Concentration Grap Composite Grap - Composite Analysis:	Tand gray C	retion: (Sano, Ca leg. soff to	y, Dry, Moist, Wet.	

			- 356 <u>- 1</u>	s:
	Surface			11
	Secime	face Scil	Case ≐ 7	
	🗔 Lagoon	i/Pand	Ey NUS	(ova
	☐ Cther_			
Brown Sien Name Filt Fell	01.7.1.1	7	/	
NUS Source No. 07.5814 C-A	>. Ne juses Tratte	roject Site Na	moer <u>363M</u>	
103 3001CE NO. 0 2.5 15 14 1 77		ce Location <u>50</u>	-14 POL	
Sample Method:		Composit	e Sample Data	
Duersized Split Spoon Sampler	Sample	Time	Caior / De	scription
Depth Sampled:				
18-70'	1	<u> </u>		
Sample Date & Time:		1		
17-19.89/1510 Samples By:	<u> </u>	1		
D. Uzthegrove / L. Basilio		1		
Signature(sty	<u></u>	! !		-
17/		1		
Me of Sample	<u> </u>	1		
Z Low Concentration		1		
High Cancentration		1		
☑ Grab		Samo	ie Data	
Composite Grap - Composite	Caiar Descr	iction: (Sand, Cay,	Dry, Moist, Wet, etc.	, + +,
	13-2Wh V.	cleary silt	some v. fine	sand, saturally
Analysis:	_l Observations / N	OTES '		
TCL Volutiles	Headspace re	ading of i	ppm w/ovA	•
TPH	<u>-</u> !	•	• •	
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	7			
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	Lab	אט א		
	Volume	1 6" liver,	142	
		Ser	` `	



SAMPLE LOG SHEET

COPPORATION			Page	c i 1
	Surface Soii Subsurface Soii Sediment			
			Case ≠ NA	
	Lagocn	/Pond	EY NUS	Con
	Cther_			(
Project Site Name Ellington Field	Sile Turestication	Praiect Site N.	umber 7/7km	
NUS Source No. DZ -STX 7A - A	Sour	ce Location 3.	ing for WW. 07	POL
Sample Sample Method:	1		te Sample Data	
Duersized Solit Spon Sombler	Sample	Time	Color / Desc	ristion
Depth Sampled:				
0-2				
Sample Date & Time:		1		
1-17-90/945 Sampled By:	1			
D. Urtherone / L. Basilio			1	
Signaturals				_
				
Type of Sample		1		
Low Concentration High Concentration		<u> </u>	<u> </u>	 -
☑ Grap		Same	le Data	
☐ Composite ☐ Grap - Composite		iption: (Sand, Clay	, Dry, Maist, Wet, etc.)	
		lag, soft, w	ist	_
Analysis:	Observations/ N	otës . /		
TCC Volatiles TPH	Routs and	iven hodule	·) *	
	<u>-</u> 			
	i			
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	1			
	1			
				1
	Lab	איא		
	Volume	1 6" liver,	1907	
		-		

	_		-3Ge	s: <u> </u>
	Surface		Can = 411	
	Segimei Suosuri	ace Soii	Case ≠ NA	
			BY NUS C	• • •
	Cther	7. 2116	o, 100 10	
				•
Project Site Name Ellington Field	The Twentinte	Project Site Nu	miner 7/744	
NIIS SQUEEN NO. 22 - CD 4713-A	30009 (1990)	es Location D	14411	-7/1
NUS Source No. 02-58678-A	30010	e cocation 150.	ing for MU-07, 1	PPOL
Sample Method:		Composit	e Sample Data	
Duersized Slit Spor Sampler	Samoie	Time	Caior / Descri	otion
Depth Sampled:				
8-10'		i		
Sample Date & Time:	<u> </u>	i		
1-12-90/1010				
Sampled By:	<u>'</u>	 		-
D. Urtherove / L. Basilio	<u> </u>	<u>. </u>		-
5. Odming (C. Day: 110	1			
Signaturals):	<u> </u>	<u> </u>		•
10. 9/	!	1		•
Type of Sample		1		•
Law Concentration	}	<u> </u>		•
High Concentration Grap				•
Composite			ie Data	•
Grap - Composite	Color Descri	ption: (Sand, Cay,	Dry, Moist, Wet, etc.)	
		lay, med 5	iff to stiff	
Analysis:	Observations / N	otes		
TCL Volatiles	I Took hodule	5		
TPH	1			
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		<u> </u>		
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		<u> </u>		
				
		<u> </u>		
		l al aic		
	Lab	hus		
		l b" liner,		
	Volume	11 6" liker,	(4 07	
		المحا		

SAMPLE LOG SHEET

SOILS

	Surrac	ta Scri	Casa - 111		
		rface Soii	Case = NA		
	Sediment Lagoon / Pond		By NUS Con		
	Cther		100	<u> </u>	
			·		
Project Site Name Ellington Field	The Truestist	2. Project Site Nur	nicer 3/3MA		
NUS Source No. DZ - 5007C-A	do:	ure location B	for WW.07 P	41	
Sample		ince forstion havi	- too MM-01	00	
Sample Method:	ĺ	Composite	Sample Data	-	
Duersized Solit Spoon Sampler	Samp:e	Time	Calar / Description	10	
Depth Sampled:	1				
16-18					
Sample Date & Time:	<u> </u>				
1-17-90/1050					
Sampled By:	<u>'</u>				
					
D. U. H. egrove / L. Basilio	<u> </u>				
Signatura(s):					
N. 17	<u> </u>				
Type of Sample	ļ	1			
Low Concentration		_!!_			
High Concentration					
Gran Composite	Sample Data				
Grap - Composite	Color Des	erigtion: (Sand, Cay,			
	Bown 9004	Claser silt, 5	intura ted		
Analysis:	Observations:	Notes 1			
TCL Volatiles	1				
TCL BNAS	1				
TPH	-				
	1				
	1				
	j				
·	i				
	1				
 					
					
	1				
					
		1014/			
	Lab	has			
		1/4			
	Volume	1 6" liver, 1	400	I	
		1,60, 1 16 07	1901		

NUS SAMPLE LOG SHEET

SOILS

COPPORATION			=3ge(cf	1		
	Surface	Scii				
		aca Soii	Case = NA			
	☐ Sedime ☐ Lagoon		By NUS COUP			
	Cther	7 Fanc	-4 1002 1003			
			`			
Project Site Name Ellington Field	She True to to	Project Site Num	noe 3/31. 4			
NUS Source No. 02-51808 A-A	dans	Si raicer site inditi	26: 363W			
Sample 02.91808 R-17	, Jour	te tocation bean	for MW.02, POL			
Sample Method:		Composite S	amole Data			
Duersized Slit Spoon Sampler	Sample	Time	Color / Description			
Depth Sampled:	1					
0-3						
Sample Date & Time:	1	i i				
13.40/945						
Sampied By:	 					
D. Urthegrove / L. Basino						
Signatura si:						
Type of Sample	<u> </u>	 				
Low Concentration		<u>'</u>				
High Concentration						
Gran		<u> </u>	2			
Composite	Sample Data Color Description: (Sang, Clay, Dry, Moist, Wet, etc.)					
Grab - Composite		Clay, soft me				
1			311 7			
Analysis:	Observations / N	otes"	. Ь			
TCC Volatiles	Ivon staini	ng and nodule	is, voils			
LYIt	<u> </u>	•				
	<u>}</u>					
	!					
	1					
	}					
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	Lab	אחל				
	Valume	z y oz jans		-		
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NUS

SAMPLE LOG SHEET

			rage	.c:	
	Surface		Case ≠ NA		
	Subsurface Soil Sediment Lagoon / Pond				
			Ey NUS C	· · ·	
	Cther_			l	
Project Site Name Ellington Field	She Twentinti	Project Site Nur	Tiper 7/744		
NUS Source No. 02-5808-A	Our Sour	ce Location B.	- for wwo or	POL	
74my Q			100 0000.05	(00	
Sample Method:			Sample Data		
Duensized Solit Spoon Sampler	Samo:e	Time	Calar / Descri	ation	
Depth Sampled: 8-10'					
Sample Date & Time:	1	<u> </u>			
1-13-90/1010					
Sampled By:)			-	
D. Uztlegone / L. Basilio				-	
Signaturals::		1		•	
N. 5/		1		•	
Type of Sample		1		•	
Low Concentration				•	
High Concentration Grap				•	
Composite	Sample Data				
Grap - Composite	Color Oescr	istion: (Sang, Clay,)	ory, Moist, Wet, esc.) iff to v. stiff;		
2	Rost & gray C	(44 SI(T) , ST	iff to v. intt,	man-strilling	
Analysis: TCL Volkfiles	Observations / N	otes		4	
TPI+	<u> </u>				
	<u>-</u>				
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	1				
	<u> </u>	,			
		<u> </u>			
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				•	
	Lab	צעאן			
		1 -			
	Valume	1 6" liver, 1	4 02	A	
	<u> </u>	lier			

SOILS

SAMPLE LOG SHEET

COPPORATION			;	Page (si 1
	Surface Soil Subsurface Soil Sediment				
			Case ≠ NA		
			By NUS Con		
	☐ Lagoon	/ Pond		y NUS (
	Cther_				(
Benjam Sing Nama Fills 1 Fell C	1.7.1.1.		· _ 4	١.	
Project Site Name Ellington Field S	on Re Insestigate	Spidlect zite Mr	iwser 28	3W	
NUS Source No. 07-5808C-A /07	-F003-A 900rd	te Location Bu	ving tou	Min-06"	POL
Sample Method:			e Sample		
Duersized Solit Spon Sampler	Sample	Time		pior / Descri	
Depth Sampled:				ייטויי הפזכנו	211011
16-20					
Sample Date & Time:	<u>' </u>				
1-13-40/1045	<u> </u>	<u> </u>			-
Sampled By:	ļ				_
D. Uzthegrove / L. Basilio	 				_
Signaturets					_
10.24					_
ype of Sample					_
Low Concentration					
High Concentration					-
 Gran		Samo	ie Data		-
Composite Grap - Composite	Caiar Descri	stion: (Sang. Clay,		Wet, etc.)	-
Gian - Composite	Brown Cla	ices silt &	v fin	e sand,	wet
Analysis:	Observations: N			·······	•
TCL Volatiles	Iron stain	in 1 come co	2len: - (a)	al: deted	condition !
TCL DUAS	& silt stone	7			man of the
Tell	4 5111 11-00				
					
			İ		
		<u> </u>			
	Lab	לט א	j		
	Volume	2 6" line-s	2400		
		Ja-5, 2 16	or jass		



SOILS

COPPORATION				_cf
	Surface Soil Subsurface Soil		Case ≠ NA	
	Secime		Case a NA	
	Lagoon/Pond		EY NOS	
	Cther_			
51 (51	C1 - 1. 1.		4-	
Project Site Name Ellington Field				
NUS Source No. DZ. SBOG A-A		ce Location Buri	-4 for MW-09	POL
Sample Method:		Composite	Sample Data	
Oversized Slit Span Sample	Sample	Time	Calar / Desc	ription
Depth Sampled:				
5-0				
Sample Dațe & Time:		1		
1-15-90/1030		! !		
Sampled By:				
D. Uzthegone / L. Basilio				
Signaturals): 1		<u> </u>		_
1				
Type of Sample		1		
Low Concentration		!		_
High Concentration Grap			. 0	_
Camposite	Sample Data Color Description: (Sand, Clay, Dry, Moist, Wet, etc.)			
Grap - Composite	Dank aven	Classic card <	tiff, iron stain.	a of modul :
Anaivsis:	Observations: N		7 (0 (1)	_7 -7
TCL Volatiles				
TPH		•		•
				
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· · · · · · · · · · · · · · · · · · ·				
				
				
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	Lab	לחל	i	
	Valume	1 6" liv-, 1	402	
		jan		
	the state of the s			

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	Surface Soil		ے.	353 ÷ 11A	
	Subsurface Soil Segiment		C.	ase = NA	
	Lagoon/Pond		3,	NUS Con	
	Cther		•	1 0 0 0	
				•	
Project Site Name Ellington Field	She Twentint	Project Site N	umber 7/-	7140	
NUS SOUTH NO PROCESTE -A	3012	e Location P	- a'	1441 Dal	
NUS Source No. 02-500915-A		e cocanon Da	ring tor	MW-09, PUL	
Sample Method:		Camposi	ite Sample D	ata	
Duersized Solit Spoon Sampler	Sample	Time		or / Description	
Depth Sampled:	1				
9-11		1			
Sample Date & Time:	İ				
1-15-90/100		<u>'</u>	 		
Sampled By:	<u> </u>	<u> </u>	1		
D. Uztlegrove / L. Basilio		1	1		
	1	1	1		
Signatureis			!		
10, 14			!		
Type of Sample		<u> </u>	1		
Low Concentration					
High Concentration					
☑ Grab ☐ Composite		Sam	cie Data		
Grap - Composite	Rost & gray Silty Clay, Soft to U. Stiff				
	Rost & gray Si	the Clau.	soft to	u. stift	
Analysis:	Observations / N	otes			
TCL Volities	Iron stainin		(CHANGE IA	ute-	
TPH		7	C=0+3	मा ः	
	1				
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	Lab	PUS			
	Volume	1 6" liver	1407		
		16-			
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COPPORATION			Pag	e c:	
	Surface Soil Subsurface Soil Sediment Lagoon / Pond Other		Case # NA By NUS Coop		
			sy _.	MOS COUP	
Project Size Name Ellington Field S	ike Investigation	a ^p roject Site No	umber <u>363</u>	m	
NUS SOUTE NO. 07 . 5809 C- A	9auro	s Pocstiou 🚰	in the	ulu-09 POL	
Sample Method:		Camposi	te Samble Da	ita	
Duersized Stit Span Sampler	Sample	Time		r / Description	
Depth Sampled:					
21-23					
Sample Date & Time:					
1-15-90/1300 Sambled By:	1				
D. Uztlegrove / L. Basilio					
Signaturals):	1	<u>'</u>	<u> </u>		
Type of Sample					
Low Concentration					
High Concentration					
☑ Grab □ Composite		Samo	ne Data		
Grab - Composite	Color Descri	ction: (Sand, Clay	, Dry, Maist, W	et, etc.) / / +	
			y v. tin	e sand, saturates	
Analysis:	Observations / No		•		
TCL Volatiles TCL BNAS	Iron stains	Ø			
TPH	1				
I L. L. L. L. L. L. L. L. L. L. L. L. L.	•				
	i				
·					
	Lab	Nus			
	Volume	169 liler, Jar. 166	1 407		

CFPG-AIGN			-3ge cf				
		ace Soii urface Soii	Case ≠ NA				
	Seci		Case ii OV				
	🔲 Lago	ion/Pand	By NUS Corp				
	☐ Cthe						
and the state of t	11017 1	l					
Project Site Name Ellington Fiel	a site lusesting	The Marcalett Site Nui	mber 363W				
NUS Source No. 02-5810 A-A	102-1004-A 90	ource Location	y for MU-10, POL				
Sample Method:		Composite	Sample Data				
Durrized Slit Spon Sound	e Sample	Time	Calar / Description				
Depth Sampled:							
8-10							
Sample Date & Time:							
1-16-96/940							
Sampled By:							
D. Uzthegrove / L. Basilio							
Signaturalsi		1					
A. A.							
Type of Sample							
Low Concentration			·				
High Concentration Grap							
Composite		Sample Data					
Grap - Composite	Color Description: (Sand. Clay, Dry, Moist, Wet, etc.)						
· ·	Rust & gree	lay stiff to	v. sfift.				
Anaivsis:	Observations	/ Notes					
TCL Volatiles	lun ste	ning, hydrocal	en oder, headspace				
TCL BNAS	- recding	of '22' 7pm	un odor, headspace ul OVA: 204-A (field dop) Herval				
794	- VDA	ion for di. Fl	204-A (fretd dop)				
	- collected	in 10-12' 16	tenal				
		•					
							
(Lab	hus					
		1.					
	Volume	3 6" livers,	2400				
		Jes, 2 4 0	7 3605				



SAMPLE LOG SHEET

23ge ____c: ___

	Surface Soil Subsurface Soil Sediment Lagoon / Pond Cther			Case # NA Ey NUS ()
Project Site Name Ellington Field	Sike Investigation	Project Site	Number 3	13m
NUS Source No. 22. SBYAB-A	Source	e Location (Boring to	Mb. 10, 20-22 POL
Sample Method:	1			
Duersized Split Spoon Sampler	Sample	Time	isite Samoi	Lolor / Description
Depth Sampled:	1		' 	raioi / Describtion
70-72'				
Sample Date & Time:			1	
1-16-90/1015			1	
Sambied By:			l	
D. U>Hierard / L. Basilio		1		
Signature(s)				
Type of Sample	1		1	
☑ Low Concentration			1	
High Concentration			1	
Gran		Sar	ncie Data	
☐ Composite ☐ Grab - Composite	Calar Descri	etion: (Sand, C	lay, Ory, Mois	t, Wet. etc.)
	Brown Cla	egen v. f	the sand	and silt, saturate
Analysis:	Observations: N	otes V		•
TCL Voletiles	Headspace v	ecding of	2 7 P	~ U/ OVA
TPH	1	٧	1,	, .
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	Lab	has		
	Valume	1 6" (ila	1 402	

SOILS SAMPLE LOG SHEET

COPPORATION				Page(c i 1	
	Z Surface	Scri				
		aca Soii	Case # NA			
	Secime:		By NUS CON			
	Lagoon	/ Ponc		EA MOS	**	
	☐ Other_				(
Benjams: - Nama Elle 1 Eall C	17.66	2	_	. 1.		
Project Site Name Ellington Field	Ne jures Trade.	Accolect 2168 M	nwaer 3			
NUS Source No. 01-5501. A	your	e Location V	stern 1/	3 of la	44:11	
Sample Method: Steinless Steel Son	Y	Composi	te Samoie	Data		
Durgiced Cit Sales Couly	Sample	Time		Color / Desc		
Depth Sampled:	01-5501A-A	915				
0.6"	01-550178-4	930	CN LOOK	4	and silly	
Sample Date & Time:	01-501 C-A	940	Clar	elected		
1-17-90/940	D1-1701 C-17	7 (0	15 10 0 10 1 10 10 10 10 10 10 10 10 10 10		al enderce	
Sampled By:				1 material	<u>L</u> tresh	
D. Urtherough/L. Basilio) 	lvolble,	etc)		
	<u>} </u>		<u> </u>			
Signature(s):/			<u> </u>		-	
A. 5/17	<u> </u>		!			
Type of Sample			1		<u>-</u>	
Low Concentration			<u> </u>		-	
High Concentration					<u> </u>	
Grad Composite		Samt	sie Data		_	
Grab - Composite	Color Descri	otion: (Sand, Ca)	, Dry, Mais	t. Wet, etc.)	_	
Anaivsis:	Observations / No	otes				
TCL BNAS	See above;	lace from n	ited:	امارا	, k	
TCL Pasticides			,	~ (m)	-	
TE TPH						
TAL Thorsaics						
						
			<u>'</u>			
		<u>'</u>				
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	Lab	hus				
		4 24	/			
	Volume	jer jer	1 16 0			
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SUILS



SAMPLE LOG SHEET

COPPORATION			;	;366	cf
	Surface				
	Subsurfi Sedimer		(ase ≠ NA	
	Lagoon		5	y NUS C	· · ·
	Cther_			***********	-
			,		
Project Site Name Ellington Field					
NUS Source No. 01-5582-A	Source	e Location 🙋	ntex /4	of lan	<u>16:11</u>
Sample Method: Shinless Steel Sport		Composi	te Samoie	Data	
Sample Method: Shinlers Steel Sport	Sample	Time		oior / Descri	ation
Depth Sampled:	01-5502A-A	945		Ju & te.	Shedi
0-6	0+550ZB-A	155	与公下	clas, co	llected
Sample Date & Time:	01-5502C-A	1005	In a-ck		sufici-1
1-17-90/1005			avider		
Sampled By:			luxtes:al		•
D. Uzthegowe / L. Basilio			<u> </u>		•
Signaturals):			 		•
Δ.			<u> </u>		
Type of Sample			<u> </u>		•
✓ Low Concentration ☐ High Concentration					•
Grap Grap		<u> </u>	1 2 2 2 2 2 2		•
Cemposite	Calas I Sees	stion: (Sand, Ca	ole Data	14/05 050	•
Grap - Composite	Color Descri	edon. (Janu, Ca	y, 21 y, 141015t.	1460 2001	
Anaivsis:	Observations: No	otes			•
TCL BYAS	Observations: No See above l	outions n	oted in	lectock	
TCL Pesticides			•	1	
TP4					
TAL Thorquics					
,					
					
	<u></u>				
		<u> </u>			
			f		
	Lab	HUS			
	Volume	1402 jan,	116 00		
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SAMPLE LOG SHEET

SOILS

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	Surrace		_	
	Subsuri		Case =	S Coup
	☐ Secime		2 . 410	
	☐ Lagoon	1/Pond	39 <u>00</u>	5 (04)
	☐ Other_			(
Samia - Standard Talle 1 Feel 1	.1 7 1. 1.			
Project Site Name Ellington Field	site lucestrate	Rucalect Site V	lumber 363M	
NUS Source No. 2701 5503-A 10	1- FDOS-A Sour	ce Location 💆	stern 1/3 0	f landfill
Committee Ship last Steel Com	7			
Sample Method: States Steel Sport			ite Sampie Data	
	Sample	Time		Description
Depth Sampied:	01-8503A.V	1 (010	Callected in	ecation of
6-6"	D1-55038-A	1020	Loust down	t rulle, one
Sample Date & Time:	01-55036-14	1070	Rocation who	in water roots
1-17-90/10:30			Idvin lean	
Sampled By:		1		a Tun
D. Urtherone / L. Basilio			Coincident	4/6
Signature(s):	1	1	1 1 1 1 1 1 1 1	4. 1
				ench in
Type of Sample	<u>' </u>	<u> </u>	lold aerial 7	holds.
			 	
Low Concentration				
High Concentration Grap		<u> </u>	<u> </u>	
☐ Composite			pie Data	
Grab - Composite	Color Descri	iption: (Sand, Ca	iy, Dry, Maist, Wet, e	etc.)
	1			
Anaivsis:	Observations / N	otes ,	oted in ligh	
TCL TONAS	See alove;	locations u	oted in lack	aple
tcc Restides		, -	7	
TEL TPH	<u>.</u> }			
TAL Impravies	1			
THE TRANSPORES	!			
	4			
<u>, </u>	-			
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	Lab	11/15		
		KUS	1	
	1404	3 4	× 2 1/	
	Volume	2402 360	>,	



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						-age G: _	
				Well Data ell Data	Case · NA		
		C Othe		en uata			
						By NUS Com	
Project Site Name E	Ilington Field	SI	F	Project Site	Number '	367m CA	
NUS Saurce No. M	W-W				_	Base Loudfill	
	31.7		· ————				
otal Well Depth: 🤊					ge Oata		
Well Casing Size & D		Valume	OH			IDO Color & Turbidity	
7", vell set @			6.70	11500 1		23.4	
tatic Water Levei:			6.75	1260	17.9	20.1	
One Casing Volume			<u> </u>	! !			
itart Purge (hrs.): 9			<u> </u>				
nd Purge (hrs.): 10			<u> </u>	<u> </u>			
fotal Purge Time (m			ı	1		l	
Total Amount Purge	ea (azi.): 2577		l				
Monitor Reading:	٨		1	1 1		1	
urge Method: \$5	لم: اور		<u></u>				
iample Method: 5			<u></u>	<u> </u>		<u>. </u>	
Depth Sampled: T			<u> </u>				
ample Date & Time				Sa	moie Data		
1/25/40	1015	oH !	S.C.		10. (°C)	Po Calar & Turbiaity	
iampled By:		1					
D. Urthegrave	L. Besilio		250	18.	<u> </u>	17.3 Clear	
iignature(s)		Observation					
X1		Sample .	data	was cale	cted att	lection. completed	
10. 4		land' 7	~;~	to san	ash col	lection.	
ype of Sar	npie			(-	1	•	
Z Law Concentr	ation	Ì					
High Concent	ration						
☑ Grab							
☐ Composite☐ Grab - Compo	site						
Analysis:	Preservative				anic	ingrganic	
ICL VOAS	HCL	Traffic 4000	r e	UA		MA	
tci Buas		Tag #	R	- /A		lky.	
TCL Pesticides		<u> </u>					
TPH		AS 0		NA		IVA	
TM Theraphics	1 1. tv: co	Oate Shippe	•	VΑ		IM	
		Time Shippe	Hd.	MA		NY	
		LAB		MS		hus	
		Vetume		7 40 ml	vials	(1)=-	
		<u> </u>		- (



					Page	af			
	☐ Othe		i uata		NA				
	By NUS Corp								
Project Site Name Ellington Field ST Project Site Number 363h CA									
MW-DZ	·	Source L	ocation .	Former	Base	Leadfill			
Total Well Degth: 30.1	81		Pu	rge Oata					
Well Casing Size & Depth: 285'	Volume	DH			O DO CO	ior & Turbidity			
z", set well 0 + 25- ou		6.90	640		118.0				
Static Water Level: 70.66	1 3	6.901	640	20.4	16.0				
One Casing Volume: 5.57 5.70	-	1			1				
Start Purge (hrs.): 1140 5-41					1				
End Purge (hrs.): 1240		<u> </u>							
Total Purge Time (min.): 60					l .				
Total Amount Purged (gal.): 27	1			1	1				
Monitor Reading:		1			1				
HNU O, OVA O		1		<u> </u>					
Purge Method: 55 Lailer	1	1							
Sample Method: 55 Lailer		1		<u> </u>					
Depth Sampled: Ton of UKG-									
Sample Date & Time:			Sa	mole Dat	2				
1/25/90 1240	oH 1	S.C.	Ter	no. (°C) 🕽	01 cc	olar & Turbidity			
Sampled By: D. Usthermore L. Berilio	690	630	70.	0 20.	4 Clac	,			
Signature(s);	Observation	ns/Note	:5:						
814	Samle	date o	ollected	after	your it	g complete			
1. 1 9			L exu	unle c	elletta				
Type of Sample	7 440		10	7	,				
Low Concentration									
High Concentration	1								
☑ Grab	- (
☐ Composite ☐ Grab - Composite	}								
C Grab - Composite									
Analysis: Preservative				garuc		יחפוקאחוכ			
TCL VOAS IHCL	Traffic 4000	or a	/ A		NY.				
TCL BNAS 1	Tag #	1	/		WA				
TCL Posticious 1									
TPH	AS 0		<u> </u>		NA				
TAL Empanies Witric	Date Shread		<u>'</u>		124				
	Time Shippe		/		I NA				
		الم	u S		hus				
	Velume	13	10 m	l vial	11:	te			
		• •			•				



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		g Well Data	Case . NA
	☐ Other	11611 0414	
			By NUS Com
Project Site Name Ellington Fiel	d st	Project Site Numb	er 367m
NUS Source No. MW-0/3	Saur	ce Location Forme	- Base Landfill
Feer Well Boson C . 3	 	2	
Total Well Depth: (S. 0 3) Well Casing Size & Depth:	Volume I as	Purge Dat	(°C) DO Calar & Turbidity
2" 2 well set @:23.5"	Volume or		
Static Water Level: (1.87 9.6)	7 7.		
One Casing Volume: 8,47 1/45		1 1	
Start Purge (hrs.): (355 V	i	1 1	
End Purge (hrs.): 1460	i	1 1	1
Total Purge Time (min.): 55	ı	1 1	1
Total Amount Purged (gal.): 77	ı		1
Monitor Reading:		1	1
HNU o, out o		Ī	
Purge Method: 55 Baller	<u> </u>		
Sample Method: SS Bailo-			
Depth Sampled: Top of Water			
Sample,Date & Time:		Sample 0	
1/27/90 1450	DH S.C.	Tema. (°€)	DOI Color & Turbiaity
Samoied By: D. Uptlegrove L. Pacilio	7.05 625	75.5	24.8 Clear, v. slightly tulid
Signature(sit)	Observations / N	lotes:	<u>`</u>
3100	Senda del	ince collector	d the sure in analoted
W. 14-1-	Sample Mate	a was collecti	d after jurging completed dection
Type of Sample	and zoios	to sample c	aluction
Low Concentration	,	·	
High Concentration			
□ Grab	Į.		
☑ Composite			
☐ Grab - Composite			
Analysis: Preservative		Organic	inarganic
TCL VOAC IHCL	Traffic Report #	Į V A	INA
TCC BULL 1	Tag ø	WA	INA
TCL Pesticides			
784	A8 0	I MA	INA.
THE Ingenier Nitre	Cate Shipped	MA	INA
	Time Shieses	NA	NA
	Lis	MS	LAn Z
	<u> </u>	1	s. (liter
	Valume	3 40 ml vist	1 1,700
•		- >:\	



			ing Well Data c'Well Data	1	Page 1 of 1 Case • NA By NUS Coup		
Project Site Name	Ellinaton Field	1 SI	Project Sit	e Number	363m CA		
NUS Source No. W	W-04 26.72		arce Location		Bace Landfill		
Total Well Depth:			Pt	irge Oata			
Well Casing Size & I		Valume I	H S.C.		100 Color & Turbidity		
2", well set a	1 t 75'	1 8.	59 1 1100		1(2.8		
Static Water Level:	15.97 LTOC	7 18.	10 1 1050	1 77.0	162		
One Casing Volume	: 5:13/96 S	1		1			
Start Purge (hrs.):	120 1:01	<u> </u>	1	1	1		
End Purge (hrs.): 1	015	1		1			
Total Purge Time (n		1			ŧ		
Total Amount Puro	ea (aai.): ZZ	İ		1			
Monitor Reading: HNU 0, OVA	D			1	1		
Purge Method: 5.5		1		1			
Sample Method: 5.5		i		T -			
Depth Sampled: Ta							
Sample Date & Time			S	ampie Oata			
1/23/90	1015	DH 5.0	Ter	mp. (°C) DO	Color & Turbigity		
Samoled, By: D. Unthervove	L Barilio	8.17 105			clear, v. slightly fulid		
Type of Sa Type of Sa Low Concents High Concent Grab Composite Grab - Compo	ration tration	Observations/ Sample date and prime	Notes: q whs Cd - fo san	lected af	ter yoursing completed		
Analysis:	Preservative			Sure	inorganic		
TCL VOAS	IHCC	Traffic 4 egort #	L/A		NA AN		
TCI BMAS		Tag #	MA		MA.		
TCL Posticidos	!				IVA		
TH	1	AR #	NA NA				
TAL Inorganies	IVitvi c	Care Shiened	INA		IVA		
•		Time Shieses	IVA				
		Lue	hns		hnz		
		Valume	3 40 m	l vials,	1 lifer		



						Pageaf _
			nng V			
		Cther	75 146	II U4t2		Case o NA
						By NOS Can
Project Site Name	FILL L. F.A.	1 7				\
NUS Source No. M	all of		Pr	oject Sit	e Number	363m CA
	10.03	×	urce (nou rs o.	To-men	Base Landfill
Total Well Depth:	30.63 30.68			Pt	irge Oata	
Well Casing Size &	Depth:	Volume 1	он			C11 Do Calar & Turbidity
Z", set well a		1 1	5.70		121.6	123.0
Static Water Level:		1716	5.70	660	121.7	24.9
One Casing Volum		1			1	
Start Purge (hrs.):		1				
End Purge (hrs.): (1			1	
Total Purge Time (1	
Total Amount Purc	rea (qai.): (5	1				
Monitor Reading:					1	
HUU O, OVA	0	<u> </u>				
Purae Method: 55		<u> </u>			<u> </u>	
Sample Method: 5		!			<u> </u>	
Depth Sampled: Ta		!				
Sample Date & Tim	4				amble Dati	
1/25/90	1600	DH 5.0	<u> </u>	Ter	πο. (°C) δ	Ol Color & Turbidity
Samorea By: D. Upthegrove	L Resilio	6.70 66	0	71	.o 26.5	Clear
Signature(#):		Observations.	Note	s:		
X. 21	· >	Sample d	AZ	collecte	ed alter	- purging complete
Will		المناحد المام	- +		الم حال	The state of
Type of Sa		1000	(0	- SAM	pu con	Zalan
Low Concent					•	
☐ High Concent ☑ Grab	ration					
Composite						
Grab - Compo	site					
A						
Analysis:	Preservative				auic .	inorganic
	HCL	Traffic Report #				NA
TCL PUAC	!	rag #	W/	-		NA
TCL Pesticious	1					-
AL Tenganics	11/12:	A8 ¢	12/			INA
AL Insquice	17170.6	Date Shipped	M			INA I
·		Time Shieged	N/			INA IM S
		Lia	יאן	25		ا × سما ا
	<u>'</u>	Valume	+-	ا مدا	viale	1 liter
	<u>'</u>	431WH4	٦	acic	vials,	11 liter



						Page	L of /				
		Monitoring Well Data Case • NA									
		U Dom									
		By NUS Corp									
Seniore Cien Alama											
Project Site Name_NUS Source No. MI		Source Location POL Storage Aveg									
	27.9L		. Saure	e rocation	POC S	prace un	44				
Total Well Depth:				Pu	rge Oata						
Weil Casing Size & C		Volume	OH	S.C.	Temo. (°	CIDO Color	& Turbidity				
Z" well set	@ 178	(16.90		24.5	16.1					
Static Water Level:	11.27	て	1 6.87	1750	73.4	14.9					
One Casing Volume			l		1						
Start Purge (hrs.): (545 12:10				t	1					
End Purge (hrs.): 1			1		!	ì					
Total Purge Time (n	11n.): 60		<u> </u>		!	<u> </u>					
Total Amount Purg	ea (gai.): 37		1			1					
Monitor Reading:	7		1	<u> </u>	1	!					
Purae Methoa: 5,5			<u> </u>		1						
Sample Method: 5.5			<u> </u>	_	1	<u>'</u>					
Death Sampled: To-		! 	<u>'</u>		<u> </u>	 _					
Sample Date & Time					ampie Oa	t a					
	150	oH S.C. Temp. (°C) DO Color & Turbidity									
Sampled By:											
D. Upthegrove	L. Basilio	6.25	1750	7:	3.6 17	1.3 [4 6000	n, turlid				
Signature(3):		Observation	ans / No	otes:		_					
511/		Sangle	date	collected	d after	purging	completed				
J. Age	>	and =	vi, or	to so	nole	whechish	,				
Type of Sai		1		, -	l	•					
☑ Low Concents		Ţ									
☐ High Concent	ration										
☐ Composite											
☐ Grab - Compo	site										
Anaivsis:	Preservative			Ore	ganic		narganic				
TCL VOAS	IHCL	Traffic 4000	nr #	NA		NA					
ICE BUAS		Tag #		44		PA.					
1711		† .		[· · · · · · · · · · · · · · · · · · ·							
		AS .		MA		NA					
		Oate Shippe	Nd	N		MA					
		Time Shippe	rd	NA		INA					
		400		hus		NA					
	1	1		2 40 ml	vie (I VA					
	1	Valume		2 9415	-1-12/	P4					



						Page c: _					
			toring V istic We	Vell Data	s						
			Case o NA								
		Other By NUS Co-P									
	ed. 1 To 1					,					
Project Site Name_	llibaton tiel			-		367m CA					
NUS Source No. M	W·018		Source	Location	POL St.	wage Area					
	eil Depth: 26.90 LTOC Purge Data										
Well Casing Size & C		Volume I	σΗ			IDO Color & Turbidity					
Z" well set a		Volume	7.10	1200		120.1					
		7			24.4	7.5					
Static Water Levei:	93320		7.05	1500	21.	55.5 × ×					
One Casing Volume		<u> </u>		 	!						
Start Purge (hrs.): 1				 							
End Purge (hrs.): 1				<u> </u>							
Total Purge Time (m		<u> </u>		!	!	1					
Total Amount Pura	ea (gal.): 30			<u> </u>							
Mogisor Reading:				<u> </u>							
HUBU O, OVA	70	1		1	1	1					
Purae Method: 5.5	. Bailer				1						
Sample Method:	14			I	1						
Death Sampled: To	p of H ₂ O										
Sample Date & Time		Sample Data									
	30	рΗ	S.C.	Color & Turbidity							
Samuel Bu											
D. Upthenove/	L. Besilio	7.00 1200 24.4 22.2 Turkid, It. brown									
Signature(s):		Observatio	ns/Nat	es:	•	DIU					
$\mathcal{C}_{\Delta}I$		Samole	data	collecte	d after	anple collection					
X LA		Com de la	1 64	A:	er La c	anala collection					
Type of Sa	maie	Company	J. 4.	V. [V.	(0)	201011					
Low Concents		}									
☐ High Concent		}									
Grab		l				1					
☐ Composite		İ									
Grab - Compo	site	1				!					
A 0.01	i Gamana a a a a a a a a a a a a a a a a a			Cer	ganic	inorganic					
Analysis:	Preservative	Panttin Gara		7	7	PA					
Y-0/\	1	Traffic Pego	FT # 1	- / 7							
TCL VDAS	IHCL	rag #	1	MA		MA					
TCL BMAS	<u> </u>					NY					
T PH	!	A8 #		NA .		VA					
		Date Shidge		NA		PA PA					
		Time Shippe	4	PA							
		Lia	1	hus		PUS NA					
		Valume		2 40 44	viels,	MA					
		1		z gals		11.4					



			Case · NA								
	Cother	IASII NATA									
			ay NUS Corp								
Project Site Name Eliter	Field ST	ST Project Site Number 3634 CA									
NUS Source No. MW-04	Saur	ce Location Pol Sta	rege Aveg								
38.44											
Total Well Depth 24.47-		Purde Data									
Well Casing Size & Depth:	, Volume I of		11 DO Color & Turbidity								
7", set well @ + 33		11200 1 23.3	117.9								
Static Water Level: 17.05	171	11150123.3	(\$.7								
One Casing Volume: (2.28)											
3.41 C. G. G. C. (1113.7. (70	10										
End Purae (hrs.): 1045			<u> </u>								
Total Purge Time (min.): 15			1								
Total Amount Purged (gal.):	31 1										
Monitor Reading:	1		l								
OVA 45, HNU 5	1		1								
Purge Method: SS Lailer	1										
Sample Method: 55 hailer											
Death Sampled: Top of a	xler										
Sample Date & Time:		Sample Oata	ı								
1/24/90 1045	aH S.C.	Temp. (°C)	a Color & Turbidity								
Sampled By: D. Urthegrove L. Bes	1150 1150	73.3 17.3	3 Clear								
Signature(s):	Observations / N	intes:									
4 11 /	Canala data	Clarkad Clea	- meine constate								
(). UT-	Jamque das	to sample colle	Link compare								
Type of Sample	and prior	to simple colle	Sher								
	113	10 1	111 11								
Low Concentration High Concentration	pt meter	malfunctionging;	Author: zed, by								
Grab	HAZWPAP(S	. Goldlery) & tol	sample without.								
Composite		V	·								
☐ Grab - Composite											
Analysis: Preserva		Organic	ingratric								
TCL VIAS IHCL	Traffic fegges #	MA	INA								
TCL TOWAS	Tag #	INA	MA								
		pr	lhu.								
TPH	A8 ¢	PA	NA								
		NA	IVA								
	Cate Shipped	lux.	NA								
			IVA .								
		hns	1 1								
		2 40 ml vials	I NA								
	Valume	1- 1-16	INA								



	^			Page 1 of 1						
				Case · NA						
	☐ Other	C 1161	ii Uala							
					By NUS Comp					
Project Site Name Ellington Field	SI				363m CA					
NUS Source No. MW-18	Sar	urce L	noutson.	POL Sta	ness trea					
Total Well Depth: 34.69 ToC	Purge Data									
Weil Casing Size & Depthacy	Volume pH S.C. Temp. (°C) DO Color & Turbidity									
z", well set @ + 29 33.5'			1250	175.3	18.5					
Static Water Level: 18.76 6 TOC		.01		1 55.6	122.3					
One Casing Volume: 10.72 4 gals	1		1			- i				
Start Purge (hrs.): (330 12.202			1							
End Purge (hrs.): 1440	1		1	<u> </u>	İ					
Total Purge Time (min.): [:10			!		ı					
Total Amount Purged (gal.): 33	i		1		,					
Monitor Reading:	1		<u> </u>	<u> </u>		!				
HNO 0, OUR 22	1			<u> </u>	<u> </u>	!				
Purae Methoa: 55. Baile-	1		<u> </u>	1	<u> </u>	!				
Sample Method:	<u> </u>		}	<u> </u>						
Death Sampled: Top of Water										
Sample Date & Time:	Sample Oata									
1/27/90 1445 Sampled By:	DH S.C		Tema (°C) DOI Color & Turbia							
D. Upthegrove / L Berilio	7.11 12.	11 1200 75.7 Clear, v. slightly			Clear, v. slightly t	ulid				
Signaturets/f.	Observations	Note	es: , ,	. 1	20					
X 1	Sample de	ata .	collect	d after	sampling	}				
λι. σ	completed	al	d pu	ion to	sampling	}				
Type of Sample	1		ţ		1 1	ł				
Low Concentration						ŀ				
High Concentration Grab	<u>}</u>					ł				
Composite						}				
☐ Grab - Composite						1				
Analysis: Preservative	<u>. </u>	T	Q,	ganic	ingrganic	_				
ICL VOAS HELL	Traffic 4egort #		NA		INA					
TCL BUNG	Tag ø		_			7				
7PH 1	7 .	1	YA		MA					
	A8 #		UA		NA.					
	Date Shipped		JA		INA	'				
	Time Shipped		JA		NA					
	Lue		NnZ		NA					
İ	Vatume	127	40 W	· l vials,	N A					

WELL COMPLETION FORMS



FIELD WELL COMPLETION FORM		CHAISTY BOX	1
name: Ellington Field Site Inves	stigation	O LOCKING STEEL COV	1
PROJECT :	nda Steakley	STEEL CONDUCTOR CASING	A
EV: David Isturgrave EVITED	1		Ì
WELL MW-01	12-13-89	BOREHOLE	R
COMPANY: Custom Coving, Inc.			- 1
EQUIPMENT: 4.25 INCH HOLLOW STEM AUGE	HOWILLED SOU	BENTONITE CEMENT SEAL OR SEACK CEMENTSAN SEAL	- 1
GALLONS OF WATER	GALLONS	tofeet	
METHOD OF DECONTAMINATION	111:44	TOP OF CASING AT	
DEVELOPMENT See Well Developm	117	# Z FEET BOVE A	/FL
SEVELOPMENT:		3.25 INCH DIAMETE	
DEVELOPMENT BEGAN DATE: TIME:		BOREHOLE D:021.5 seet	
TIME: TO TO	DATE:	2 INCH DIAMET	ER
YIELD: TIME: GPM FROM TO	DATE:	SCHEDULE 40 PVC BLANK CASING	ļ
TIME: GPM FROM TO	DATE:	+2 to -16 feet	
YIELD: TIME: GPM FROM TO	DATE:	SEAL OR	1
TOTAL WATER REMOVED OURING DEVELOPMENT:	GALLONS	B-SACK CEMENT-SAN	0
DESCRIPTION _	LIGHTLY CLOUDY	<u>D</u> -0-10 teer	
AT END OF	ERY MUDDY	BENTONITE PELLET	
ODOR OF WATER:	211	20/40 grade 51	
WATER GROUND SURFACE TANK	- -	SAND PACK	€ → ,
TO: USTORM SEWERS USTOR	AGE TANK		
DEPTH TO WATER	FEET	Z INCH DIAMET	E
MATERIALS USED	PEET	16 10 76 1441	
		Z INCH DIAMET	·c &
5.5 SACKS OF 20/40 grade 51	ICGSAND	SCHEDULE 40 PVC BLANK SILT TRAP	EA
3 SACKS OF Type IT Po-Hand	CEMENT	- 26 to 78.5 leet	
-30 GALLONS OF GROUT USED		BOTTOM WELL CAP	
7.5 SACKS OF POWDERED BENTONITE		- <u>79</u> teet	
50 POUNDS OF BENTONITE PELLETS		HOLE CLEANED OU	T TO
77.5 FEET OF 7 INCH PVC BLANK CASIN	G	'***	-
10 FEET OF 7 INCH PVC SLOTTED SCRI	EEN	BOTTOM OF BOREH	OLE
VA YARO ³ CEMENT-SANO (REDI-MIX) ORDI	inso	NOT TO SCALE	
SACKS CEMENT-SAND (REDI-MIX) USED		ADDITIONAL INFORMATION:	
CONCRETE PUMPER USED? GNO TYES	•	AUGITIONAL INFORMATION.	
NAME NA			
WELL COVER USED: TOCKING STEEL COVER			
CHRISTY BOX			



FIELD WELL COMPLETION FORM			CHRISTY BOX
Hame: Filington Field Site Invest	higation		LOCKING STEEL COVER
NAME: [[Ington [: Eld], TE] INVEST HUMBER: 365 M MANAGER: L'IN	N	41-7	STEEL CONDUCTOR CASING
LOGGED Javid Lothegrape Soited	1		:0/set
WELL MW- 07	2-14- 94		- INCH DIAMETER
ORILLING A L C . T	1 2-14- 21		BOREHOLE
COUIPMENT: 11 5C	DRILLERY.		SENTONITE CEMENT
_	MOUSS	.	SEAL OR
ALLONS OF WATER	DRILLED: 7.75	11 1	1 11 SEAL
44THOD OF DECONTAMINATION .	GALLONS		
	1.14 a	1	TOP OF CASING AT
DEVELOPMENT See Well Developme	ut Form		BELOW GROUND LEVEL
ETHOD OF			8.25 INCH DIAMETER
DEVELOPMENT DEGAN DATE: YIME:			O :5-23-5 : err
TIME: GPM FROM TO	DATE:		Z INCH DIAMETER
GPM FROM TO	DATE:		SCHEDULE 40 PVC BLANK CASING
YIELD: TIME:	DATE:		D 10-15.5 'eet
GPM FROM TO	DATE:		SEAL OR
GPM FROM TO	!		6-SACK CEMENT-SAND
	GALLONS		0 · 0 11 1eer
T TURBIDITY CLEAR SLI	GHTLY CLOUDY		BENTONITE PELLET
	RY MUDDY		SEAL -13 'get
GGR OF ATER:			Zol40 grade 5. 11 ca
GROUND SURFACE TANK	- -		SANO PACK
GSTORM SEWERS STORM			2 NCH DIAMETER
EPTH TO WATER	FEET	. \ =	SLOTTED : 410
ATERIALS USED			15.5 .0 25.5 .get
	-	=	Z INCH DIAMETER
5 SACKS OF 20 40 grade 5:1.c	SANO		SCHEDULE 40 PVC BLANK SILT TRAP
3 SACKS OF Type IT Portland	CEMENT	1 1	25.5 to 28_teet
130 GALLONS OF GROUT USED		<u> </u>	SOTTOM WELL CAP
7.5 CAGNO OF POWDERED BENTONITE			78.5 leen
50 POUNDS OF BENTONITE PELLETS		-	HOLE CLEANED OUT TO
20 FEET OF Z INCH PVC BLANK CASING	•		(791
10 FEET OFINCH PVC SLOTTED SCREE	EN	<u> </u>	HOTTOM OF BOREHOLE
YARO ³ CEMENT-SANO (REDI-MIX) ORDEF	RED	NOT TO	SCALE
TARE CEMENT-SAND (REDI-MIX) USED		ACCITI	ONAL INFORMATION:
ONCRETE PUMPER USED? ONO OYES			
VELL COVER USED: GLOCKING STEEL COVER GCHRISTY BOX			



THE CONTROL TO DATE STREET OF THE STREET OF	FIELD WELL	COMPLETION FO	RM				CHRISTY BOX
STELL CONDUCTOR SAME SET TO STELL CONDUCTOR CASING SOFTED		I. Teal Col	a Times				C LOCKING STEEL COVER
STATE OF THE STATE			POJECT	N Clalla	· 4 -		STEEL CONDUCTOR
SACK CEMENT SACKS OF TO DATE: SET OF SACKS OF TO GROUND SURFACE TANK TRUCK STACKS OF			DITED	1	·		1 .
COMMANY OF THE COMMINENT OF THE COMMINEN		7,3,0000	· ·	DATE:		[- INCH DIAMETER
SENTONITE CEMENT SEAL OF SEAL	ORILLING A	73	-	117-14-67			I
SEAL OR STAND OF SACKS OF TO STORAGE TANK TRUCK STAND OF SACKS OF TO STAND OF STORAGE TANK STAND OF SACKS OF TO STAND OF STORAGE TANK STAND OF SACKS OF TO STAND OF SECOND				1000 15014			
ALLONS OF WATER ASER DURING DRILLING. GRALLONS TO GATE: GRALLONS TO GATE: GRALLONS TO GATE: GRALLONS TIME: C. :	₫-	1.25 INCH HOLLOW	STEM AUGER		. []	i !	SEAL OR
TOP OF CASING AT TOP OF			WASH	ONICTED: 5'52		i	SEAL
DEVELOPMENT See Nell Development Form SEVELOPMENT See Nell Development Form SEVELOPMENT SEED SORREST TIME. JESUS GPM FROM TO DATE: SEED GPM FROM T	SED DURING OR	ILLING: D		GALLONS			!:
DEVELOPMENT SETTION OF SETTION TO DATE: TIME: TI		SHTAMINATION STEE	in Clean	n.4 a	ı		
SEVELOPMENT EVELOPMENT EVELOPMENT EVELOPMENT EVELOPMENT FROM TO OATE: OBATE:	DEVELOPMENT			int Form			FEET ABOVE AT
TIME. TIME. OPTION			1				
TIELD: GPM FROM TO DATE: GPM FR	SEVELOPMENT				•	}	O - 51
SCHEDULE 40 PVC SCHEDU	IELD:	TIME		OATE:			<u> </u>
GPM FROM TO DATE: Time:				I OATE:		1	
GPM FROM TO SEAL OR	GPM	FROM TO	-]]	
SEAL OR SEAL OR SEAL CEMENT SA OTAL WATER REMOVED OTAL WATER REMOVED OTAL WATER REMOVED OTAL WATER REMOVED OTAL WATER REMOVED OTAL WATER REMOVED OTAL WATER REMOVED OTAL WATER REMOVED OTAL WATER SEAL CEMENT SA SEAL OR SEAL OR SEAL OR SEAL OR SEAL OR SEAL OR SEAL OR SEAL OR SEAL OR SEAL OR SEAL OR SEAL CEMENT SA SEAL OR SEAL	GPM	FROM TO				١١٦	
SEAL DO SERVICION SERVICION SEAL DO SE				DATE:			SEAL OR
SERTIVIOR TO PROPERTY: CLEAR	OTAL WATER RE	MOVED PMENT:		GALLONS			SEAL
SEAL STORMENT: MOD. TURBID VERY MUDDY SEAL STORMENT: MOD. TURBID VERY MUDDY SEAL STORM SEWERS STORAGE TANK SAND PACK STORM SEWERS STORAGE TANK SAND PACK SAND P		CLEAR	□ SLi	IGHTLY CLOUDY		:550	
TOTOM WELL CALL SARO P CEMENT-SAND IREDI-MIXI USED TOTOM SEVERS SAND PACK SAND SAND PACK SAND PACK SAND PACK SAND PACK SAND PACK SAND PACK SAND PACK SAND PACK SAND PACK SAND PACK SAND PACK SAND SAND PACK	T END OF	Ξ					
SAND PACK SAND PACK				-			5.5 :0 5.5 reet
STORM SEWERS STORAGE TANK DRUMS OTHER STORAGE TANK DRUMS OTHER SLOTTED: # 10 STORAGE TANK SLOTTED: # 10 STORAGE TANK SLOTTED: # 10 STORAGE TANK SLOTTED: # 10 STORAGE TANK SLOTTED: # 10 SCHEDULE 40 PVC BLANK SILIT TRAN SCHEDULE 40 PVC BLANK SILIT		Ocanino sucre				-	
DRUMS OTHER CEPTM TO WATER SLOTTED: # [O THE SCREEN] ATERIALS USED SACKS OF TO GOLD SILCS SAND SCHEDULE 40 PVC SLAMK SILT THAN SCHEDULE 40 PVC BLANK SILT THAN SCHEDULE 40 PVC BLANK SILT THAN SCHEDULE 40 PVC BLANK SILT THAN SCHEDULE 40 PVC BLANK SILT THAN SCHEDULE 40 PVC BLANK SILT THAN SOTTOM WELL CAI SOTTOM WELL CAI SOTTOM OF BORE THE TOP INCH PVC BLANK CASING OFEET OF INCH PVC BLANK CASING VARO CEMENT-SAND (REDI-MIX) ORDERED NOT TO SCALE ADDITIONAL INFORMATION:	DISCHARGED		=		, ,	=:	
SACKS OF TOTAL SILE THAT SACKS OF TOTAL SILE THAT SACKS OF TOTAL SILE THAT SACKS OF TOTAL SILE THAT SCHEDULE 40 PVC BLANK SILE THAT SCHEDULE 40 PVC BLANK SILE THAT SCHEDULE 40 PVC BLANK SILE THAT SCHEDULE 40 PVC BLANK SILE THAT SO GALLONS OF POWDERED BENTONITE SO POUNDS OF BENTONITE PELLETS TOTAL SILE THAT SO POUNDS OF BENTONITE PELLETS TOTAL SILE THAT SCHEDULE 40 PVC BLANK SILE THAT SCHEDULE		=		· -			- Z NCH DIAMETE
S.S. SACKS OF TO GOLDE SI CA SAND Z. INCH DIAME SCHEDULE 40 PVC BLANK SILT THAP SCHEDULE 40 PVC BLANK SILT THAP SOLES OF POWDERED BENTONITE SOLED POUNDS OF BENTONITE PELLETS TO FEET OF Z. INCH PVC BLANK CASING OF FEET OF Z. INCH PVC SLOTTED SCREEN YARD CEMENT-SAND IREDI-MIXI ORDERED ONTO TO SCALE ADDITIONAL INFORMATION:				FEET		=:	SLOTTED : # 10
SACKS OF TOP GOLD SILE SAND SCHEDULE 40 PVC BLANK SILT TRAP SACKS OF TYPE TOP CEMENT TO GALLONS OF GROUT USED SO POUNDS OF BENTONITE POUNDS OF BENTONITE PELLETS TO FEET OF T INCH PVC BLANK CASING OFFEET OF T INCH PVC SLOTTED SCREEN YARO CEMENT-SAND (REDI-MIX) ORDERED YARO CEMENT-SAND (REDI-MIX) USED SCHEDULE 40 PVC BLANK SILT TRAP CEMENT SAND SCHEDULE 40 PVC BLANK SILT TRAP ROTTOM WELL CAN ADDITIONAL INFORMATION:	AATERIALS US	ED			'		(0.5 .0 20.5 :4et
SACKS OF THE TOTAL CEMENT TO GALLONS OF GROUT USED SO POUNDS OF BENTONITE SO POUNDS OF BENTONITE PELLETS TEST OF TINCH PVC BLANK CASING OF FEET OF TINCH PVC SLOTTED SCREEN YARD CEMENT-SAND (REDI-MIX) ORDERED OF THE CONTROL OF SCREEN NOT TO SCALE ADDITIONAL INFORMATION:	5.5	- /4 -	1 -1	•	'		
SACRS OF TOTAL CEMENT TO GALLONS OF GROUT USED SO POUNDS OF BENTONITE PELLETS PEET OF T INCH PVC BLANK CASING OFFEET OF T INCH PVC SLOTTED SCREEN YARO CEMENT-SAND (REDI-MIX) ORDERED OFFEET OF CEMENT-SAND (REDI-MIX) USED ONOT TO SCALE ADDITIONAL INFORMATION:	-7			SANO		İi	
SO POUNDS OF BENTONITE PELLETS POUNDS OF BENTONITE PELLETS TO FEET OF Z INCH PVC BLANK CASING OFFEET OF Z INCH PVC SLOTTED SCREEN YARD CEMENT-SAND (REDI-MIX) ORDERED OFFEET OF CEMENT-SAND (REDI-MIX) USED NOT TO SCALE ADDITIONAL INFORMATION:	*	41		CEMENT			50.5 10 ET. 1 101
SO POUNDS OF BENTONITE PELLETS POUNDS OF BENTONITE PELLETS TEST OF Z INCH PVC BLANK CASING OFEET OF Z INCH PVC SLOTTED SCREEN YARD CEMENT-SAND (REDI-MIX) ORDERED OFEET OF CEMENT-SAND (REDI-MIX) USED NOT TO SCALE ADDITIONAL INFORMATION:		<			1	المحلك	BOTTOM WELL CAP
THE TOP INCH PVC BLANK CASING OFEET OF INCH PVC SLOTTED SCREEN BOTTOM OF BORE YARD CEMENT-SAND (REDI-MIX) ORDERED NOT TO SCALE ADDITIONAL INFORMATION:	SACK	& OF POWDERED SEN	ITONITE				<u>>3</u> Ficer
FEET OF Z INCH PVC SLOTTED SCREEN YARD CEMENT-SAND (REDI-MIX) ORDERED OF THE SCALE OF THE SCALE ADDITIONAL INFORMATION:					-		HOLE CLEANED OUT
YARO CEMENT-SAND (REDI-MIX) ORDERED NOT TO SCALE OF THE CONTROL O							
CANTS TARE CEMENT-SAND IREDI-MIXI USED ADDITIONAL INFORMATION:	10 FEET	OF INCH PVC SI	LOTTED SCRE	EN	<u></u>		BOTTOM OF BOREHOL
.a	YARQ) ³ CEMENT-SAND IRE	DI-MIX) ORDEI	RED	NO	T TO SCAI	. £
.a	<u> </u>	CEMENT-SAND INE	DI-MIXI USED		AC	DITIONAL	INFORMATION:
IAME NA	ONCRETE PUMPE		☐ YES				
WELL COVER USED: A LOCKING STEEL COVER		D: ALOCKING STEE	L COVER		•		



FIELD WELL COMPLETION FORM			CHRISTY BOX
mane: Ellinaton Field Site Twestin			LOCKING STEEL COVER
name: Ellington Feld Site Iwesti 108 number: 368M PROJECT Number: Lind	a Steakley	41-7-1	STEEL CONDUCTOR CASING
LOGGED) . EDITED	1		:ofeer
WELL 15	ATE: 17-17-89		NCH DIAMETER
COMPANY: CUSTOM Coving, INC.	<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>		
EQUIPMENT: 436	Burreu!		SENTONITE CEMENT
	Z. Ruffin Iours Spilled: Z.5		SEAL
GALLONS OF WATER + TO THE	ALLONS		;eet
METHOD OF DECONTAMINATION /		-	TOP OF CASING AT
DEVELOPMENT See Well Development	116		FEET AND AT
METHOD OF CEVELOPMENT			2.25 NCH DIAMETER
DEVELOPMENT			D : 75 : eet
	DATE:		- 3 INCH DIAMETER
111111111111111111111111111111111111111	ATE:		SCHEDULE 40 PVC BLANK CASING
GPM FROM TO	DATE:		+ 2 10 - 17 feet
GPM FROM TO	DATE:	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	SENTONITE CEMENT
GPM FROM TO		+	SEAL OR 6-SACK CEMENT-SANO
	ALLONS		SEAL B DEV
AT END OF	HTLY CLOUDY		SEAL
ODOR OF			70/40 avade 5:1: ca
MATER GROUND SURFACE TANK TE	RUCK		SANO PACK
OISCHARGED STORM SEWERS STORAG	ETANK		-10:0-25 teer
DRUMS OTHER		, =	3LOTTED : #10
AFTER DEVELOPMENT:	EET		HTM SCREEN
MATERIALS USED			-15 :0 -55 take
4.5 SACKS OF ZOLYO Grade silica	SAND		SCHEDULE 40 PVC
Z SACKS OF TUPR IT Po-tland	CEMENT		BLANK SILT TRAP
± 20 GALLONS OF GROUT USED			SOTTOM WELL CAP
5' LB3.			-75 tem
50 POUNDS OF BENTONITE PELLETS			
+517.5 FEET OF 3 INCH PVC BLANK CASING			1997
10 FEET OF INCH PVC SLOTTED SCREEN	N	L	40TTOM OF BOREHOLE
YARD CEMENT-SAND (REDI-MIX) ORDER	EO	NOT TO SCAL	. E
YARD CEMENT-SAND (REDI-MIX) USED		ADDITIONAL	INFORMATION:
CONCRETE PUMPER USED? ZNO ZYES			
WELL COVER USED: GLOCKING STEEL COVER			



FIELD WELL COMPLETE	ON FORM			CHRISTY BOX
name: Ellington Field	d Site In	restigation		C LCCXING STEEL COVER
108 HUMBER: 363 M	PROJECT MARAGER:	Linda Steakley	41	STEEL CONDUCTOR
LOGGED David 11 Street	EDITED	1		:oteet
WELL MW- 05		(Z-Z1 - 24		INCH DIAMETER
DRILLING A	ring. Inc.	The Court of		BOREHOLE
EQUIPMENT:	HOLLOW STEM AL	IGER Z. KJACH	11 1	BENTONITE CEMENT
	ROTARY WASH	HOURS	11 1	SEAL OR 3-SACK CEMENT-SAND SEAL
GALLONS OF WATER	DEP.	OBILLED: (17 15		;o!eet
METHOD OF DECONTAMINATION TO CONTAMINATION TO CONTAMINATION	"Steam C	GALLONS	F-	TOP OF CASING AT
	Vell Develo	buent Form		T FEET ABOVE AT
SEVELOPMENT:	-11	1		BELOW GROUND LEVEL
SEVELOPMENT				BOREHOLE
FEGAN DATE:	TIME:	DATE:		7
GPM FROM	<u> </u>	DATE:		SCHEDULE 40 PVC
GPM FROM	TO	I DATE:	1 1	BLANK CASING D 10 16-5 feet
GPM FROM	<u> </u>	DATS:		SENTONITE CEMENT
GPM FROM	то			SEAL OR SEAL OR SACK CEMENT-SAND
TOTAL WATER REMOVED OURING DEVELOPMENT:		GALLONS		SEAL O OLL Leer
DESCRIPTION OF TURBIDITY CLEA	я (SLIGHTLY CLOUDY		SENTONITE PELLET
	TURSID (VERY MUDDY		SEAL . 11.5 : 13.5 . eet .
GOOR OF WATER:				30/10 grade 5, 10
GROUND		NK TRUCK		SANOPACK
TO: STORM SE		ORAGE TANK		NCH DIAMETER
SEPTH TO WATER		FEET	· =	SLOTTED : # 10
MATERIALS USED				- SCREEN
<u> </u>	1.	1) }=	NCH DIAMETER
SACKS OF 20/40	o goode ci	Licesand	1 1	SCHEDULE 40 PVC
3 SACKS OF TOPE		CEMENT	1 1	BLANK SILT TRAP
# 30 GALLONS OF GRO	UT USED		-	BOTTOM WELL CAP
				79. Sleen
				HOLE CLEANED OUT TO
27.5 FEET OF 7 INC	ih PVC Blank Ca	SING	<u> </u>	BOTTOM OF BOREHOLE
FEET OF Z INC	m pvc slotted s	CREEN		24.5 lear
YARO ³ CEMENT-SA	MO (REDI-MIX) O	ROERED	NOT TO	SCALE
P CACHS CEMENT-S	MO (REDIMIX) U	SED	AODIT	IONAL INFORMATION:
CONCRETE PUMPER USED?	ØNO □YES			
NAME MA				
WELL COVER USED: TLOCKI				



FIELD WELL	COMPLETION FORM		CHRISTY BOX
100 [].	I Fall cit	T	☐ LOCKING STEEL COVER
HUMBER: 3651	100015	Investigation	STEEL CONDUCTOR
.00000	COLTES	GV VIM ZIGOTOTO	CASING
WELL MALL	Ustreame !	DATE:	INCH DIAMETER
DRILLING A	1 C . T	12.15.89	SOREMOLE
COMPANY: CUS	1	1001LLEGAL	BENTONITE CEMENT
3.25 @=	INCH HOLLOW STE	1011E	SEAL OR
GALLONS OF WAT	INCH ROTARY WAS	SH ORILLED: (, 5	
	ILLING: 0	GALLONS	
TION TO DRILLI	stram_	Clean.ha	TOP OF CASING AT
DEVELOPMENT	See Hell Dev	elopment boun-	BELOW GROUND LEVE
SEVELOPMENT:			7.25 INCH DIAMETER
DEVELOPMENT DEGAN DATE:	TIME:		0:0 29:000
	FROM TO	DATE:	1.25 INCH DIAMETER
	FROM TO	DATE:	BLANK CASING
GPM	TIME: FROM TO	OATE:	DENTONITE CEMENT
VIELD:	FROM TO	DATE:	SEAL OR
TOTAL WATER RE		GALLONS	SEAT MATURAL BACK
DESCRIPTION OF TURBIDITY	CLEAR	SLIGHTLY CLOUDY	SENTONITE PELLET
AT END OF DEVELOPMENT:	MOD. TURBID	VERY MUDDY	SEAL . 10 10 727 1881
ODOR OF			70/40 mede 5:110
WATER DISCHARGED	GROUND SURFACE	TANK TRUCK	SANO PACK
T O :	☐STORM SEWERS ☐DRUMS	STORAGE TANK	1.35 INCH DIAMETE
DEPTH TO WATER		FEET	SLOTTED :#10
MATERIALS US		PEET	- 24 - 26-Street
	/ /	.1.	1.75 INCH DIAMETE
SACH	15 OF 20 40 great	A FILICE SAND	SCHEDULE 40 PVC BLANK SILT TRAP
	is of	CEMENT	76.5:0 79 ieer
Δ1A.	LONS OF GROUT USED		SOTTOM WELL CAP
SACI	S OF POWDERED BENTO		MOLE CLEANED OUT
	NOS OF BENTONITE PELLS OF 6-25 INCH PVC BLAN		- test
	OF 1-25 INCH PVC SLOT		BOTTOM OF BOREHOL
	AL THE MAC SEGI.	I EM BRUEEU	<u>79</u> foot
YAR	D ³ CEMENT-SAND (REDI-M	IXI ORDERED	NOT TO SCALE
	D ² CEMENT-SAND IREDI-M	_	ADDITIONAL INFORMATION:
CONCRETE PUMPI	ER USEO? @NO []	YES	
	D: LOCKING STEEL C	CVER	



FIELD WELL	COMPLETION FOR	RM			CHRISTY BOX
name: Elling	ton Field Site	e Impestigation			LOCKING STEEL COVER
NUMBER: 363	M PRE	MAGER: Linda Steak	24	H	STEEL CONDUCTOR
. (03880		720	기		
VELL MALLO		GATE:	_		INCH DIAMETER
HILLING A	1 C. C.	112.20.9	<u> </u>	1 11	BOREHOLE
OMPANY:	stom laring,	INC.	-		BENTONITE CEMENT
3.22 @-	INCH HOLLOW	STEM AUGER	<u> </u>		SEAL OR E 8-SACK CEMENT-SAND
<u> </u>	INCH ROTARY	MASH DRILLED: (.	25	1 17 -	SEAL
ALLONS OF WAT	11 - 250 16	GALLONS			
THOO OF BEC	ONTAMINATION STEAM	n Cleanina		-	TOP OF CASING AT
EVELOPMENT	1011	135	nna		BELOW GROUND LEVEL
EVELOPMENT:				-	-7.21 INCH DIAMETER
EVELOPMENT		_			SOREHOLE
IELO:	TIME	E: DATE:			D :0 72 1000
GPM	FROM TO	OATE:	[[SCHEDULE 40 PVC
	FROM TO		_		BLANK CASING 1 7 to -275 feet
GPM		OATE:		ا ا	I SENTONITE CEMENT
GPM	FROM TO	DATE:			SEAL OR
TAL WATER RE	MOVED PMENT:	GALLONS	_		SEALWATURAL BACKE
ESCRIPTION P TURBIDITY	□CLEAR	SLIGHTLY CLOU		2000	0 165 teer
T END OF EVELOPMENT:	MOD. TURSID	VERY MUDDY			– Bentonite Pellet Seal
00# 07		G ************************************		3888	160 :019 · eet
ATER	GROUND SURFACE	TANK TRUCK	}	_ !• -	SAND PACK
ISCHARGED O:	STORM SEWERS	STORAGE TANK	} }	\equiv	19:0 75 1001
	DRUMS	OTHER		=:	- LZS INCH DI AMETE
FTER DEVELOP	, MGMT:	FEET		\equiv	SLOTTED : #10
ATERIALS US	ED			=	52.5.0 Z. 1941
	1.			<u> </u>	- 1.25 INCH DIAMETER
SACK	cs of 20/40 grad	le silica san	•		SCHEDULE 40 PVC BLANK SILT TRAP
SACK	45 OF	CEM	ENT	11	25 10 27.5 1eet
- 1 A:	LONE OF GROUT USED		4		- BOTTOM WELL CAP
	S OF POWDERED BENT	CONITE			Z7. Steen
	NOS OF BENTONITE PEL		 		- HOLE CLEANED OUT T
	OF 1. 25 INCH PVC BL				
Z.S FEET	OF 1-25 INCH PVC SLI	OTTED SCREEN			- BOTTOM OF BOREHOL
n	D ¹ CEMENT-SAND (RED		NOT	TO SCALE	
NA YARO	o ³ cement-sano (red	I-MIXI USED	AOC	ITIONAL INF	ORMATION:
	ER USED? GNO	☐YES			
IAME NA					



FIELD WELL COMPLETION FORM	CHRISTY SOX
100 Ell I Tall Cita T at 1.	☐ LOCKING STEEL COVER
name: Ellington Field Site Investigation 100 100 100 100 100 100 100 1	INCH DIAMETER STEEL CONDUCTOR CASING
LOGGED David Latherne EDITED	
MAME: MAN P2-03 DATE:	INCH DIAMETER
COMPANY: CUSTOM Coving. Inc.	
TOUR HOLLOW STEM AUGER Z. 12/6	BENTONITE CEMENT
INCH ROTARY WASH	B-SACK CEMENT-SAND
GALLONS OF WATER USED DURING ORILLING: / GALLONS	tofeet
PRIOR TO DRILLING	TOP OF CASING AT
DEVELOPMENT See Wet Development - Form	T FEET AROUND LEVEL
SEVELOPMENT:	7. SINCH DIAMETER
DEVELOPMENT BEGAN DATE: TIME:	BOREHOLE O :0 ZSS (see
TIME: DATE:	125 INCH DIAMETER
YIELDI TIMEI TO DATE:	SCHEDULE 40 PVC BLANK CASING
VIELD: TIME: DAYE:	O 10-18-5 feet
YIELD: TIME: DATE:	SEAL OR
TOTAL WATER REMOVED DURING DEVELOPMENT: GALLONS	SEAL VATURAL BACKET
DESCRIPTION CLEAR SLIGHTLY CLOUD	
DEVELOPMENT: MOD. TURBIO VERY MUDDY	SEAL SEAL
DOOR OF	- 3 :0 [5.5 'en
VATER GROUND SURFACE TANK TRUCK	SAND PACE
OSTORM SEWERS STORAGE TANK	[5.5.0 <u>5</u>].5 teet
DRUMS OTHER	SLOTTED : 40
MATERIALS USED	men SCREEN
	1845 77 THE LIZE INCH DIAMETER
3 SACKS OF 20/40 Guade Silich SANC	
NA SACKS OFCEME	
MA GALLONS OF GROUT USED	SOTTOM WELL CAP
34	2 <u>3.5</u> 1000
	HOLE CLEANED OUT TO
27.5 FEET OF 1.75 INCH PVC BLANK CASING 2.5 FEET OF 1.75 INCH PVC SLOTTED SCREEN	BOTTOM OF BOREHOLE
LEEL OF TOSTINCH LAC STOLLED SCHEEN	73. leer
SACHT YARD CEMENT-SAND (REDI-MIX) ORDERED	NOT TO SCALE
VA YARD CEMENT-SAND (REDI-MIX) USED	ADDITIONAL INFORMATION:
ONCRETE PUMPER USED? TO THE	NOTIFICATION OF THE PROPERTY O
NAME MA	
MELL COVER USED: DEOCKING STEEL COVER	
Construction of the second of	



FIELD WELL COMPLETION FORM			CHRISTY BOX
vame. Ellinaton Field Site Inva	estigation		LOCKING STEEL COVER
NUMBER: 365M PROJECT	inda Steukley	41-7-7	STEEL CONDUCTOR CASING
occepland Usturance enter	1		:o'reet
TALE. MW- 07	1-13-90		SOREHOLE
GMPANY: Custom Coving, Inc.			!eer
OUIPMENT: 4.25 INCH HOLLOW STEM AUG	ER Z. RUffin		BENTONITE CEMENT
INCH ROTARY WASH	HOURS -Z	11 1	SEAL CEMENT SAND
ALLONE OF WATER	GALLONS		(0 !***
RIOR TO DRILLING	eanin a	,	TOP OF CASING AT
EVELOPMENT / Islall	ment form		FEET ABOVE AT
ETHOD OF			275 NCH DIAMETER
EVELOPMENY EGAN GATE: TIME:			O :0 ZE teet
TIME: TO TO	DATE:		INCH DIAMETER
IELD: TIME: TO TO	DATE:		SCHEDULE 40 PVC BLANK CASING
GPM FROM TO	DATE:		D 10 15 'err
GPM FROM TO	DATE:		SEAL OR
STAL WATER REMOVED URING DEVELOPMENT:	GALLONS		SEAL
T END OF	SLIGHTLY CLOUDY VERY MUDDY		SEAL
DOR OF			76/10 cade 3:10
SCHARGED GROUND SURFACE TAM	NK TRUCK PRAGE TANK		SAND PACK
EPTH TO WATER	FEET	· =	SLOTTED : #16
MATERIALS USED			IS to 35 Take
SACKS OF 20/40 GUEDE S SACKS OF TAPE IT POHI STO GALLONS OF GROUT USED SACKS OF POWDERED SENTONITE FEET OF TINCH PVC SLATED SC CONTROL CEMENT-SAND IREDIMIXI OR THAT CEMENT-SAND IREDIMIXI USE ONCRETE PUMPER USED? THO TYPES	ING REEN	NOT TO S	TINCH DIAMETER SCHEDULE 40 PVC BLANK SILT TRAP 25 10 77.5 Firet BOTTOM WELL CAP 29 1000 HOLE CLEANED OUT TO
AME YA			



FIELD WELL	COMPLETION FOR	M		CHRISTY BOX
100 [1]	1 5.11 0.1.	T. A.L.		C LOCKING STEEL COVER
HAME: [] IN 4	ton Field Site	Investigation Esta: Linda Steakles	4	STEEL CONDUCTOR CASING
LOGGED	I I I EDIT	<u> </u>		
v: David	1 Streamel = .	DATE:	11 1	NCH DIAMETER
MANE: MW-	08	1-13-90		BOREHOLE
COMPANY, CJ	stom Carina. I	nc		
COUIPMENT:	4.25 INCH HOLLOWS	TEM AUGER PRILLERY		SEAL OR
α.	INCH ROTARY W	20105		B SACK CEMENT SAND
344.085.05.85	***	(1)		;0!eet
44THOD OF DEC	ONTAMINATION	GALLONS		TOP OF CASING AT
PRIOR TO DRILL				FEET ABOVE AT
DEVELOPMENT	r see Well De	velopment form		BELOW GROUND LEVEL
EVELOPMENT				30REHOLE
SEVELOPMENT SEGAN DATE:	TIME	i:		O :3 79 : set
TIELD:	TIME:	DATE:]]	INCH DIAMETER
TIELDI	TIME:	DATE:	1 1	SCHEDULE 40 PVC BLANK CASING
* 16L0:	TIME	DATE:	[]	0 10 -15 feet
GPM	TIME:	QATE:		SEAL OR
	FROM TO			8-SACK CEMENT-SAND
OTAL WATER R	PMENT:	GALLONS		SEAL OF THE PER
ESCRIPTION OF TURBIOITY	CLEAR	SLIGHTLY CLOUDY		SENTONITE PELLET
T END OF DEVELOPMENT:	MOD. TURBID	VERY MUDDY		SEAL 3
DOR OF				20/40 grade >: (ica
VATER	GROUND SURFACE	☐ TANK TRUCK		SANO PACK
NSCHARGED 'O:	STORM SEWERS	STORAGE TANK	=	-(3:0-24:001
	DRUMS	OTHER		NCH DI AMETER
PTER DEVELOR		FEET	·	SLOTTED : #16
MATERIALS US	SED			=: 15 .0 75
	- A/4	10 :110		Z INCH DIAMETER
SAC フ sac	KS OF TONE TO	D. I. I		BLANK SILT TRAP
	41	CEMENT CEMENT		25 :077.5 teer
£ 30 GA	LONS OF GROUT USED		<u>_</u>	SOTTOM WELL CAP
546	KS OF POWDERED BENT	ONITE		<u>78</u> 1000
	INDS OF BENTONITE PEL			MOLE LEANED OUT TO
17.5 FEE	T OF Z INCH PVC BL	ANK CASING		
(D FEE	T OF INCH PVC SLC	TTED SCREEN	<u></u>	BOTTOM OF BOREHOLE
, 4	4			
	18 ³ CEMENT-SANO (REDI LBS			TO SCALE
37 3M	to cement-sand iredi	MIX) USED	AOOI	ITIONAL INFORMATION:
CONCRETE PUMI	PER USED? INO	_YES		
NAME NA			··	
	ED: ULOCKING STEEL	COVER		
	GCHRISTY BOX			



Š.

		CHAISTY BOX
tich a		LOCKING STEEL COVER
N CL II	41	STEEL CONDUCTOR
1		:o!eer
DATE:		BOREHOLE
		to
A TO VOTAL		SEAL OR
HOURS		- 3 8 SACK CEMENT SAND
GALLONS		io!seet
		TOP OF CASING AT
115		FEET ABOVE AT
		- 27 INCH DIAMETER
		D :0-33
DATE:		Z INCH DIAMETER
PATE:		SCHEDULE 40 PVC BLANK CASING
PATE:		0 10 70 feet
DATE:		SEAL OR
GALLONS		SEAL
LIGHTLY CLOUDY		- SENTONITE PELLET
ERY MUDDY		SEAL - IS.S. 17.5 eet .
		70/40 a-2de 5,64
TRUCK		SANO PACE
-		- ZINCH DIAMETER
FEET	, =	SLOTTED : # 10
		20 10 30
		SCHEDULE 40 PVC
1		BLANK SILT TRAP
CEMENI		
		BOTTOM WELL CAP
		HOLE CLEANED OUT TO
G		
EEN	<u> </u>	HOTTOM OF BOREHOLE
ERED	NOT TO SCALE	i .
	ADDITIONAL	NFORMATION:
	GALLONS IGHTLY CLOUDY TRUCK AGE TANK R FEET GEN GEN GEN GEN GEN GEN GEN	DATE: OATE: OATE: OATE: OATE: OATE: OATE: CALLONS LIGHTLY CLOUDY ERY MUDDY TRUCK AGE TANK R FEET GAMENT NOT TO SCALE



FIELD WELL COMPLETION FORM		CHRISTY BOX	
name. Ellinaton Field Site Inva	eti edi a		LOCKING STEEL COVER
NAME: [Ing toh T. Eld S. TE LINE 108 NUMBER: 368M PROJECT MANAGER: L.	enda Steaklea	4	STEEL CONDUCTOR CASING
LOGGED LEVIC LA LABOUR ENTED	1		:o
WELL MW-10	1-16-90		NCH DIAMETER
COMPANY: Custom Coving. Inc.			
EQUIPMENT: 74.75 INCH HOLLOW STEM AUGI	ERIK VOIDO		SEAL OR
INCH ROTARY WASH	HOURS 7		B SACK CEMENT-SAND
GALLONS OF WATER	GALLONS		(o feet
METHOD OF DECONTAMINATION STRAM CE	an.ha		TOP OF CASING AT
DEVELOPMENT See Well Develope			FEET ABOVE AT
SETHOD OF SEVELOPMENT:			2.75 INCH DIAMETER
DEVELOPMENT			BOREHOLE
PEGAN DATE: TIME:	DATE:		7
GPM IFROM TO	DATE:		SCHEDULE 40 PVC BLANK CASING
GPM FROM TO	OATE:		D 10 20. 5 feet
GPM FROM TO	DATE		SEAL OF
GPM FROM TO		•	SEAL OR B.SACK CEMENT-SAND SEAL
DURING DEVELOPMENT:	GALLONS		D .0-16 toor
OF TURBIDITY CLEAR S	SLIGHTLY CLOUDY		AENTONITE PELLET
	VERY MUDDY		-16 :0 12 'eer.)
DOGROF VATER:			20/10 made 511.4
3.2044460	K TRUCK RAGE TANK		SAND PACK -19 :0-33.5 1841
ORUMS OTH			- Z INCH DIAMETER
DEPTH TO WATER AFTER DEVELOPMENT:	FEET	` =	SLOTTED : #10
MATERIALS USED			70.5 .0 30.5 seet
5.5 SACKS OF ZO/YO GUELLE SILIS	• /	— — — —	Z INCH DIAMETER
4 SACKS OF TYPER I POST	1		BLANK SILT TRAP
14	CEMENT	111	30.5 to 33 leer
LPC			BOTTOM WELL CAP
		}	
			HOLE CLEANED OUT TO
LU FEET OF Z INCH PVC SLOTTED SCF	REEN		BOTTOM OF BOREHOLE
YARO ³ CEMENT-SANO (REDI-MIX) ORC	nepen	NOT TO SC	ALE
YARD' CEMENT-SAND (REDI-MIX) GROERED		ADDITION	AL INFORMATION:
CONCRETE PUMPER USED? ZNO TYES	_		
NAME			
MELL COVER USED: CLOCKING STEEL COVER			
CHRISTY SOX			

WELL DEVELOPMENT FORMS

WELL DEVELOPMENT FORM ELLINGTON FIELD (ANG)

mw-01

	12-19	1-9	1-8
Total Depth of Well (bTOC*)	30.60	36.58	30.87
Static Water Level (bTOC)	17.58	<u></u>	17.42
h - Height of Water Column (feet)	7.07	12.81	13.45
r - Inside Diameter of Well (feet)	<u>. 083</u>		
R - Diameter of Boring (feet)	. 344		
Volume of Well and Filter Pack			
$v = [\pi r^2 h + (\pi R^2 h - \pi r^2 h)0.30]7.48$	17.33	17.13	45.51
where:			
0.30 = 30% porosity of filter pack			
7.48 = gallons per cubic foot			

Date	17-19 1-5	1-%
Time	1005 800	1045
Volume Removed	10 gals 20 gals	25 gals
Development Method	55 <u>Lailer 55</u> lailer	air lift
Developed By	R. Rexuscol D. Upthegrane	D. Uptherone

Comments:
After & removing a total of 55 gals, well produces water containing little or no sediment. Still slightly tookid

^{*}below top of casing

WELL DEVELOPMENT FORM **ELLINGTON FIELD (ANC)** WW-02

	17.19 (-4	(- g
Total Depth of Well (bTOC*)	30.18 30.07	29.56
Static Water Level (bTOC)	70.48 70.60	70.57
h - Height of Water Column (feet)	9.70 9.42	2.99
r - Inside Diameter of Well (feet)	.023	
R - Diameter of Boring (feet)	3411	
Volume of Well and Filter Pack		
$v = [\pi r^2 h + (\pi R^2 h - \pi r^2 h)0.30]7.48$	9.19 8.92	2.51
where:		
0.30 = 30% porosity of filter pack		
7.48 = gallons per cubic foot		

Date	17-19 1-4	1- \$
Time	1110 1730	1300
Volume Removed	8 9615 229915	zz gals
Development Method	ss lailer ss Uniler	ai- lift
Developed By	R. Rex-cd D. Uytherone	D. Uptherone
		l g

Comments: 53 gals total removed. Very little sed: next, slightly tookid

^{*}below top of casing

WELL DEVELOPMENT FORM **ELLINGTON FIELD (ANG)**

mw.o3

	12-19	1-9
Total Depth of Well (bTOC*)	25.07	<u> </u>
Static Water Level (bTOC)	13.10 7	? 9.76
h - Height of Water Column (feet)	11.97	15.27
r - Inside Diameter of Well (feet)	.043	
R - Diameter of Boring (feet)	. 344	
Volume of Well and Filter Pack		
$v = [\pi r^2 h + (\pi R^2 h - \pi r^2 h)0.30]7.48$	11.79	14.46
where:		
0.30 = 30% porosity of filter pack		
7.48 = gallons per cubic foot		

Date Time Volume Removed **Development Method Developed By**

Comments:

I removed. Relatively turbid, but only sedinant. Water level seems to 4

^{*}below top of casing

WELL DEVELOPMENT FORM ELLINGTON FIELD (ANG)

mw-04

50(15 5)	17-19	4 1-59
Total Depth of Well (bTOC*)	27.05 2	6.70 75.85°
Static Water Level (bTOC)	16.75 1	<u>5.9</u> 5 15.93
h - Height of Water Column (feet)	10.30	<u>0.75</u>
r - Inside Diameter of Well (feet)	.023	
R - Diameter of Boring (feet)	.344	
Volume of Well and Filter Pack $v = [\pi r^2 h + (\pi R^2 h - \pi r^2 h)0.30]7.48$ where:	9.75	2.18 9.39
0.30 = 30% porosity of filter pack		

7.48 = gallons per cubic foot

Date	17-19 1-4	1-9
Time	9:00 1445	800
Volume Removed	8 gals 22 gals	32 761
Development Method	55 Lailor S5 Lailor	air (iff
Developed By	R. Rexroad D. Vathegrove	D. Upthegrane

be gals total removed. Very little sediment, slightly turbid

^{*}below top of casing

WELL DEVELOPMENT FORM ELLINGTON FIELD (ANG)

MW-05

		(- 4	1-9
Total Depth of Well (bTOC*	')	30.68	<u> 30</u> .63
Static Water Level (bTOC)		21.75	<u> </u>
h - Height of Water Column	(feet)	2,43	2.93
r - Inside Diameter of Well (feet)	.023	
R - Diameter of Boring (feet	2)	.344	
Volume of Well and Filter P	ack		
$v = [\pi r^2 h + (\pi R^2 h - \pi r^2 h)0.30]$	0]7.48	2.46	2.46
where:			
0.30 = 30% porosity of filter	pack		
7.48 = gallons per cubic foot	t		
Data	1 U	1-9	
Date	154	`	
Time	9:00	4:50	
Volume Removed	30 4415	_ 14 gals	

Comments:

Developed By

Development Method

44 gals total removed. Little or no sediment, very slightly toolist.

^{*}below top of casing

WELL DEVELOPMENT FORM ELLINGTON FIELD (ANG)

MW-07

	1-17	_
Total Depth of Well (bTOC*)	27.4	<u> </u>
Static Water Level (bTOC)	11.3	5
h - Height of Water Column	(feet) <u>(6.4</u>	<u> </u>
r - Inside Diameter of Well (f	eet) . 02	3
R - Diameter of Boring (feet)	.34	<u> </u>
Volume of Well and Filter Pa		
$v = [\pi r^2 h + (\pi R^2 h - \pi r^2 h)0.30]$	17.48 (5.6	D
where:	·	
0.30 = 30% porosity of filter	pack	
7.48 = gallons per cubic foot	•	
7.40 = ganons per cable (90)		
Date	-19 1-19	
Time	1245	•
Volume Removed	15 60) -
Development Method	85 bailer air li	Ft.
Developed By	D. Uptherme L. Bes	ilio
,		•

Comments: Total of 75 gals removed. Slightly turbid, little or no sediment

^{*}below top of casing

WELL DEVELOPMENT FORM ELLINGTON FIELD (ANG) WW-08

Total Depth of Well (bTOC*) Static Water Level (bTOC) h - Height of Water Column (feet) r - Inside Diameter of Well (feet) R - Diameter of Boring (feet) Volume of Well and Filter Pack $v = [\pi r^2 h + (\pi R^2 h - \pi r^2 h)0.30]7.48$ where: 0.30 = 30% porosity of filter pack	1-18 76.90 14.70 12.70 .083 .344
7.48 = gallons per cubic foot	
Date Time Volume Removed Development Method Developed By 1-19 1-19 1-19 1-19 1-19 1-19 1-19 1-	1-19 1120 15 gals 15 gals 16 L. Basilio
Comments: 80 gals removed. Slightly two	id, little sediumt

^{*}below top of casing

WELL DEVELOPMENT FORM ELLINGTON FIELD (ANG) いいしょうち

	1-17	1-18
Total Depth of Well (bTOC*)	37.72	37.42
Static Water Level (bTOC)	17.18	17.75
h - Height of Water Column (feet)	15.04	15.17
r - Inside Diameter of Well (feet)	023	
R - Diameter of Boring (feet)	. 344	
Volume of Well and Filter Pack		
$v = [\pi r^2 h + (\pi R^2 h - \pi r^2 h)0.30]7.48$	14.24	14.37
where:		
0.30 = 30% porosity of filter pack		
7.48 = gallons per cubic foot		

Date	1-17 1-18
Time	1330 1200
Volume Removed	Zo gals to gals
Development Method	ss bailer air lift
Developed By	Da Upthegrave L. Besilia

Total of 60 gals removed. Slighting toulist, little or no sediment

^{*}below top of casing

WELL DEVELOPMENT FORM ELLINGTON FIELD (ANG) WW - [0

1-18 34.68 Total Depth of Well (bTOC*) 12.20 Static Water Level (bTOC) 15.88 h - Height of Water Column (feet) 043 r - Inside Diameter of Well (feet) R - Diameter of Boring (feet) Volume of Well and Filter Pack 15.04 $v = [\pi r^2 h + (\pi R^2 h - \pi r^2 h)0.30]7.48$ where: 0.30 = 30% porosity of filter pack 7.48 = gallons per cubic foot

Date	1-18	1-19
Time	1430 1645	0915
Volume Removed	15 gals 35 gals	40 gals
Development Method	55 Lailer air lift	air lift
Developed By	D. Uptherone L. Besilio	L. Basilia

Comments: 90 gals removed. V. slightly toulid. After 60 gals removed, doesn't appear to clear up further

^{*}below top of casing

APPENDIX B SLUG TEST CALCULATIONS

SLUG IN TEST

,	
MONITOR WELL NUMBER:	MW-01
ELEVATION TOP OF CASING:	37.68
ELEVATION WATER (IN):	19.99 ELEVATION WATER (OUT):
DEPTH OF WELL (TOC):	31.13 DIAMETER OF CASING: .167 FEET
SCREEN LENGTH AND INTERVAL:	10 FEET, 16.0 TO 26.0 FEET BELOW GRADE
SCREEN/FILTER TYPE:	# 10 PARTIALLY PENETRATING/ 20/40 GRADE SILICA SAND
AQUIFER TYPE AND THICKNESS:	CLAYEY SILT AND SILTY SAND, 14 TO 27 FEET BELOW GRADE
H(0) TRANSLATION:	1.25 H(0) THEORETICAL: 1.53
INITIAL CONSISTENT VALUE:	21.24 TRANS. METH. (SLUG IN) T(0): .0667
FINAL TRANSDUCER VALUE:	19.99

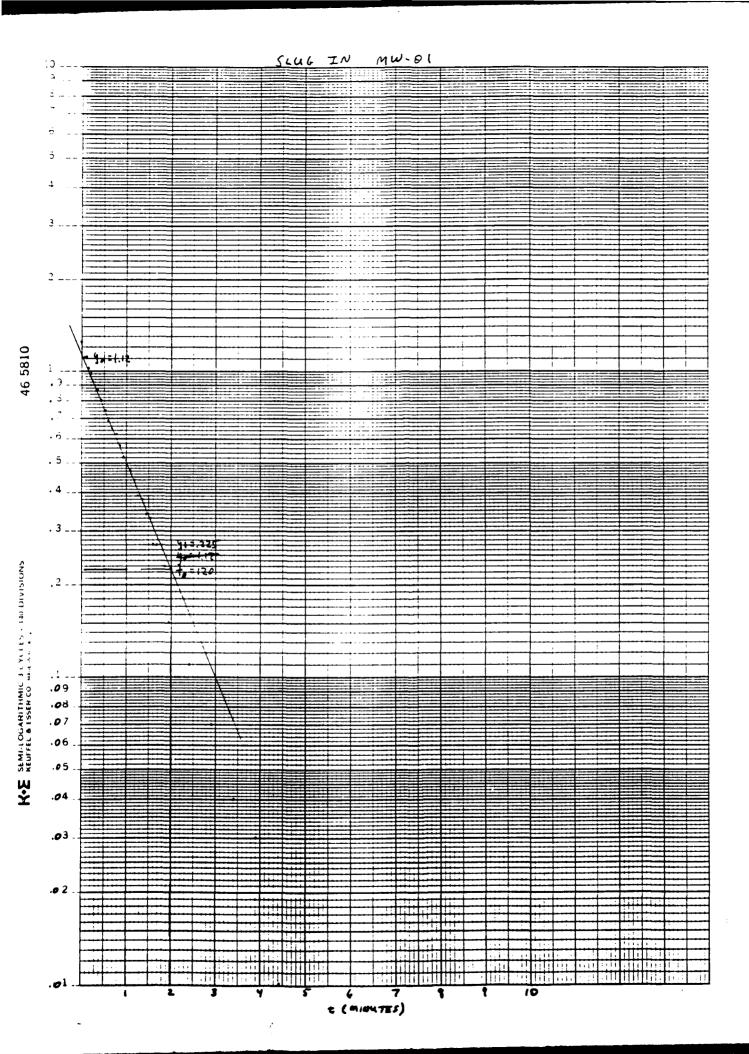
NG TEST IN:

100 1E51 1	LIY.				н,			<u>\</u>
SAMPLE	TIME	TIME	T(0)	XD	A/B DATUM	Н	H/H(0)	H/H(0)
	(MINUTES)			READING	TRANS.	TRANS.	TRANS.	THEOR.
			=======	========				
000	0	0	0667	17.25	3.9 9	-2.74		
001	.0033	.198	0634		.52	.73	.584	
002	.0067	.402	06	24.69	3.4 5	-2.2		
003	.01	.6	0567		.02	1.23	.984	
004	.0133	.798	0534	19.38	1.8 6	61	488	
005	.0167		05		.35		.72	
006	.02		0467	22.48	1.24	.01	.008	
007	.0233	1.398	0434		.05	1.2		
008	.0267	1.602	04	20.92	.32	.93	.744	
009	.03	1.8	0367	21.67	.43	.82	.656	
010	.0333	1.998	0334	21.15	.09		.928	.7582
011	.05	3	0167	20.99	.25	1	.8	.6536
012	.0667	4.002	0 :	21.24	0	1.25		.817
013	.0833	4.998	.0166	21.16	.08	1.17		
014	.1	6	.0333	21.15	.09	1.16		.7582
015	.1167	7.002	.05	21.10	.14	1.11		.7255
016	.1333	7.998	.0666	21.10	.14	1.11		.7255
017	. 15	9	.0833	21.08	.16	1.09		.7124
018	. 1667	10.002	.1	21.10		1.11		.7255
019	. 1833	10.998	.1166	21.03	.21	1.04		.6797
020	.2	12	.1333	21.03	.21	1.04		.6797
021	.2167	13.002	.15	21.02	.22	1.03		.6732
022	. 2333	13.998	.1666	20.99		1 1	.8	.6536 .6536
023	.25	15	. 1833	20.99	. 25		.8	
024	.2667	16.002	.2	20.97	.27	.98		.6405 .6275
025	. 2833	16.998	.2166	20.95	.29	.96	.768	.6209
026	.3	18	.2333	20.94	.3	.95	.76	.6078
027	.3167	19.002	. 25	20.92	.32	.93	.744 .744	
028	. 3 33 3	19.998	.2666	20.92	.32	.93		
029	.4167	25.002	. 35	20.86	.38	.87		
030	.5	30	.4333	20.80	.44	.81	.592	.4837
031	.5833	34.998	.5166	20.73	.51	.74	.552	.451
032	.6667	40.002	.6	20.68	.56	.69	.52	.4248
033	. 75	45	.6833	20.64	.6	.65 .62	.496	.4052
034	.8 33 3	49.998	.7666	20.61	.63	.57	.456	.3725
035	.9167	55.002	.85	20.56	.68		.416	.3399
036	1	60	.9333	20.51	.73	.52	.392	.3203
037	1.0833	64.998	1.0166		.76	. 49	.376	.3072
038	1.1667	70.002	1.1	20.46	.78	.47	.352	.2876
039	1.25	75	1.1833		.81	. 44 . 39	.312	.2549
040	1.3333	79.998	1.2666		.86 .87	.38	.304	.2484
041	1.4167	85.002	1.35	20.37	.91	.34	.272	.2222
042	1.5	90	1.4333		.92	.33	.264	.2157
043	1.583	94.98	1.5163		.98	.27	.216	.1765
044	1.6667	100.002	1.6	20.26	. 30			

ود. ايواليد

SLUG TEST IN:

SENG TEST T	Progress in:							
SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD READING	A/B DATUM TRANS.	H TRANS.	H/H(0) TRANS.	H/H(O) THEOR.
045	1.75	105	1.6833	20.27	.98	.27	.216	.1765
046	1.833	1 09 .98	1.7663	20.26	5	-3.75	-3	-2.451
047	1.9167	115.002	1.85	26.24	1.02	.23	.184	. 1503
048	2	120	1.9333	20.22	1.1	. 15	.12	.098
049	2.5	150	2.4333	20.14	1.14	.11	.088	.0719
050	3	180	2.9333	20.10	1.18	.07	.056	.0458
051	3.5	210	3.4333	20.06	1.21	.04	.032	.0261
052	4	240	3.9333	20.03	1.22	.03	.024	.0196
053	4.5	270	4.4333	20.02	1.24	.01	.008	.0065
054	5	300	4.9333	20.00	1.24	.01	.008	.0065
055	5.5	330	5.4333	20.00	1.24	.01	.008	.0065
056	6	360	5.9333	20.00	1.25	0	0	0
057	6.5	390	6.4333	19.99	1.24	.01	.008	.0065
058	7	420	6.9333	20.00	1.24	.01	.008	.0065
059	7.5	450	7.4333	20.00	1.25	0	0	0
060	8	480	7.9333	19.99	1.24	.01	.008	.0065
061	8.5	510	8.4333	20.00	1.25	0	0	0
062	9	540	8.9333	19.99	1.25	0	0	0
063	9.5	570	9.4333	19.99	1.25	0	0	0
064	10	600	9.9333	19.99	0	0	0	0
9 65	12	720	11.9333		0	0	0	0
066	14	840	13.9333		0	0	0	0
067	16	960	15.9333		0	0	0	0
.968	18	1080	17.9333		9	0	0	0
9 69	20	1200	19.9333		0	0	0	0
970	22	1320	21.9333		0	0	0	0
071	24	1440	23.9333		0	0	0	0
072	26	1560	25.9333		0	0	0	0
073	28	1680	27.9333		0	0	0	0
074	30	1800	29.9333		0	0	0	0
075	32	1920	31.9333		0	0	0	0
076	34	2040	33.9333		0	0	0	0
077	36	2160	35.9333		0	0	0	0
078	38	2280	37.9333		0	0	0	0
079	40	2400	39.9333		0	0	0	0
080	42	2520	41.9333		0	0	0	0
081	44	2640	43.9333		0	0	0	0
082	46	2760	45.9333		0	0	0	0
0 83	48	2880	47.9333		0	0	0	0
0 84	50	3000	49.9333		0	0	0	0
085	52	3120	51.9333		0	0	0	0
086	54	3240	53.9333		0	0	0	0
087	56	3360	55.9333		0	0	0	0
088	58	3480	57.9333		0	0	0	0
0 89	60	3600	59.9333		0	0	0	0



SLUG- IN Well No. AW-0:

Casing Diameter = 2 in. = .167 ft.

Casing radius (r_e) = .083 ft.

Length of screen (L) = 10.0 ft.

Height of water from base of screen (H) = 10.44 ft.

Radius of borehole (r_w) = .344 ft.

Thickness of Aquifer (D) = 13 ft.

C = 1.9 y_a = 1.12 y_t = 0.225 ft = 120 sec.

$$\ln(R_{\bullet}, r_{\bullet}) = \begin{bmatrix} 1.1 & 0 \\ ---- & --- \\ 1n & E/r_{\bullet} \end{bmatrix},$$

= 2.58

K = HYDRAULIC CONDUCTIVITY

$$K = \frac{r_e^2 \ln(R_e/r_w)}{2L} + \frac{1}{\sqrt{1-r_w}} + \frac{1}{\sqrt{1$$

T = TRANSMISSIVITY

T = (K) (D) (7.48 gpd/ft)

BEST AVAILABLE COPY

T = (1.03) (13) (7.48)

T = 100.18 gpd/ft

SLUG OUT TEST

-1 40 -7-

MONITOR WELL NUMBER: MW-01

ELEVATION TOP OF CASING: 37.68

ELEVATION WATER (IN): ELEVATION WATER (OUT): 19.99

DEPTH OF WELL (TOC): 31.13 DIAMETER OF CASING: .167 FEET

SCREEN LENGTH AND INTERVAL: 10 FEET. 16.0 TO 26.0 FEET BELOW GKADE

SCREEN/FILTER TYPE: # 10 PARTIALLY PENETRATING/ 20/40 GRADE SILICA SAND

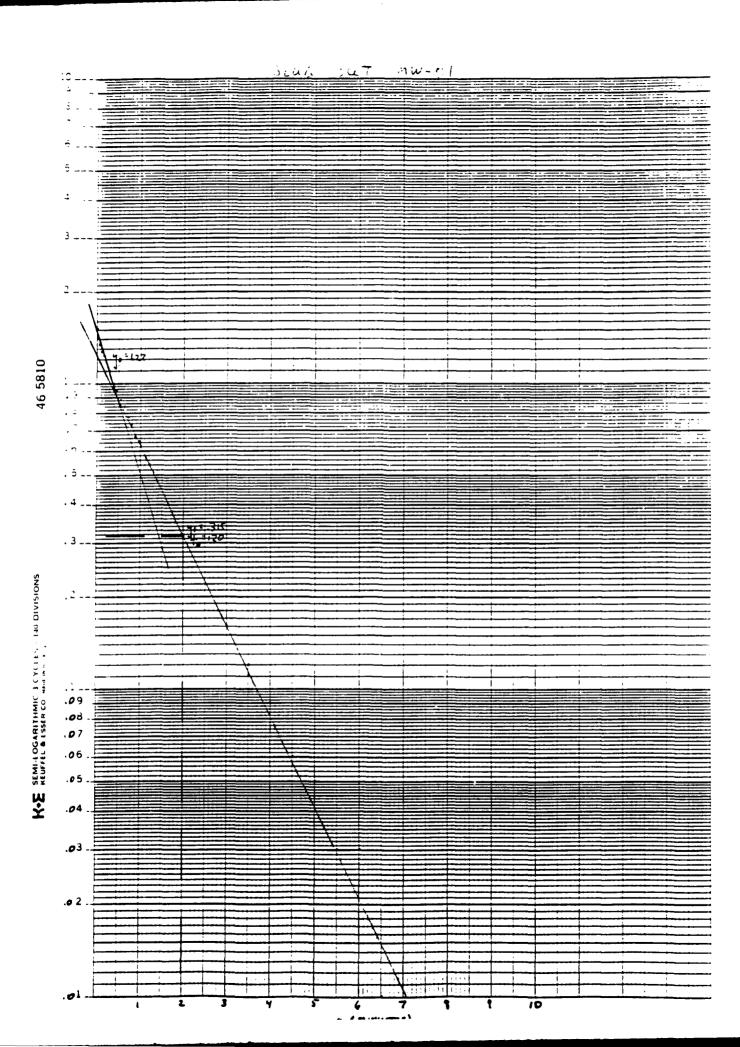
AQUIFER TYPE AND THICKNESS: CLAYEY SILT AND SILTY SAND. 14 TO 27 FEET BELOW GRADE

H(0) TRANSLATION: 1.51 H(0) THEORETICAL: 1.53

INITIAL CONSISTENT VALUE: 18.49 TRANS. METH. (SLUG OUT) T(0): .03

7000 IESI C					н.			
	TIME (MINUTES)	(SECONDS)	TRANS.	READING	A/B DATUM TRANS.	TRANS.	H/H(O) TRANS.	H/H(O) THEOR.
:========								
000 001	0 .0033	0 .198	03 0267	18.14 18.55	35 .06	1.86 1.45	1.2318 .9603	1.2157 .9477
002	.0067	.402	0233	18.22	27	1.78	1.1788	1.1634
003	.01	.6	02	18.71	. 22	1.29	.8543	.8431
004	.0133	.798	0167	18.35	14	1.65	1.0927	1.0784
005	.0167	1.002	0133	18.57	.08	1.43	.947	.9346
906	.02	1.2	01	18.49	0	1.51	1	.9869
007	.0233	1.398	0067	18.49	0	1.51	1	.9869
008	.0267	1.602	0033	18.57	.08	1.43	.947	.9346
009	.03	1.8	0	18.49	0	1.51	1	.9869
010	.0333	1.998	.0033	18.57	. 08	1.43	.947	.9346
011	.05	3	.02	18.59	.1	1.41	.9338	.9216
012	.0667	4.002	.0367	18.60	. 11	1.4	.9272	.915
013	.0833	4.998	.0533	18.65	. 16	1.35	.894	.8824
014	.1	6	.07	18.67	. 18	1.33	.8808	.8693
015	.1167	7.002	.0867	18.68	. 19	1.32	.8742	.8627
016	. 1333	7.998	.1033	18.71	. 22	1.29	.8543	.8431
017	.15	9	.12	18.73	. 24	1.27	.8411	.8301
018	.1667	10.002	.1367	18.75	. 26	1.25	.8278	.817
019	.1833	10.998	. 1533	18.76	. 27	1.24	.8212	.8105
020	.2	12	.17	18.79	.3	1.21	.8013	.7908
021	.2167	13.002	. 1867	18.79	.3	1.21	.8013	.7908
022	.2333	13.998	. 2033	18.82	. 3 3	1.18	.7815	.7712
023	. 25	15	. 22	18.84	. 35	1.16	.7682	.7582
024	.2667	16.002	.2367	18.86	. 37	1.14	.755	.7451
025	. 2833	16.998	. 2533	18.87	. 38	1.13	.7483	.7386
026	.3	18	.27	18.89	. 4	1.11	. 7351	.7255
027	.3167	19.002		18.90	. 41	1.1	.7285	.719
028	. 3333	19.998		18.92	. 43	1.08	.7152	.7059
029	.4167	25.002		19.00	.51	1	.6623	. 6536
030	.5	30	. 47	19.05	. 56	.95	.6291	.6209
031	.5833	34.998	. 5533	19.11	. 62	.89	.5894	.5817
032	.6667	40.002	. 6367	19.16	. 67	.84	.5563	.549
033	.75	45	.72	19.22	.73	.78	.5166	.5098
034	.8333	49.998	.8033	19.27	. 78	. 73	.4834	.4771
035	.9167	55.002	.8867	19.32	.83	.68	. 4503	.4444
036	1	60	.97	19.35	.86	.65	. 4305	.4248
037	1.0833	64.998	1.0533	19.38	.89	.62	.4106	.4052
038	1.1667	70.002	1.1367	19.43	.94	.57	.3775	.3725
039	1.25	75	1.22	19.46	.97	.54	.3576	.3529
040	1.3333	79.998	1.3033	19.49	1 02	.51	.3377	.3333
041	1.4167	85.002	1.3867	19.52	1.03	. 48	.3179	.3137
042	1.5	90	1.47	19.54	1.05	. 46	.3046	.3007
043	1.583	94.98	1.553	19.57	1.08	. 43	.2848	.281
044	1.6667	100.002	1.6367	19.60	1.11	.4	.2649	.2614

					Н1			
sample number	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD R EA DING	A/B DATUM TRANS.	H TRANS.	H/H(O) TRANS.	H/H() THEC .
								=======:
045	1.75	105	1.72	19.62	1.13	.38	.2517	.248
046	1.833	109.98	1.803	19.65	1.16	.35	.2318	.2280
047	1.9167	115.002	1.8867	19.65	1.16	. 35	.2318	.2288
048	2	120	1.97	19.68	1.19	.32	.2119	. 208
049	2.5	150	2.47	19.78	1.29	.22	.1457	. 143.
050	3	180	2.97	19.84	1.35	.16	.106	. 1046
051	3.5	210	3.47	19.89	1.4	.11	.0728	.071
052	4	240	3.97	19.91	1.42	.09	.0596	.05€
053	4.5	270	4.47	19.94	1.45	.06	.0397	.0392
054	5	300	4.97	19.95	1.46	.05	.0331	.0327
055	5.5	3 3 0	5.47	19.97	1.48	.03	.0199	.019
∂56	6	360	5.97	19.97	1.48	.03	.0199	.0 19 6
057	6.5	390	5.47	19.99	1.5	.01	.0066	.0065
0 58	7	420	6.97	19.99	1.5	.01	.0066	.00€
0 59	7.5	450	7.47	19.99	1.5	.01	.0066	.006ರ
0 60	8	480	7.97	19.99	1.5	.01	.0066	.0065
061	8.5	510	8.47	19.99	1.5	.01	.0066	.00€
062	9	540	8.97	19.99	1.5	.01	.0066	.00€
0 63	9.5	570	9.47	19.99	1.5	.01	.0066	.0065
0 64	10	600	9.97	20.00	1.51	0	0	0
0 65	12	720	11.97		0	0	0	0
066	14	840	13.97		0	0	0	0
067	16	960	15.97		0	0	0	0
068	18	1080	17.97		0	0	0	0
0 69	20	1200	19.97		0	0	0	0
070	22	1320	21.97		0	0	0	0
071	24	1440	23.97		0	0	0	0 0
072	26 28	1560	25.97		0	0	0 0	0
07 3 0 74	28 30	1680 1800	27.97 29.97		0	0 0	0	0
075	32	1920	31.97		0 0	0	0	0
076	3 <u>4</u>	2040	33.97		0	0	ő	Ö
077	36	2160	35.97		0	0	ő	0
078	38	2280	37.97		0	Ö	ő	ŏ
079	40	2400	39.97		ŏ	ŏ	ŏ	ŏ
080	42	2520	41.97		ŏ	ŏ	Ŏ	Ŏ
081	44		43.97		ŏ	ŏ	Ö	0
082	46		45.97		ŏ	Ö	0	0
0 83	48		47.97		Ö	Ö	Ō	Ö
084	50		49.97		Ö	Ö	0	0
085	52		51.97		Ö	Ō	0	0
086	54		53.97		Ö	Ö	0	0
087	56		55.97		Ö	0	0	0
088	58		57.97		0	0	0	0
089	60		59.97		0	0	0	0
							0	



SLUG- OUT Well No. AW-O:

Casing plameter = 2 in. = .157 ft.

Casing radius (r_e) = .083 ft.

Length of screen (L) = 10.0 ft.

Height of water from pase of screen (r₀) = 10.44 ft.

Radius of borehole (r₀) = 10.0 ft.

C = 1.7y₀ = 1.22 y₀ = 0.315 t = 120 que.

= \left(\frac{1.7}{1.7}\right) \quad \left(\frac{1.7}{10.07.344}\right) \quad \quad \text{10.07.344}\right)

= 2.58

K = HYDRAULIC CONDUCTIVITY

T = TRANSMISSIVITY

T = (K) (D) (7.48 gpd/ft)

T = (0.87) (13.0) (7.48)

T = 84.60 gpd/ft

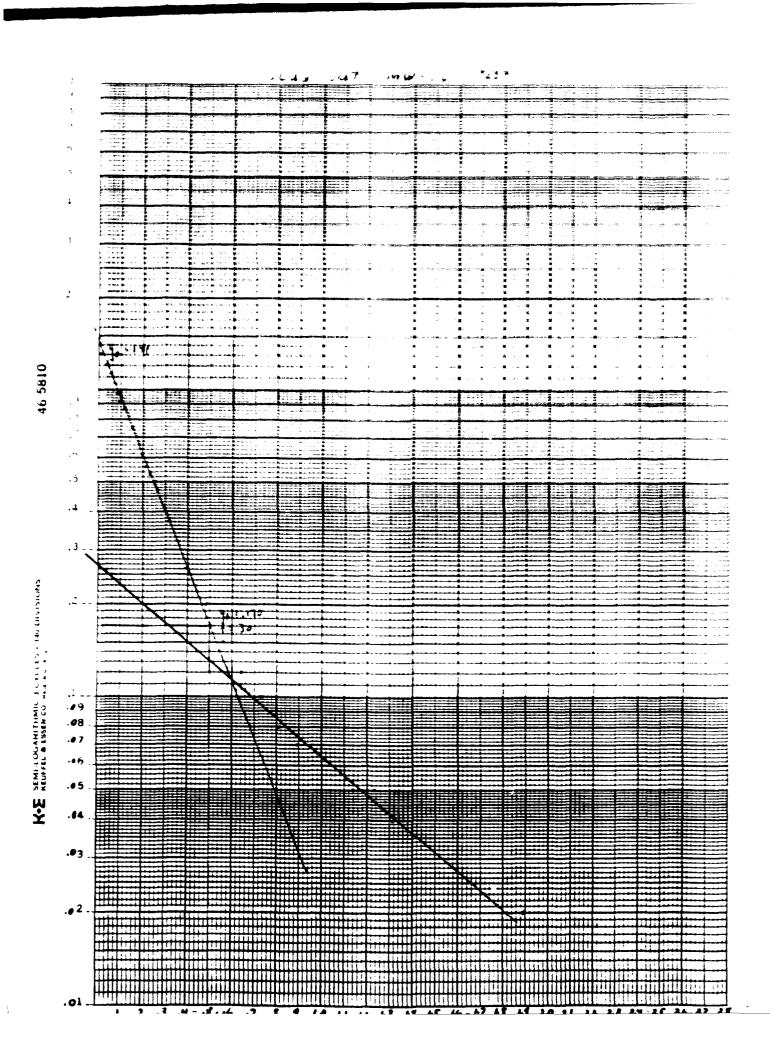
SLUG OUT TEST

		== :
MONITOR WELL NUMBER:	η₩-02 TEST ι	i
ELEVATION TOP OF CASING:	36.87	;
ELEVATION WATER (IN):	ELEVATION WATER (OUT): 16.2	
DEPTH OF WELL (TOC):	30.18 GIAMETER OF CASING: .167 FEET	
3CREEN LENGTH AND INTERVAL:	10 FEET. 15.5 TO 25.5 FEET BELOW GRADE	
SCREEN/FILTER TYPE:	# 10 PARTIALLY PENETRATING/ 20/40 GRADE SILICA SAND	
AQUIFER TYPE AND THICKNESS:	FILTY SAND AND SAND. 13 TO ? FEET BELOW GRADE	
H(0) TRANSLATION:	1.4 H(0) THEORETICAL: 1.53	.~_
INITIAL CONSISTENT VALUE:	14.8 FRANS. METH. (SLUG OUT) T(0): .02	
FINAL TRANSDUCER VALUE:	16.2	

SAMPLE	TIME	TIME	T(0)	ΧD	H' A/B DATUM	. :	11 /11 / 6 \	
NUMBER		(SECONDS)	TRANS.	READING	TRANS.	H TRANS.	H/H(0) TRANS.	H/H(Ó) THEOP(.
=========					*****			====== ==:
200	۸							i,1
000 001	0	0	02	14.64	16	1.56	1.1143	1.0196
	.0033	.198	0167	16.12	1.32	.08	.0571	.052
002	.0067	.402	0133	14.86	.06	1.34	.9571	.8751)
003	.01	.5	01	15.35	. 55	.85	.6071	.5556
004	.0133	.798	0067	14.83	. ়ত্ত	1.37	.9786	.895
005	.0167	1.002	0033	14.94	. 4	1.23	.9	.823 \
006	.02	1.2	0	14.80	O	1.4	1	.915
007	.0233	1.398	.0033	14.84	.04	1.36	.7714	.8880
008	.0267	1.602	.0067	:4.88	.08	1.32	.9429	.862
009	.03	1.8	.01	14.89	. 5 9	1.31	.9357	.8562
010	.0333	1.998	.0133	14.91	. 11	1.29	.9214	.8431
011	.05	5	.03	15.00	- 2	1.2	.8571	.784
012	.0867	4.002	.0467	10.08	. 23	1.12	.8	.73½l
015	.0833	4.998	.0633	13.10	, 36	1.04	.7429	•5 79 7
014	.1	5	.08	13.23	.43	×.97	.6929	.63
015	-1167	7.002	.0967	15.29	.49	.91	.65	.594
016	.1333	7.998	.1133	15.34	.54	ું . કેઠ્	.5143	.5621
017	.15	9	.13	15.40	• 6	.8	.5714	.5227)
018	.1667	10.002	.1467	15.45	. 65	.75	.5357	.490
019	.1833	10.998	.1633	15.50	.7	.7	.5	.4575
020	.2	12	.18	15.54	.74	•6 6	.4714	.4314
021	.2167	13.002	.1967	15.59	.79	.61	.4357	.398
022	.2333	13.998	.2133	15.64	.34	.56	.4	-360'
023	.25	15	.23	15.67	.37	.53	.3786	.3464
024	.2667	16.002	.2467	15.70	.9	.5	.3571	.326
025	.2833	16.998	-2633	15.73	.93	.47	.3357	.3071
026	.3	18	.28	15.77	.97	.43	.3071	.281
927	.3167	19.002	. 2967	15.80	1	.4	.2857	.261
√28 220	.3333	19.798	.3133	15.83	1.03	.37	.2643	.241:
029	.4167	25.002	.3967	15.94	1.14	.25	.1857	.1699 .1307;
030	.5	30	.48	16.00	1.2	.2	.1429	
031	.5833	34.998	. 5633	16.05	1.25	.15	.1071	.098
032	.6667	40.002	.6467	16.08	1.28	.12	.0857 .0714	.0784 .0654
033	.75	45	.73	16.10	1.3	.1	.0571	.0527
034	.8333	49.998	.8133	16.12	1.32	.08		
035	.9167	55.002	.8967	16.13	1.33	.07	.05 .05	.0456
036	1	60	.98	16.13	1.33	.07	.03	.0458
037	1.0833	64.998	1.0633	16.13	1.33	.07		.0458
038	1.1667	70.002	1.1467	16.15	1.35	.05	.0357 .0357	.0327
039	1.25	75 70 000	1.23	16.15	1.35	.05	.0337	.0327
040	1.3333	79.998	1.3133	16.16	1.36	.04	.0286	.0261
041	1.4167	85.002	1.3967	16.16	1.36	.04	.0286	.0261
042	1.5	90	1.48	16.16	1.36	.04	.0286	.0261
043	1.583	94.98	1.563	16.16	1.36	.04	.0286	.0261
044	1.6667	100.002	1.6467	16.16	1.36	.04	• 45.00	.0401

.UG TEST OUT:

.50 /1.01					н'			
SAMPLE NUMBER	TIME	TIME	T(O)	K D READING	A/B DATUM TRANS.	H TRANS.	H/H(O) TRANS.	H/H(O) THEOR:
		(SECONDS)	TRANS.					
045	1.75	105	1.73	16.15	1.36	.04	.0286	.0261
046	1.833	109.58	1.813	15.15	1.36	.04	.0286	.0261
047	1.9167	115.002	1.8967	16.18	1.38	.02	.0143	.0131
048	2	120	1.98	15.18	1.38	.02	.0143	.0131
049	2.5	150	2.48	16.18	1.38	.02	.0143	.0131
050	3	180	2.98	10.18	1.38	.02	.0143	.0131
051	3.5	210	3.48	15.20	1.4	1.3323e-15	0	0
052	4	240	3.98	15.20	1.4	1.3323e-15	0	O
053	4.5	270	4.48	15.20	1.4	1.3323e-:5	0	Q
054	5	300	4.98	16.20	1.4	1.3323e-15	0	Ō
055	5.5	330	5.48	15.20	1.4	1.3323e-15	0	0
056	5	530	5.98	.5.20	1.4	1 .33 23e-15	Ō	ů.
957	0.5	390	5.48	35.440	1.4	1.5525e	ن	9
058	,	420	5.98	13.20	1.4	1.3323e-i5	•)	ن
059	7.5	450	7.48	16.20	1.4	1.3323e-15	Ò	Ó
960	ម	480	7.98	13.20	1.4	1.3323e-15	0	i)
961	8.5	510	3.48	16.20	1.4	1.3323e-15	0	0
062	9	540	9.98	16.20	1.4	1.3323e-15	0	0
063	9.5	570	9.48	16.20	1.4	1.3323e-15	0	Ŏ
064	10	600	9.98	16.20	1.4	0	0	0
065	12	720	11.98		0	0	0	0
066	14	840	13.99	: ! 4	0	0	0	0
067	16	960	15.98		0	0	0 5	0
968	18	1080	17.98		O.	0	0	0
069	20	1200	1 9.9 8		0)	Ú	0	0
970	22	1320	21.98		0	0	0	0 ()
971	. 24	1440	23.98		9	i) ii	() ()	
1172	26	1560	25.99		ÇÎ.		ij	o o
073	28	1680	7.98		() ()	0 0	0	0
074	30	1800	29.98		Q Q	o	ŏ	ŏ
075	32	1920	31.98		0	ŏ	ŏ	ŏ
076	34	2040	33.98		0	ŏ	Ŏ	Ō
077	36	2160	35.98		O *	Ŏ	Ö	Ō
078	38 40	2280 2400	37.98 39.98		Ö	ŏ	Ŏ	Ō
079	40 42	2520	41.98		ő	Ŏ	Ö	Ō
080	44	2640	43.98		Ö	Ö	0	0
081 082	46	2760	45.78		Ō	Ō	0	0
083	48	2880	47.98		0	Ŏ	0	0
084	50	3000	49.98		Ö	0	0	0
085	52	3120	51.98		0	0	0	٥
086	54	3240	53.98		Ō	0	0	0
087	56	3340	55.78		0	0	0	0
088	58	3480	57.98		0	0	٥	0
089	60	3600	59.98		0	0	0	0
70,		32	- · · · -				0	



SLUG- OUT TEST 1 Well No. MW-02

Casing Diameter = 2 in. = .167 ft.

Casing radius (r_e) = .083 ft.

Length of screen (L) = 6.51 ft.

Height of water from case of screen (H) = 5.51 ft.

Radius of borehole (r_w) = .344 ft.

Thickness of Aquifer (D) = .7.51 ft.

C = 1.75

y_o = 1.41 y_e = 0.170 t = .30 sec.

202,

K = HYDRAULIC CONDUCTIVITY

$$K = \frac{r_e^2 \ln(\kappa_e/r_w)}{2L} + \frac{1}{x \ln(\gamma_e/\gamma_e)}$$

$$\frac{2L}{2L} + \frac{1}{x \ln(\gamma_e/\gamma_e)}$$

$$K = \frac{1}{2(6.51)} + \frac{1}{30}$$

$$K = \frac{7.98 \times 10^{-6} \text{ ft./sec.}}{4}$$

$$K = \frac{6.90}{x \ln(\gamma_e/\gamma_e)} + \frac{1}{x \ln(\gamma_e/\gamma_e)}$$

$$\frac{1}{2L} + \frac{1}{x \ln(\gamma_e/\gamma_e)}$$

$$\frac{1}{2L} + \frac{1}{x \ln(\gamma_e/\gamma_e)}$$

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$$\frac{1}{2L} + \frac{1}{x \ln(\gamma_e/\gamma_e)}$$

$$\frac{1}{2L} + \frac{1}{$$

T = TRANSMISSIVITY

T = (K) (D) (7.48 gpd/ft)

T = (6.90) (9.51) (7.48)

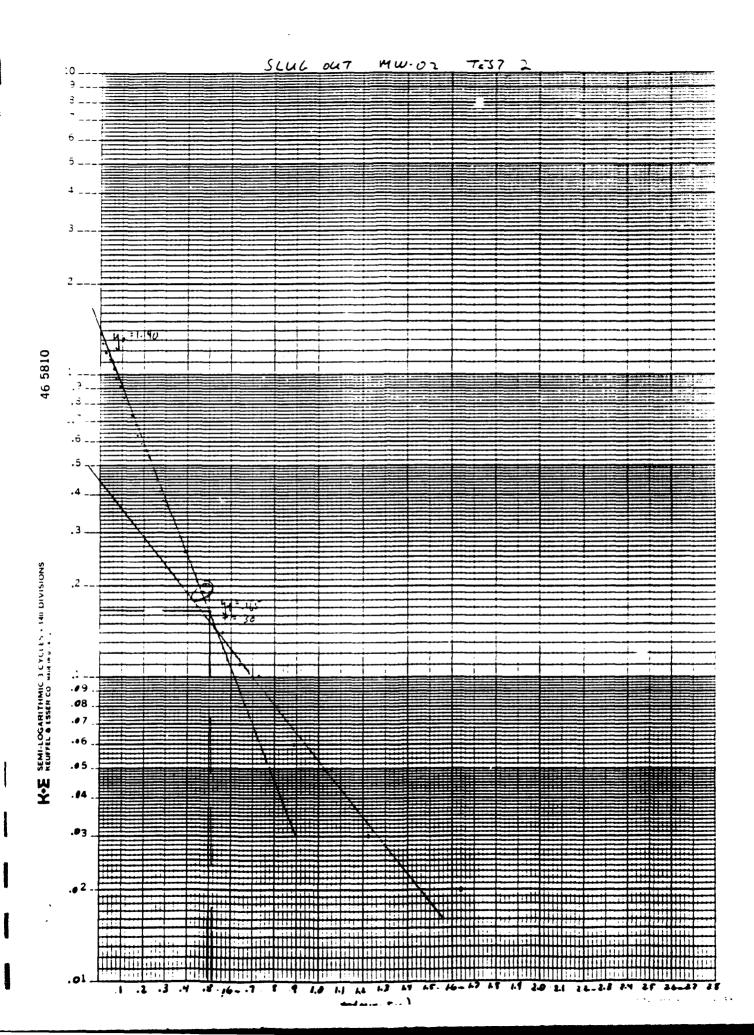
T = 490.83 apd/ft

SLUG OUT TEST

	=======================================
MONITOR WELL NUMBER:	MW-02 TEST 2
ELEVATION TOP OF CASING:	J6.87
ELEVATION WATER (IN):	ELEVATION WATER (OUT): 16.2
DEPTH OF WELL (TOC):	30.18 DIAMETER OF CASING: .167 FEET
SCREEN LENGTH AND INTERVAL:	10 FEET. 15.5 TO 25.5 FEET BELOW GRADE
SCREEN/FILTER TYPE:	# 10 PARTIALLY PENETRATING/ 20/40 GRADE SILICA SAND
AQUIFER TYPE AND THICKNESS:	SILTY SAND AND SAND. 18 TO ? FEET BELOW GRADE
H(0) TRANSLATION:	(1.38 H(0) THEORETICAL: 1.53
INITIAL CONSISTENT VALUE:	14.8 TRANS. METH. (SLUG OUT) T(0): .0233
FINAL TRANSDUCER VALUE:	16.18

SAMPLE NUMBER	MINUTES)	(SECONDS)	TRANS.	XD R EA DING		TRANS.	TRANS.	THEOR.
000	0	0		16.40		22		
				14.84			.971	
002				15.69		. 49		
003	.01		0133		.3			
004	.0133		01	15.07		1.11	.8043	
005	.0167	1.002	0066	15.03	.23	1.15	.8333	
006	.02	1.2	0033		.03	1.35 1.38	.9 78 3	.8824
007	.0233	1.398	0	14.80	U	1.38	1	.902
800	.0267	1.602	.0034	14.86	.06	1.32		
009	.03	1.8	.0067	14.88	.08	1.3		. 8497
010	.0333	1.998	.01	14.91	.11	1.27	.9203	.8301
011	. 05		.0267			1.19	.8623	.7 77 8
012	.0667		.0434			1.11		
013		4.998	.06					
014	.1	6	.0767				.7029	. 634
015	. 1167	7.002	.0934			.91	. 6594	.5948
016	. 1333	7.998	.11	15.34	.54	.84	.6087	.549
017	15	a	. 1267	15.04	.58	.8	.5797	.5229
018	. 1667		. 1434	15.38 15.45	.65	. 73	. 529	. 4771
019	. 1833	10.002	. 16	15.50	.7	.68	. 4928	. 4444
		10.550	.1767	15.55	.75	.63		
020	.2 .2167	12	.1767	15.55 15.59	.15			
022	. 2333		.21					
023	. 25		.2267					
024	.2667		. 2434	15.70	.9	. 48		.3137
025	. 2833	16.998	. 26	15.73	.93	. 45	. 3261	. 2941
026	.3	18	.2767	15.77	.97	.41	. 2971	. 268
027	. 3167	19.002	.2934	15.80	1	. 38	. 2754	.2484
0 28	. 3 33 3	19.998	. 31	15.81	1.01	.37	.2681	. 2418
0 29	. 4167		. 3934	15.92	1.12	.26		. 1699
030	.5		.4767		1.19	. 19		
031	.5833	34.9 98	.56	16.04	1.24	.14		
032	. 6667	40.002	. 6434	16.07	1.27	.11	.0797	.0719
	. 75	45	.7267	16.08	1.28	.1	.0725	.0654
034	.8333	49.998	.81	16.10	1.3	.08	.058	.0523
035	.9167	55.002	.8934	16.12	1.32	.06	.0435	.0392
036	1	60	.9767	16.12	1.32	.06	. 0 43 5	.0392
037	1.0833	64.998	1.06	16.13	1.33	.05	.0362	.0327
038	1.1667	70.002	1.1434	16.13	1.33	.05	.0362	.0327
039	1.25	75	1.2267	16.15	1.35	.03	.0217	.0196
040	1.3333	79.998	1.31	16.15	1.35	.03	.0217	.0196
040	1.4167	85.002	1.3934	16.15	1.35	.03	.0217	.0196
		90			1.35	.03	.0217	.0196
042	1.5		1.4767	16.15		.03	.0217	.0196
043	1.583	94.98	1.5597	16.15	1.35	.03		.0120

					н-			
SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD R EA DING	A/B DATUM TRANS.	H TRANS.	H/H(0) TRANS.	H/H(^) THE(_
				========			*=======	
045	1.75	105	1.7267	16.16	1.36	.02	.0145	.013
046	1.833	109.98	1.8097	16.16	1.36	.02	.0145	.0131
047	1.9167	115.002	1.8934	16.16	1.36	.02	.0145	.0131
048	2	120	1.9767	16.16	1.36	.02	.0145	.018
049	2.5	150	2.4767	16.18	1.38	8.8818e-16	0	0
050	3	180	2.9767	16.18	1.38	8.8818e-16	ŏ	ő
051	3.5	210	3.4767	16.18	1.38	8.8818e~16	ŏ	ŏ
052	4	240	3.9767	16.18	1.38	8.8818e-16	ŏ	ő
053	4.5	270	4.4767	16.18	1.38	8.8818e-16	ŏ	ő
054	5	300	4.9767	16.18	1.38	8.8818e-16	ŏ	ŏ
055	5.5	330	5.4767	16.18	1.38	8.8818e-16	ŏ	ő
056	6	360	5.9767	16.18	1.38	8.8818e-16	ŏ	Ö
057	6.5	390	6.4767	16.18	1.38	8.8818e-16	ŏ	ó
058	7	420	6.9767	16.18	1.38	8.8818e-16	ŏ	ŏ
059	7.5	450	7.4767	16.18	1.38	8.8818e-16	Ö	Ŏ
060	8	480	7.9767	16.18	1.38	8.8818e-16	Ö	Ö
061	8.5	510	8.4767	16.18	1.38	8.8818e-16	Ö	Ŏ
062	9	540	8.9767	16.18	1.38	8.8818e-16	Ö	Ö
063	9.5	570	9.4767	16.18	1.38	8.8818e-16	Ö	Ö
064	10	600	9.9767	16.18	1.38	0	Ö	Ö
065	12	720	11.9767		0	Ō	0	Ö
066	14	840	13.9767		0	Ö	Ō	Ö
067	16	960	15.9767		0	Ö	0	0
068	18	1080	17.9767		0	0	0	Ö
069	20	1200	19.9767		0	0	0	0
070	22	1320	21.9767		0	0	0	0
071	24	1440	23.9767		0	0	0	Ō
072	26	1560	25.9767		0	0	0	0
073	28	1680	27.9767		0	0	0	0
074	30	1800	29.9767		0	0	0	0
075	32	1920	31.9767		0	0	0	0
076	34	2040	33.9767		0	0	0	0
077	36	2160	35.9767		0	0	0	0
078	38	2280	37.9767		0	0	0	0
079	40	2400	39.9767		0	0	0	0
080	42	2520	41.9767		0	0	0	0
081	44	2 64 0	43.9767		0	0	0	0
082	46	2760	45.9767		0	0	0	0
083	48	2880	47.9767		Ö	Ö	Ö	Ō
084	50	3000	49.9767		0	0	0	Ō
085	52	3120	51.9767		0	0	0	0
086	54	3240	53.9767		0	0	0	0
087	56	3360	55.9767		Ō	Ö	Ö	0
088	58	3480	57.9767		Ö	0	Ö	0
089	60		59.9767		Ö	Ö	Ō	Ō
			-				0	



SEUG- OUT Well No. MW-CI

Casing planeter = 1 in. = .167 ft.

Casing radius (r_e) = .083 ft.

Length of screen (L) = 5.51 ft.

Height of water from base of screen (H) = 5.51 ft.

Radius of borehole (r_w) = .344 ft.

Thickness of Aquifer (D) = 9.51 ft.

C = 1.75 v_o = 1.40 v_t = 0.165 t = 30 sec.

= 2.14

K = HYDRAULIC CONDUCTIVITY

$$K = \frac{r_e^2 \ln(R_e/r_w)}{2L} + \frac{1}{x^2 + x^2 +$$

T = TRANSHISSIVITY

T = (K) (D) (7.48 gpd/ft)

 $K = 2.46 \times 10^{-3} \text{ cm./sec.}$

T = (6.97) (9.51) (7.48)

T = 495.81 gpd/ft

SLUG IN TEST

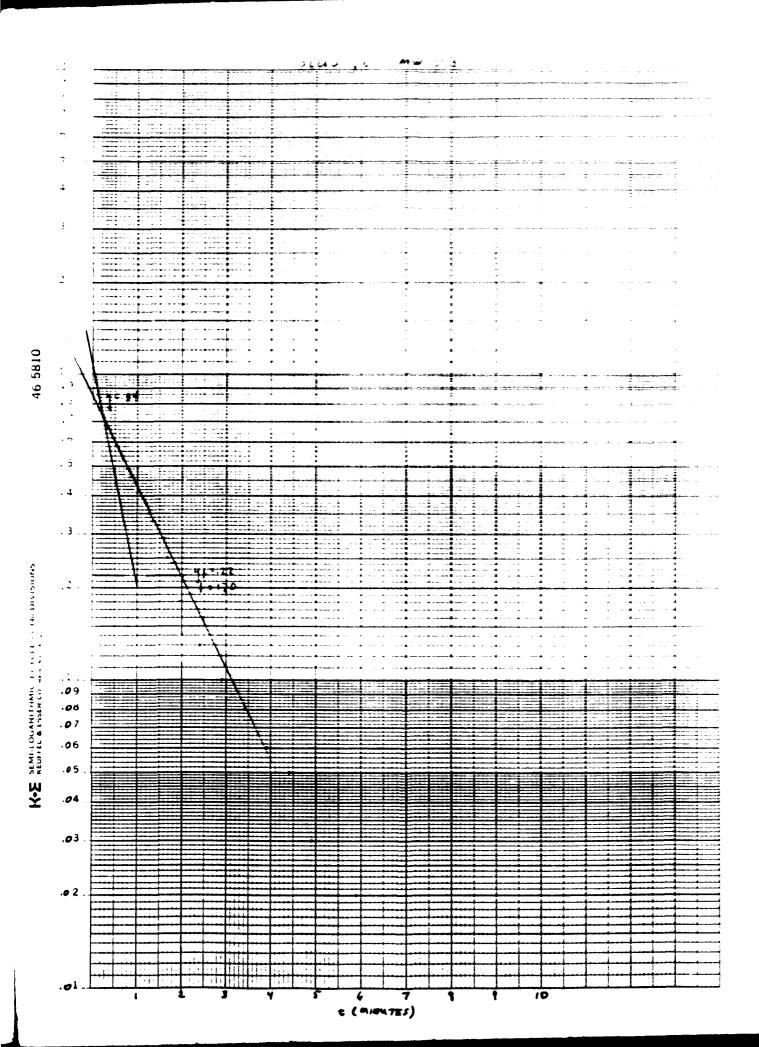
t .	
MONITOR WELL NUMBER:	MW-00 ,
ELEVATION TOP OF CASING:	37.8
ELEVATION WATER (IN):	26.63 ELEVATION WATER (OUT):
DEPTH OF WELL (TOC):	25.03 GIAMETER OF CASING: .167 FEET
SCREEN LENGTH AND INTERVAL:	10 FEET. 10.5 TO 20.5 FEET BELOW GRADE
	# 10 FULL / PENETRATING/ 20/40 GRADE SILICA SAND
AQUIFER TYPE AND THICKNESS:	SILTY SAND AND CLAYEY SILT. 12 TO 14.5 FEET BELOW GRADE
H(0) TRANSLATION:	1.05 H(0) THEORETICAL: 1.53
INITIAL CONSISTENT VALUE:	27.77 TRANS. METH. (SLUG IN) T(0): .0667
FINAL TRANSDUCER VALUE:	26.72

SLUG TEST IN:

SAMPLE TIME TIME T(0) XD A/B DATUM H NUMBER (MINUTES) (SECONDS) TRANS. READING TRANS. TRANS.	H/H(0) TRANS.	H/H(0) THEOR.
		.=======
000 0 00667 28.07 .3 .75	.7143	.4902
001 .0033 .1980634 27.75 .02 1.03	.981	.6732
002 .0067 .40206 28.18 .41 .64	. 6095	.4183
003 .01 .60567 29.06 1.2924	2286	1569
004 .0133 .7980534 27.58 .19 .86	.819	.5621
005 .0167 1.00205 27.59 .18 .87	.8286	.5686
006 .02 1.20467 28.39 .62 .43	. 4095	.281
007 .0233 1.3980434 28.80 1.03 .02	.019	.0131
008 .0267 1.60204 28.26 .49 .56	.5333	.366
009 .03 1.80367 28.15 .38 .67	.6381	.4379
010 .0333 1.9980334 28.25 .48 .57	.5429	.3725
011 .05 30167 28.52 .75 .3	.2857	. 1961
012 .0667 4.002 0 27.77 0 1.05	1	.6863
013 .0833 4.998 .0166 27.72 .05 1	.9524	.6536
014 .1 6 .0333 27.71 .06 .99	.9429	.6471
015 .1167 7.002 .05 27.66 .11 .94	.8952	.6144
016 .1333 7.998 .0666 27.64 .13 .92	.8762	.6013
017 .15 9 .0833 27.61 .16 .89	.8476	.5817
018 .1667 10.002 .1 27.58 .19 .86	.819	.5621
019 .1833 10.998 .1166 27.56 .21 .84	.8	.549
020 .2 12 .1333 27.53 .24 .81	.7714	.5294
021 .2167 13.002 .15 27.53 .24 .81	.7714	.5294
022 .2333 13.998 .1666 27.52 .25 .8	.7619	.5229
023 .25 15 .1833 27.50 .27 .78	.7429	.5098
024 .2667 16.002 .2 27.48 .29 .76	.7238	. 4967
025 .2833 16.998 .2166 27.47 .3 .75	.7143	. 4902
026 .3 18 .2333 27.47 .3 .75	.7143	. 4902
027 .3167 19.002 .25 27.45 .32 .73	. 6952	.4771
028 .3333 19.998 .2666 27.44 .33 .72	.6857	.4706
029 .4167 25.002 .35 27.39 .38 .67	.6381	.4379
030 .5 30 .4333 27.34 .43 .62	.5905	. 4052
031 .5833 34.998 .5166 27.31 .46 .59	.5619	. 3856
032 .6667 40.002 .6 27.28 .49 .56	.5333	.366
033 .75 45 .6833 27.25 .52 .53	.5048	. 3464
034 .8333 49.998 .7666 27.21 .56 .49	.4667	. 3203
035 .9167 55.002 .85 27.18 .59 .46	. 4381	.3007
036 1 60 .9333 27.17 .6 .45	.4286	.2941
037 1.0833 64.998 1.0166 27.13 .64 .41	. 3905	.268
038 1.1667 70.002 1.1 27.12 .65 .4	.381	.2614
039 1.25 75 1.1833 27.10 .67 .38	.3619	.2484
040 1.3333 79.998 1.2666 27.07 .7 .35	. 3333	.2288
041 1.4167 85.002 1.35 27.05 .72 .33	.3143	.2157
042 1.5 90 1.4333 27.04 .73 .32	.3048	.2092
043 1.583 94.98 1.5163 27.02 .75 .3	.2857	. 1961
044 1.6667 100.002 1.6 27.01 .76 .29	.2762	. 1895

SLUG TEST IN:

SLUG TEST	IN:				н,			
SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD R EADING	A/B DATUM TRANS.	H TRANS.	H/H(O) TRANS.	H/H(O) THEOR.
045	1.75	105	1.6833	26.99	.8	. 25	. 2381	. 1634
046	1.833	109 .98	1.7663	26.97	.81	.24	. 2286	. 1569
047	1.9167	115.002	1.85	26.96	.81	.24	. 2286	. 1569
048	2	120	1.9333	26.96	.87	. 18	.1714	.1176
049	2.5	150	2.4333	26.90	.92	.13	. 1238	. 085
050	3	180	2.9333	26.85	.95	.1	.0952	.0654
051	3.5	210	3.4333	26.82	.97	.08	.0762	. 0523
052	4	240	3.9333	26.80	.99	.06	.0571	. 0 392
053	4.5	270	4.4333	26.78	1	. 05	.0476	. 9 32 7
054	5	300	4.9333	26.77	1.02	.03	.0286	.0196
055	5.5	330	5.4333	26.75	1.02	.03	.0286	.0196
056	6	360	5.9333	26.75	1.03	.02	.019	.0131
057	6.5	390	6.4333	26.74	1.03	.02	.019	.0131
058	7	420	6.9333	26.74	1.03	.02	.019	.0131
059	7.5	450	7.4333	26.74	1.03	.02	.019	.0131
060	8	480	7.9333	26.74	1.05	-6.661e-16	0	0
061	8.5	510	8.4333	26.72	1.05	-6.661e-16	0	0
062	9	540	8.9333	26.72	1.05	-6.661e-16	0	0
063	9.5	570	9.4333	2 6.72	1.05	-6.661e-16	0	0
064	10	600	9.9333	26.72	0	0	0	0
065	12	720	11.9333		0	0	0	0
066	14	840	13.9333		0	0	0	0
067	16	960	15.9333		0	0	0	0
068	18	1080	17.9333		0	0	0	0
069	20	1200	19.9333		O	0	0	Ð.
070	22	1320	21.9333		0	0	0	0
071	24	1440	23.9333		0	0	0	0
072	26	1560	25.9333		0	0	0	0
073	28	1680	27.9333		0	0	0	0
074	30	1800	29.9333		0	0	0	0
075	32	1920	31.9333		Ö	0	0	0
076	34	2040	33.9333		Ö	Ō	0	0
077	36	2160	35.9333		Ö	Ō	0	0
078	38	2280	37.9333		Ō	0	0	0
079	40	2400	39.9333		0	0	0	0
080	42	2520	41.9333		Ō	0	0	0
081	44	2640	43.9333		Ō	0	0	0
082	46	2760	45.9333		Ö	Ö	Ö	Ō
083	48	2880	47.9333		ŏ	Ö	Ö	Ō
084	50	3000	49.9333		ŏ	ŏ	ŏ	Ŏ
085	52	3120	51.9333		ŏ	ŏ	Ŏ	Ŏ
086	54	3240	53.9333		ŏ	Ö	ŏ	Ö
087	56	3360	55.9333		ŏ	ŏ	Ŏ	Ö
088	58	3480	57.9333		ŏ	ŏ	Ö	ŏ
089	60	3600	59.9333		ŏ	Ö	Ŏ	Ö
					•	=		•



SEUG- IN Well No. 384-03

Casing Diameter = 2 in. = .167 ft. Casing radius (r_e) = .083 ft. Length of screen (L) = 10.0 ft. Height of water from base or screen (h) = 10.66 ft. Radius of borehole (r_w) = .344 ft. Thickness of Aquifer (D) = .2.5 ft. C = 1.70 y_a = 0.84 y_b = 0.220 ft = 120 sec.

 $ln(R_{+}, r_{+}) = \begin{cases} 1.1 & 0 \\ ---- & --- \\ ln H r_{+} & L / r_{+} \end{cases}$

= 2.60

K = HYDRAULIC CONDUCTIVITY

T = TRANSMISSIVITY

$$T = (K) (D) (7.48 \text{ gpd/ft})$$

$$T = (0.86) (2.5) (7.48)$$

T = 16.08 gpd/ft

SLUG OUT TEST

MONITOR WELL NUMBER: MW-03

ELEVATION TOP OF CASING:

ELEVATION WATER (IN):

ELEVATION WATER (OUT): 26.63

PERTH OF WELL (TOC): 25.03 PIAMETER OF CASING:

.167 FEET

SCREEN LENGTH AND INTERVAL: 10 FEET. 10.5 TO 20.5 FEET BELOW GRADE

SCREEN/FILTER TYPE: # 10 FULLY PENETRATING/ 20/40 GRADE SILICA SAND

AQUIFER TYPE AND THICKNESS: SILTY SAND AND CLAYEY SILT, 12 TO 14.5 FEET BELOW GRADE

H(0) TRANSLATION:

1.37 H(0) THEORETICAL:

INITIAL CONSISTENT VALUE: 25.32 TRANS. METH. (GLUG OUT) T(0):

FINAL TRANSDUCER VALUE:

SLUG TEST (DUT:							
					H ¹ A/B DATUM TRANS.			
000	9					27	1971	1765
001	.0033	. 198	02	16.34	1.02	. 35	. 2555	.2288
002	.0067	. 402		25.81	. 49	. 88	. 6423	.5752
003	.01		0133	25.45	.13	1.24	. 3051	.8105
004	.0133	.798	01	25.62	.3	1.07	. 781	. 6993
005	.0167	1.002	0066	25.13	19	1.56	1 1387	
006	.02	1.2	0033	25.46	.14 0 .07 .1	1.23	. 3978	.8039
007	.0233	1.398	O)	25.32	0	1.37	1	. 8954
008	.0267	1.602	.0034	25.39	.07	1.3	. 3489	.8497
009	.03	1.8	.0067	25.42	. 1	1.27	.927	.8301
910	.0333	1.998	.01	25.43	.11	1.26	. 3197	
911	.05	3	.0267	25.50	. 18		. 3 68 6	7778
012	.0667	4.002		25.58	. 24	1.13	.3 24 8	.7386
013	. 08 3 3	4.998	.06	25.61				. 7059
014	. 1	6	.0767	25.66	. 34	1.03	. 7518	
015	.1 .1167 .1333	7.002	.0934	25.69	. 37	1	. 7299	. 653€
016	.1333	7.998	.11	25.72 25.75	. 43 . 45	.97	.708	. 634
017	. 15	9	. 1267	2 5 .75	. 43	.94	. 6861	.6144
018	. 1007	10.002	. 1434	25.77	. 45	.92	. 6715	.6013
019	. 1833		. 16	25.78	. 46	.91	.6642	.5948
020	.2		.1767			.88		
021	.2167		. 1934			.86		
022	.2333	13.998	.21	25.85	.53	.84		
023	. 25	15	.2267	25.86	.54	.83	.6058	
024	.25 .2667 .2833	16.002	. 2434		.56	.81	.5912	. 5294
925	.2833	16.998	.26 .2767	25.89	.57	.8 .78 .76	. 5839	.5229
9 26	. 3	18	.2767	25.91 25.93 25.99	. 59	. 78	.5693	.5098
027		19.002	. ~934	<i>4</i> 5.93	.61	76	.5547	. 4967
02 8	. 3333	19.998	.31	25.99			.5109	
)29			.3934		.67	.7	.5109	
030	.5	30	.4767	26.04	.72	. 65	. 4745	
931	.5833	34.998	. 56	26.08	.76	.61		
032	.6667	40.002	. 6434	26.12	.8	.57		
		45		26.15	.83	.54	. 3942	. 3529
034	.8333	49.998	.81	26.18	.86	.51	. 3723	. 3333
035	.9167	55.002	.8934	26.21	.89	. 48	. 3504	.3137
036	1 0000	60	.9767	26.23	.91	. 46	. 3 35 8	.3007
037	1.0833	64.998	1.06	26.24	.92	. 45	.3285	.2941
038	1.1667	70.002	1.1434	26.28	.96	.41	. 2993	. 268
039	1.25	75 70 000	1.2267	26.29	.97	.4	. 292	.2614
040	1.3333	79.998	1.31	26.31	.99	. 38	.2774	. 2484
041	1.4167	85.002	1.3934	26.34	1.02	. 35	. 2555	. 2288
042	1.5	90	1.4767	26.35	1.03	. 34	.2482	. 2222
043	1.583	94.98	1.5597	26.37	1.05	. 32	. 2336	. 2092
044	1.6667	100.002	1.6434	26.39	1.07	. 3	.219	. 1961

SAMPLE NUMBER		TIME (SECONDS)	T(0) TRANS.	XD READING	H' A/B DATUM TRANS.	H TRANS.	H/H(0) TRANS.	H/H) : THEUR:
0.45						20	^=	
045	1.75	105	1.7267	26.40	1.08	. 29	.2117	.18 >
046	1.833	109.98	1.8097	26.40	1.08	. 29	.2117	. 1895
047	1.9167	115.002	1.8934	26.42	1.1	. 27	. 1971	. 1755
048	2	120	1.9767	26.43	1.11	. 26	. 1898	.16 }
049	2.5	150	2.4767	26.5 0	1.18	. 19	. 1387	. 1242
050	3	180	2.9767	26.55	1.23	.14	. 1022	.0915
051	3.5	210	3.4767	26.58	1.26	.11	.0803	.07 }
052	4	240	3.9767	26.61	1.29	.08	. 0584	دَے۔05
053	4.5	270	4.4767	26.63	1.31	.06	.0438	.0392
054	5	300	4.9767	26.63	1.31	.06	.0438	.03 :
055	5.5	330	5.4767	26.64	1.32	.05	.0365	.03 ′
056	6	360	5.9767	26.6 6	1.34	.03	.0219	.0196
057	6.5	390	6.4767	26.67	1.35	.02	.0146	.0177
058	7	420	6.9767	26.67	1.35	.02	.0146	.01
059	7.5	450	7.4767	26.67	1.35	.02	.0146	.0131
060	_8_	480	7.9767	26.67	1.35	.02	.0146	.01.31
061	8.5	510	8.4767	25.69	1.37	- 8.882e- 16	0	0
062	9	540	8.9767	26.69	1.37	-8.882e -16	0	0
063	9.5	570	9.4767	26.69	1.37	-8.882e-16	0	0
064	10	600	9.9767	26.69	1.37	0	0	0
065	12	720	11.9767		0	0	0	0
066	14	840	13.9767		0	0	0	0
067	16	960	15.9767		0	0	0	0
068	18	1080	17.9767		0	0	0	0
069	20	1200	19.9767		0	0	0	Ó.
070	22	1320	21.9767		0	0	0	Ó
071	24	1440	23.9767		Ó	0	ò	Ó
072	26	1560	25.9767		0	0	9	Q
073	28	1680	27.9767		0	0	9	O
074	30	1800	29.9767		0	0	0	0
075	32	1920	31.9767		0	0	0	0
076	34	2040	3 3. 9767		0	0	0	0
077	36	2160	35.9767		0	0	0	0
078	38	2280	3 7. 9767		0	0	0	0
079	40	2400	39.9767		0	0	0	0
080	42	2520	41.9767		0	0	0	0
081	44	2640	43.9767		0	0	0	0
082	46	2760	45.9767		0	0	0	0
083	48	2880	47.9767		0	0	0	0
084	50	3000	49.9767		0	0	0	0
085	52	3120	51.9767		0	0	0	0
086	54	3240	53.9767		0	0	0	0
087	56	3 36 0	55.9767		0	0	0	0
088	58	3480	57.9767		0	0	0	0
089	60	3600	59.9767		0	0	0	0
							0	

SLUG- OUT Well No. MW-03

Casing Diameter = 2 in. = .167 ft.

Casing radius (r_e) = .083 ft.

Length of screen (L) = 10.0 ft. ...

Height of water from base of screen (H) = 10.86 ft.

Radius of borehole (r_w) = .344 ft.

Thickness of Aquifer (D) = 2.5 ft.

C = 1.90y_a = 0.81 y_b = 0.25 ft = 120 sec.

= 2.60

K = HYDRAULIC CONDUCTIVITY

$$K = \frac{r_e^2 \ln(R_e/r_w)}{2L} + \frac{1}{t}$$

$$(.083)^2 (2.60) = 1$$

$$K = \frac{1}{2(10.0)} + \frac{1}{120}$$

$$K = \frac{1}{8.77} \times 10^{-4} \text{ ft./sec.}$$

$$K = \frac{1}{2.67} \times 10^{-4} \text{ cm./sec.}$$

T = TRANSMISSIVITY

$$T = (K) (D) (7.48 \text{ qpd/ft})$$

$$T = (0.76) (2.5) (7.48)$$

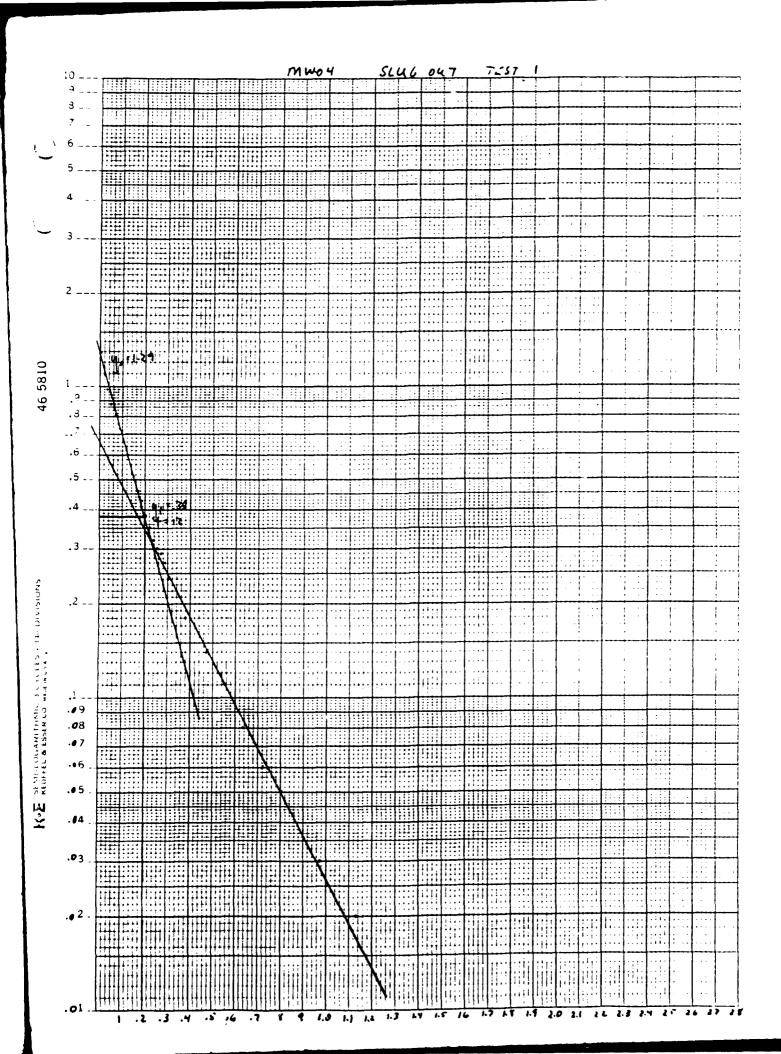
T = 14.21 gpd/ft

SLUG OUT TEST

	:=====================================	==
. MONITOR WELL NUMBER:	₩₩-04 FEST 1	
: ELEVATION TOP OF CASING:	.9.30	 :
: ELEVATION WATER (IN):	ELEVATION WATER (GUT): 23.37	: :
DEPTH OF WELL (TOC):	26.7 TAMETER OF CHSING: .167 FEET	;
GOREEN LENGTH AND INTERVAL:	to reeto fo 21.0 FEET BELOW GRADE	
SCREEN/FILTER SE:	4 10 8888,ALL, FRETRATINGS 11740 BRADE BLLIDA BAND	
ANUIFER TYPE AND THICKNESS:	CLAYER HAW SILTE FAND, 12 TO 7 FEET RELOW MADE	 :
: H(O) TRANSLATION:	1.27 H(O) THEORETICAL: 1.53	
INITIAL CONSISTENT VALUE:	21.96 RANS. METH. (BLUG OUT) 7(0): .33	
: FINAL TRANSDUCER VALUE:	23.25	

·ɔ	FOR TEST (001:				н,			
	NUMBER	(MINUTES)	(SECONDS)	TRANS.	READING	A/B DATUM TRANS.	H TRANS.	TRANS.	THE(:.
_									
	000	0	0	03	22.87	.91	. 38	. 2946	.2484
	001	.0033					1.69		
	002	.0067	. 402	0233	21.66	3	1.59	1.2326	1.05±2
	003	.01 .01 3 3	6	- 02	21 80	- 16	1 <i>4</i> 5	1 124	.9477
	004	.01 3 3	. 798	0167	21.85	11	1.4	1.0853	.9
	005	.0167	1.002	0133	21.87	09	1.4 1.38 1.34 1.3 1.26	1.0698 1.0388 1.0078	.962
	006	.02	1.2	01	21.91	05	1.34	1.0388	. 875 8
	007	.0233	1.398	0067	21.95	01	1.3	1.0078	.84
	800	.0267	1.602	0033	21.99	.03	1.26	.9767	.82:
	009	.03	1.8	0	21.96	0	1.29	1	. 8431
	010	.0 333	1.990	.0033	22.03	.07	1.22	.9457	.79 7 4
	011	.05	3	.02	22.15	.19	1.1	.8527	.73
	012	.0667	4.002	.0367	2 2.26	.3	.99	.7674	. 6471
	013	.0833	4.998	.0533	22.36	4	89	. 6899	.5817
	014		•	0 7	22 44	. 48	.81	.6279	
	015	.1167	7.002	.0867	22.52	.56	.73	.5659	. 477.1
	016	.1333	7.998	. 1033	22.58	. 62	.67	.5194	. 4379
	017	.1 .1167 .1333 .15	9	.1033 .12 .1367	22.58 22.65	. 69	.6	.4651	. 392
	018	.1667	10.002	. 1367	22.69	.73	.56	. 4341	.3€
	019	. 1833	10.998	. 1 53 3	22.74	.78	.51	.3953	.3333
	020	.2	12	. 17	22.79	.83	. 46	. 3566	.300
	021	.2167	13.002	. 1867	22.82	.86	. 43	.3333	. 28
	022	. 2333		. 2033			. 38	. 2946	. 2484
	023	.25	15	.22	22.90	.94	. 35	.2713	.228 ^p
	024	. 2667	16.002	. 2 367	2 2.93	.97	. 32	. 2481	. 209
	025	.2833	16.998	. 2533	22.95	.99	.3	.2326	. 1961
	026	.3	18	.27	22.96	1	29	. 2248	. 1895
	027	.3167	19.002	. 2867	22.98	1.02 1.05	. 29 . 27	. 2093	. 176
	0 28	. 3333	19.998	3033	23.01	1.05	. 24	. 186	.15€_
	029	.4167	25.002	. 3867	23.07	1.11	. 18	. 1395	.1176
		.5	30	. 47	23.11	1.15	. 14	. 1085	.091 -
	031	.5833		. 5 53 3		1.18		.0853	.071
	032	. 6667	40.002	. 6367	23.17	1.21	.08	.062	.0523
	033	. 75	45	.72	23.19	1.23	.06	.0465	.0397
	034	.8333	49.998	.8033	23.20	1.24	.05	.0388	.032
	035	.9167	55.002	.8867	23.20	1.24	.05	.0 388	.0327
	036	1	60	.97	23.22	1.26	.03	.0 23 3	.0196
	037	1.0833	64.998	1.0533	23.22	1.26	.03	.0 23 3	.019
	038	1.1667	70.002	1.1367	23.23	1.27	.02	.0155	.013_
	039	1.25	75	1.22	23.23	1.27	.02	.0155	.0131
	040	1.3333	79.998	1.3033	23.23	1.27	.02	.0155	.013
	041	1.4167	85.002	1.3867	23.23	1.27	.02	.0155	.013
	042	1.5	90	1.47	23.25	1.29	8.8818e-16	0	0
	043	1.583	94.98	1.553	23.25	1.29	8.8818e-16	0	0
	044	1.6667	100.002	1.6367	23.25	1.29	8.8818e-16	0	0

SAMPLE NUMBER		TIME (SECONDS)	T(0) TRANS.	XD R EADIN G	A/B DATUM TRANS.	H TRANS.	H/H(0) TRANS.	H/H(0 THEOR
045	1.75	105	1.72	23.25	1.29	8.8818e-16	0	0
046	1.833	109.98	1.803	23.25	1.29	8. 8818e- 16	0	0
047	1.9167	115.002	1.8867	23.25	1.29	8.8818e-16	0	0
048	2	120	1.97	23.25	1.29	8.8818e-16	0	0
049	2.5	150	2.47	2 3.2 7	1.31	02	0155	013
050	3	180	2.97	23.27	1.31	02	0155	013
051	3.5	210	3.47	23.27	1.31	02	0155	013
052	4	240	3.97	23.25	1.29	8.8818e-16	0	0
053	4.5	270	4.47	23.25	1.29	8.8818e-16	0	0
054	5	300	4.97	23.25	1.29	8. 8818e- 16	0	0
055	5 .5	330	5.47	23.27	1.31	02	0155	013
056	6	360	5.97	23.27	1.31	02	0155	013
057	6.5	390	6.47	23.27	1.31	02	0155	013
058	7	420	6.97	23.27	1.31	02	0155	013
059	7.5	450	7.47	23.25	1.29	8.8818e-16	0	0
060	8	480	7.97	23.25	1.29	0	Ō	Ō
061	8.5	510	8.47		0	Ö	Ō	Ö
062	9	540	8.97		Ö	Ö	Ō	Ö
063	9.5	570	9.47		Ö	Ö	Ō	Ö
064	10	600	9.97		Ö	Ō	Ö	Ö
065	12	720	11.97		ŏ	ŏ	ō	ŏ
066	14	840	13.97		ŏ	Ö	ŏ	ŏ
067	16	960	15.97		ŏ	Ö	ŏ	ŏ
068	18	1080	17.97		ŏ	ŏ	ŏ	Ŏ
069	20	1200	19.97		ŏ	ŏ	ŏ	ŏ
070	22	1320	21.97		ŏ	ŏ	ő	ŏ
071	24	1440	23.97		ŏ	ŏ	ő	Ö
072	26	1560	25.97		ő	Ö	ŏ	ŭ
073	28	1680	27.97		ŏ	ŏ	Õ	0
074	30	1800	29.97		ő	ő	Ö	Ö
075	32	1920	31.97		ő	ŏ	Ŏ	ő
076	34	2040	33.97		Ŏ	ŏ	Ŏ	Ö
077	36	2160	35.97		ő	ŏ	Ö	Ö
078	38		37.97		ŏ	ŏ	ŏ	ŏ
079	40	2400	39.97		ő	ő	Ö	Ö
080	42	2 52 0	41.97		ŏ	ŏ	Ŏ	ŏ
081	44	2 64 0	43.97		ŏ	ő	Ö	ŏ
082	46	2760			Ö	Ö	Ö	Ö
083	48		45.97					
084	50	2880	47.97		0	0	0	0
		3000	49.97		0	0	0	0
085	52		51.97		0	0	0	0
086	54 50		53.97		0	0	0	0
087	56		55.97		0	0	0	0
880	58	3480	57.97		0	o	0	0
089	60	3600	5 9.9 7		0	0	0	0



3LUG- 68T | 73ST 1 | Well No. (W-64

Casing planeter = 0.10, = 0.157 Pt.

Casing radius (re) = 0.083 /t.

Length of screen (L) = 0.72 Ft.

Height of water from case of screen (H) = 0.72 Ft.

Radius of borehole (ru) = 0.044 Ft.

Thickness of Adulfer (P) = 10.72 Pt. 0.08 = 0.08 t = 0.08

= 2.30

K = HYDRAULIC CONDUCTIVITY

$$K = \frac{r_e^2 \ln(R_e/r_w)}{-1} \cdot \frac{1}{\ln(y_{er}/r_e)}$$

$$(.083)^2 (1.50) = 1$$

$$K = \frac{1.05 \times 10^{-4} + t./sec}{1.05 \times 10^{-4} + t./sec}$$

$$K = 9.03 = \frac{1.75}{12}$$

$$K = 3.18 \times 10^{-3} \text{ cm./sec.}$$

T = TRANSMISSIVITY

T = (K) (D) (7.48 gpd/ft)

T = (9.03)(10.72)(7.48)

T = 724.08 gpd/ft

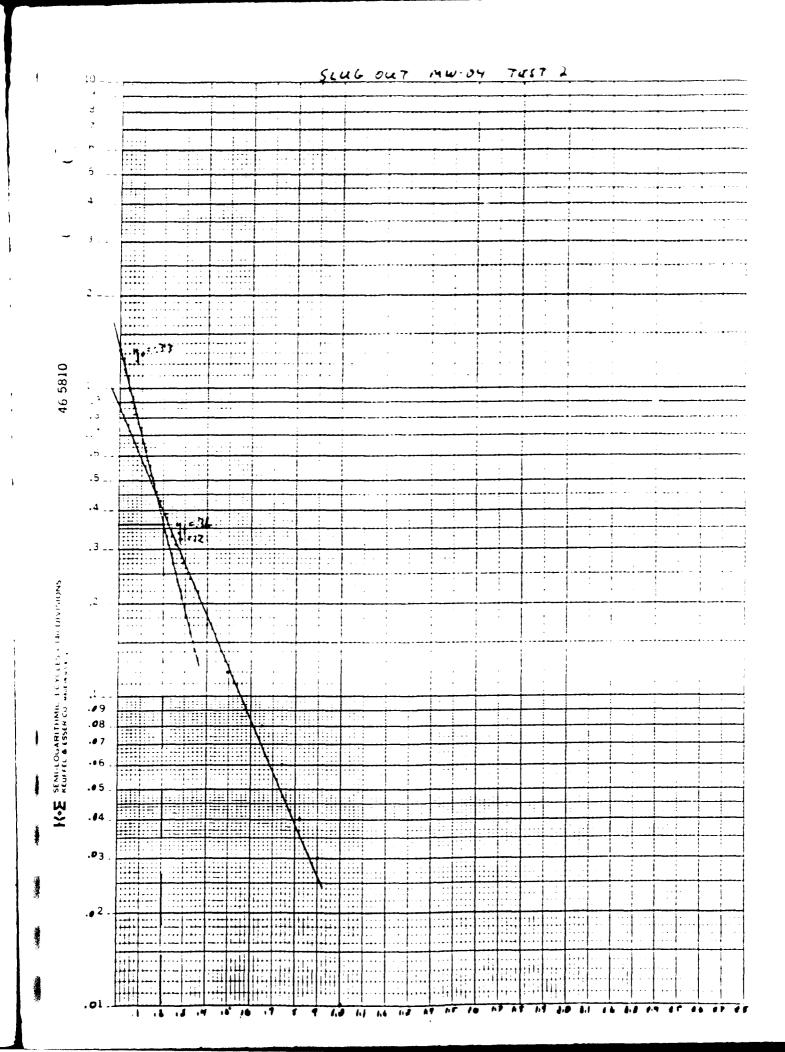
BLUG OUT FEST

***********************		====
MONITOR WELL NUMBER:	(10- 94 - 172) (大大量)()	
ELEVATION FOR OF CASING:		
	ELEVATION WATER (UUT): 23.37	
DEFTH OF WELL (TOC):	26.7 PIAMETER OF CASING: .167 FEET	
SCREEN LENGTH AND INTERVAL:	10 FEET0 .0 22.0 FEET BELOW GRADE	
	# 10 PARTIALL, FENETRATING/ LOZ40 GRADE SILICA GAND	
	CLAYE'S GOOD SILTY SAND. 12 TO 2 FEET BELOW GRADE	
	1.33 H(0) THEORETICAL: 1.53	
•	21.9 TRANS. METH. (SLUG OUT) T(0): .01	
FINAL TRANSDUCER VALUE:	23.23	

NUMBER	(MINUTES)	(SECONDS)	TRANS.	READING	TRANS.	H TRANS.	TRANS.	THEOR
000	0	0	01	23.20	1.3	.03 1.78 1.32 1.33 1.28	.0226	.0196
001	.0033	. 198	0067	21.45	45	1.78	1.3383	1.1634
002	.0067	. 402	0033	21.91	.01	1.32	.9925	.8627
003	.01	.6	0	21.90	0	1.33	1	.8693
004	.0 133	.798	.0033	21.95	.05	1.28	.9624	.8366
005	.0167	1.002	.0067	21.96	.06	1.27	. 9549	.8301
006	.02	1.2		21.99		1.24		
007	.0233		0133	22 04	1.4	1 10	8047	
800	.0267	1.602	.0167	22.06	.16	1.17 1.14 1.13 1 .9	.8797	
009	.03	1.8	.02	22.09	. 19	1.14	. 8571	
010	.0333	1.998	.0233	22.10	.2	1.13	.8496	.7386
011	.05	3	. C	22 23	.33	1	.7519	.6536
012	.0667	4.002	.n: 57	22.33	.43	.	.6767	.5882
013			.บ733	22 41	.51	82	6165	. 5359
014	.1	6	09	22.49	59	.74	.5564	
015	.1167		1067	22.57	67	.66		
016	1333	7 998		22.61		.62		
017	.15 .1667	9	.14	22.68	.78	.55		
018	1667	10 002	1507	20 20	00	E 1	2025	
019	. 1833	10.998	1733	22.72	87	46	. 3459	.3007
020	.2	12	19	22.11		. 46 . 43 . 39 . 36	. 3233	.281
021	.2167	13 002	2067	22.84	QA	30	. 2932	.2549
022	.2333	13 998	2233	22.04	97	. 36	.2707	.2353
023	.25	15	24	22.07	1	33	.2481	.2157
024		16 002	.2567	22.30	1.02	.31	.2331	
025	.2833		.2733			.3		
026	.3		.29		1.05	.27	203	. 1765
027	.3167		.3067			.25		
028	.3333							
029	.4167		. 4067	22.99	1.09	.24	. 1278	. 1569
030	.5	30	.4067	23.06	1.16	. 17	.12/0	.1111
031	.5833	34.998	.48	23.11 23.14 23.15	1.21	.12	.0902 .0677	.0784
032	.6667		.6567	23.14	1.24	.09	.0602	.0588
J3 3	.75	40.002	74	23.15	1.25	.06	.0602	.0523
9 34	. 8 33 3		.74	20.11	1.21	.00	.0431	.0392
		49.998	.8233	23.19	1.29	.04	.0301	.0261
035	.9167	55.002	.9067	23.20	1.3	.03	.0226	.0196
036	1	60	.99	23.22	1.32	.01	.0075	.0065
037	1.0833	64.998	1.0733	23.22	1.32	.01	.0075	.0065
038	1.1667	70.002	1.1567	23.22	1.32	.01	.0075	.0065
039	1.25	75 70, 000	1.24	23.23	1.33	-1.776e-15	0	0
040	1.3333	79.998	1.3233	23.23	1.33	-1.776e-15	0	0
041	1.4167	85.002	1.4067	23.23	1.33	-1.776e-15	0	0
042	1.5	90	1.49	23.23	1.33	-1.776e-15	0	0
043	1.583		1.573	23.23	1.33	-1.776e-15	0	0
044	1.6667	100.002	1.6567	23.23	1.33	-1.776e-15	0	0

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SAMPLE NUMBER		TIME (SECONDS)	T(0) TRANS.	XD R EADIN G	H' A/B DATUM TRANS.	H TRANS.	H/H(0) TRANS.	H./H(THE(
					. 22	1 776- 16	Δ.	
045	1.75	105	1.74	23.23	1.33	-1.776e-15	0))
046	1.833	109.98	1.823	23.23	1.33	-1.776e-15	ა ი	o o
047	1.9167	115.002	1.9067	23.23	1.33	-1.776e-15	Ô	0
048	2	120	1.99	23.23	1.33	-1.776e-15 -1.776e-15	0	0
049	2.5	150	2.49	23.23	1.33	02	015	
050	3	180	2.99	23.25	1.35			013
051	3.5	210	3.49	23.25	1.35	02	015	0.
052	4	240	3.99	23.25	1.35	02	015	01.
053	4.5	270	4.49	23.23	1.33	-1.776e-15	0	0 ()
054	_5_	300	4.99	23.23	1.33	-1.776e-15	0	
055	5 .5	330	5.49	23.23	1.33	-1.776e-15	0	0
056	6_	360	5.99	23.23	1.33	-1.776e-15	ů,	()
057	6.5	390	5.49	23.23	1.33	-1.776e-15)	i)
058	7	420	3. 9 9	23.23	1.33	-1.776e-15	0	- }
0 59	7.5	450	7.49	23.23	1.33	-1.776e-15	0	Ú
060	8	480	7.99	23.23	1.33	-1.776e-15	О	0
061	8.5	510	8.49	2 3.23	1.33	-1.776e-15	0	0
062	9	540	გ. 9 9	2 3 .23	1.33	-1.776e-15	0	0
063	9.5	570	9.49	23.23	1.33	-1.77 6e- 15	0	0
064	10	600	9 .99	23.23	1.33	0	0	0
065	12	720	11.99		0	0	0	0
066	14	840	13.99		0	0	0	0
067	16	960	15.99		Ò	0	0	0
0 68	18	1080	17.99		0	0	0	0
069	20	1200	19.99		9	9	0	0
070	22	1320	21.99		0	0	û	3
071	24	1440	2 3.9 9		Ó	Ò	O	Ú
072	26	1560	25.99		:)	9	O .	()
073	28	1680	27.99		Ð	0	0	ij
074	30	1800	29.99		0	0	0	0
075	32	1920	31.99		0	0	0	0
076	34	2040	3 3.99		0	0	0	0
077	36	2160	35.99		0	0	0	0
078	38	2280	37.99		0	0	0	0
079	40	2400	39.99		0	0	0	0
080	42	2520	41.99		0	0	0	0
081	44	2640	43.99		Ö	0	0	0
082	46	2760	45.99		Ö	Ö	0	0
083	48	2880	47.99		ŏ	Ö	Ö	0
084	50	3000	49.99		ŏ	ő	Ö	Ō
085	52	3120	51.99		ŏ	ő	ō	ŏ
086	54	3240	53.99		ŏ	ő	ŏ	ŏ
087	5 6	3360	5 5.99		Ŏ	ŏ	Ö	Ŏ
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	60	3480	57.99		0 0	0	0	Ŏ
089	00	3600	59.99		U	U	0	U



1206- 31 511 . Well 5. 4-33

Casing planeter = 0.10. 1.157 m.

Lasing radius rrev = 0.00 m.

Length of screen (L) = 0.72 m.

Maddus of borenois (rul = 0.44 m.

Thickness of Adulfer (D) = 10.71 m.

Length of screen (L) = 1.0

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Le

1.1 <u>C</u>

= 2.30

K = HYDRAULIC CONDUCTIVITY

 $K = \frac{7e^{2} \ln(k_{\bullet}, \omega)}{2L}$.083/2 = 2.309 $K = \frac{2(7.72)}{2(7.72)} = \frac{12}{12}$ $K = 1.12 \times 10^{-4} \text{ tt./sec.}$ $K = 9.66 \qquad \text{ft./da.}$ $K = 3.41 \times 10^{-3} \text{ cm./sec.}$

T = TRANSMISSIVITY

T = (K) (D) (7.48 gpd/ft)

T = (9.66) (10.72) (7.48)

T = 774.59 gpd/ft

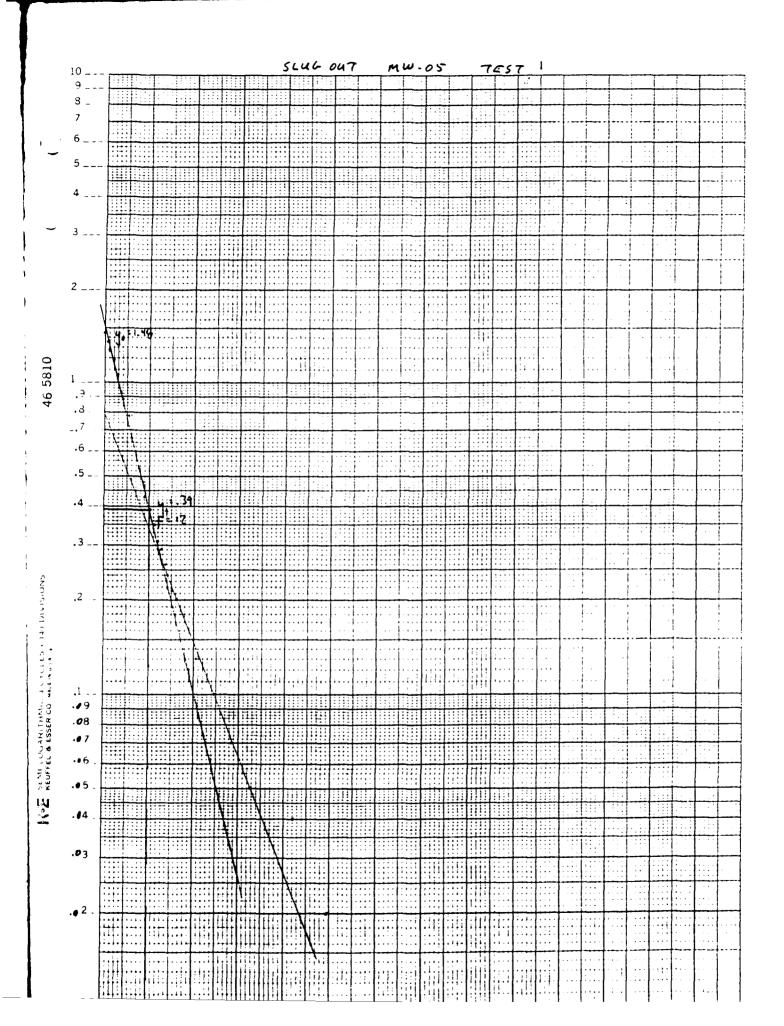
GLUG OUT TEST

	:
. MONITOR WELL NUMBER:	mW−00 1837 .
: ELEVATION TOP OF CASING:	30.04
: ELEVATION WATER (IN):	ELEVATION WATER (OUT): 14.75
DEPTH OF WELL (TOC):	JO.68 MAMETER OF CASING: .167 FFET
COCREEN LENGTH AND INTERVAL:	10 FRET. (1.5)) 2:.5 FRET HELOW GRADE
#CREEN/FILTER TOFE:	10 FAR CHILL FEMETRATIONS - IVAN GRADE FILIDA SAND
AQUIFER TYPE AND THICKNESS:	FILTE SAND AND SAND. 18 TO O REET BELOW GRADE
: H(0) TRANSLATION:	1.47 H(0) THEORETICAL: 1.55
: INITIAL CONSISTENT VALUE:	13.21 TRANS. METH. (SLUG OUT) T(0): .01
FINAL TRANSDUCER VALUE:	14.68

NUMBER	(MINUTES)	(SECONDS)	TRANS.	READING	TRANS.	H TRANS.	TRANS.	THEC .
000	0	0	01		.54	.33	.6327	
001	.0033		0067	13.23	.02	1.45	.9864	. 947
002	.0067	. 402	0033	13.13		1.55	1.0544	1.0131
003	.01	.6	0		0		1	.960₽
004	.0133			13.24		1.44	.9796	
0 05	.0167	1.002	.0067	13.28	.07	1.4	. 9524	.91ა
006	.02	1.2	.01	13.31	.1	1.37		. 8954
007	.0233	1.398	.0133	13.34	. 13	1.34	.9116	.875
800	.0267	1.602	.0167	13.36	. 15	1.32	.898	.862
009	.03	1.8	.02	13.40	. 19	1.28	.8707	.8 36 6
010	.0333	1.998	.0 23 3	13.44	.23	1.24	.8435	.810
011	.05	3	.04	13.50	. 29	1.18	.8027	.771
012	.0667	4.002	.0567		. 42	1.05	.7143	. 5863
013	.0833	4.998	.0733	13.72	.51	.96	.6531	.6275
014	.1	6	.09					.575
015	.1167	7.002	.1067		.69			
016	. 1333	7.998	.1233	14.02	.81			.4314
017	. 15	9	. 14	14.02	.88		.4014	. 385
018	.1667	10.002	.1567	14.15	.94	.53	.3605	. 346-
019	. 1833	10.002	.1733	14.13	.99	.48	. 3265	
020	. 2	10.556	.1733					.3137
020	.2167		. 2067	14.25	1.04 1.08	.43	. 2925	. 28
021	.2333	13.002	.2067	14.29	1.08	. 39	. 2653	. 254:
022	. 25			14.33	1.12	. 35	. 2381	. 2288
			.24	14.37			.2109	. 2020
024	.2667		.2567					
025	. 2833	16.998	.2733					
026	.3	18	.29	14.44	1.23			
027	.3167	19.002	. 3067	14.47			. 1429	
028	. 3333	19.998	. 3233	14.48		.2	. 1361	. 1307
029	.4167	25.002	. 4067	14.55	1.34	. 13	.0884	.085
030	.5	30	. 49	14.58	1.37	.1	.068	.0654
031	. 5833		.5733	14.58	1.4	.07	.0476	.0 45 ٤
032	.6667		. 6567	14.63	1.42		.034	.0327
	.75					.05		.0327
0 34	.8333	49. 998	.8233	14.64	1.43	.04	.0272	.0261
0 35	.9167	55.002	.9067	14.64	1.43	.04	.0272	.0261
036	1	60	.9 9	14.66	1.45	.02	.0136	.0131
037	1.0833	64.998	1.0733	14.66	1.45	.02	.0136	.013:
0 38	1.1667	70.002	1.1567	14.66	1.45	.02	.0136	.0131
039	1.25	75	1.24	14.66	1.45	.02	.0136	.0131
040	1.3333	79.998	1.3233	14.66	1.45	.02	.0136	.013:
041	1.4167		1.4067	14.66	1.45	.02	.0136	.0131
042	1.5		1.49	14.66	1.45	.02	.0136	.0131
043	1.583		1.573	14.68	1.47	1.1102e-15	0	0
044	1.6667		1.6567	14.68	1.47	1.1102e-15	0	0

SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD READING	H° A/B DATUM TRANS.	H TRANS.	H/H(O) TRANS.	H/H(0 THEOR
045	1.75	105	1.74	14.68	1.47	1.1102e-15	0	0
046	1.833	109.98	1.823	14.68	1.47	1.1102e-15	Ō	Ö
047	1.9167	115.002	1.9067	14.68	1.47	1.1102e-15	Ö	Ö
048	2	120	1.99	14.68	1.47	1.1102e-15	0	Ö
049	2.5	150	2.49	14.68	1.47	1.1102e-15	Ö	Ö
050	3	180	2.99	14.68	1.47	1.1102e-15	Ŏ	Ŏ
051	3.5	210	3.49	14.68	1.47	1.1102e-15	Ö	Ö
052	4	240	3.99	14.69	1.48	01	0068	006
053	4.5	270	4.49	14.69	1.48	01	0068	006
054	5	300	4.99	14.69	1.48	01	0068	006
055	5.5	330	5.49	14.69	1.48	01	0068	006
056	6	360	5.99	14.69	1.48	01	0068	006
057	6.5	390	6.49	14.68	1.47	1.1102e-15	0	0
058	7	420	6.99	14.69	1.48	01	0068	0065
059	7.5	450	7.49	14.68	1.47	1.1102e-15	0	0
060	8	480	7.99	14.69	1.48	01	0068	006
061	8.5	510	8.49	14.69	1.48	01	0068	006
062	9	540	8.99	14.69	1.48	01	0068	~.0065
063	9.5	570	9.49	14.69	1.48	01	0068	0065
064	10	600	9.99	14.69	1.48	01	0068	~.0065
065	12	720	11.99	14.68	1.47	0	0	0
066	14	840	13.99	14.00	0	0	0	Ö
067	16	960	15.99		Ö	Ö	Ö	ŏ
068	18	1080	17.99		0	0	0	Ö
069	20	1200	19.99		0	Ö	0	0
070	22	1320	21.99					
071	24	1440	23.99		0	0	0 0	0
072	2 4 26	1560			0	0		0
073			25.99		0 0	0	0	0
073	28 30	1680	27.99			0	0	0
075	30 32	1800	29.99		0	0	0	0
076	32 34		31.99		0	0	0	0
077	3 4 36		33.99		0	0	0	0
078		2160	35.99		0	0	0	0
	38	2280	37.99		0	0	0	0
0 79 0 80	40	2400	39.99		0	0	0	0
	42		41.99		0	0	0	0
081	44		43.99		0	0	0	0
082	46		45.99		0	0	0	0
083	48		47.99		0	0	0	0
084	50 50		49.99		0	0	0	0
085	52		51.99		0	0	0	0
086	54		53.99		0	0	0	0
087	56		55.99		0	0	0	0
088	58		5 7.99		0	0	0	0
089	60	3600	59.99		0	0	0	0

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BLUG- COT EST (Weil No. -W-09

Casing Diameter = 2 in. = .107 mg.Casing radius $(r_e) = .083 \text{ ft.}$ Length of screen (L) = 5.80 ft.Height or water from base of screen |a| = 5.80 rt.Radius of borehole $(r_w) = ...44 \text{ rt.}$ Thickness of Adulfer (D) = -5.80 rt.C = 1.75 grade $y_0 = 1.48 \text{ grade}$ $y_0 = 1.48 \text{ grade}$

= 2.03

K = HYDRAULIC CONDUCTIVITY

$$K = \frac{re^{2} \ln(R_{e}/r_{w})}{2L} \frac{1}{\tau} + \ln(y_{e}, y_{z})$$

$$(.083)^{2} \cdot (2.03) = 1$$

$$K = \frac{re^{2} \ln(R_{e}/r_{w})}{2(5.80)} + \frac{1}{12} + \ln(1.48/.39)$$

 $K = 1.34 \times 10^{-4} \text{ ft./sec.}$

K = 11.58 ft./da.

 $K = 4.08 \times 10^{-3} \text{ cm./sec.}$

T = TRANSMISSIVITY

T = (K) (D) (7.48 gpd/ft)

T = (11.58) (8.80) (7.48)

T = 762.24 gpd/ft

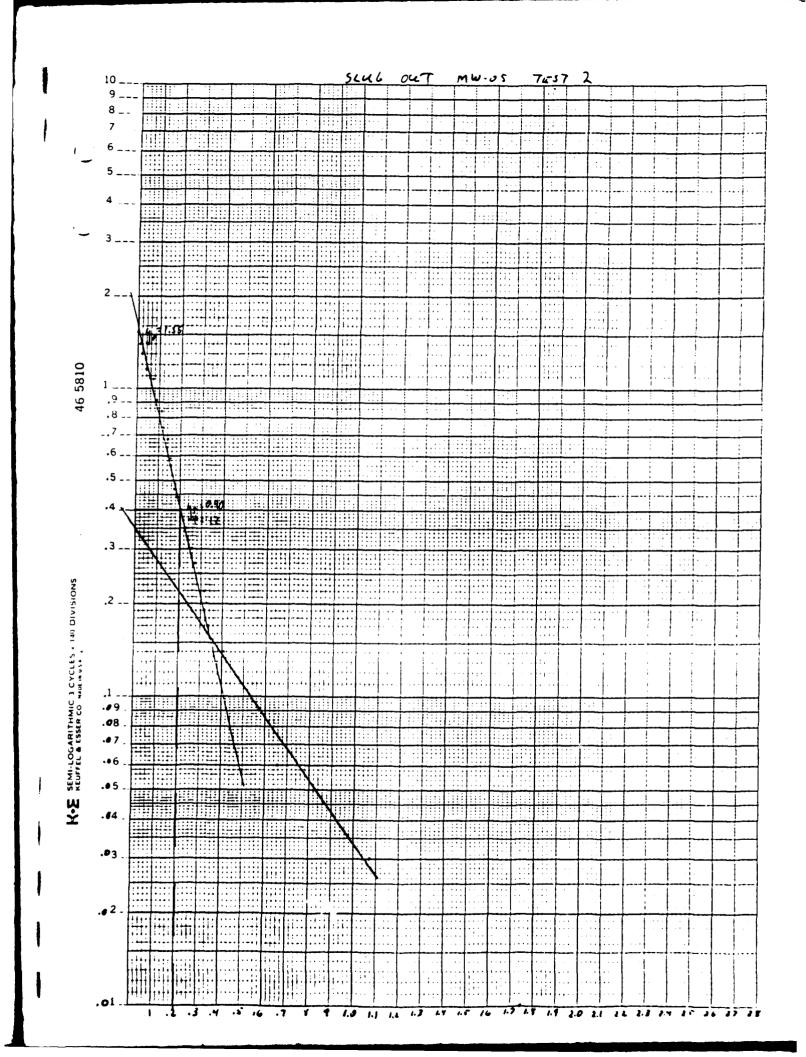
SLUG OUT TEST

		====
MONITOR WELL NUMBER:	MW-05 2MD E-ENT	;
ELEVATION TOP OF CASING:		
: ELEVATION WATER (IN):	ELEVA-ION WATER FOUT): 14.76	'
DEPTH OF WELL (TOC):	30.68 LIAMETER OF CASING: .167 FEET	
SCREEN LENGTH AND INTERVAL:	10 FEET, 16.5 TO 26.5 FEET BELOW GRADE	
SCREEN/FILTER TYPE:	# 10 PARTIALL. FENETRATING/ 20/40 GRADE BILICA SAND	
AQUIFER TOPE AND THICKNESS:	SILTY SAND OUD SAND. 19 TO T FEET BELOW GRADE	
H(0) TRANSLATION:	1.52 (0) (HEORETICAL: 1.53	
INITIAL CONSISTENT VALUE:	13.16 FRANS. METH. (SLUG GUT) T(0): .01	,
FINAL TRANSDUCER VALUE:	14.68	

NUMBER	(MINUTES)	(SECONDS)	TRANS.	READING	H' A/B DATUM TRANS.	TRANS.	TRANS.	THEOR.
000	0	0			.97			
001	.0033		0067	13.03	13	1.65	1.0855	1.0784
002	.0067	.402	0033	13.16	0	1.52	1	.9935
003	.01	.6	0	13.16	0	1.52	1	.9935
004	.0133	.798 1.002	.0033	13.16 13.22 13.25 13.28	.06	1.46	.9605	.9542
005	.0167	1.002	.0067	13.25	.09	1.43	.9408	.9346
006	.02	1.2	.01	13.28	.12	1.4	.9211	.915
007		1.398	.0133	13.33	.17	1.35	.8882	.8824
008		1.602	.0167	13.35	. 19	1.33	.875	.8693
009		1.8			.22			.8497
010	.0333		.02 3 3			1.27		.8301
011	.05	3	.04	13.52	. 36	1.16		.7582
012	.0667	4.002	.0567	13.59	. 43	1.09	.7171	.7124
013	.0833	4.998	.0733	13.60	. 44	1.08	.7105	.7059
014	•	c	.09	13.76	.6	.92	.6053	.6013
015	.1167	7.002	. 1067	13.84	. 68	.84	.5526	.549
016	.1167 .1333	7.998	. 1233	13.76 13.84 13.94 14.00	.78 .84	.74	.5526 .4868	. 4837
017	. 15	9	. 14	14.00	.84	.68	4474	. 4444
018	. 1667	10.002	. 1567	14.09	.93	.59	. 3882	.3856
019	. 1833	10.998	.1733	14.21	1.05	.47	. 3092	.3072
020	.2	12	. 19	14.24	1.08		. 2895	
021	.2167		. 2067			.4		.2614
022	.2333	13.998		14.33		. 35	.2303	.2288
023	. 25	15	.24	14.36	1.2	. 32	.2105	.2092
024	.2667	16.002	.2567 .2733 .29 .3067	14.38	1.22		. 1974	. 1961
025	.2833	16.998	.2733	14.41	1.25	.3 .27 .25	.1776	.1765
026	.3	18	. 29	14.43	1.25 1.27	25	. 1645	. 1634
027	.3167	19.002	.3067	14.46	1.3	.22	.1447	.1438
028	. 3333	19.998	.3233	14.48	1.32	.2	. 1316	.1307
029	.4167		. 4067		1.38	.14		
030	.5		. 49			.11		
031	.5833						.0592	
032	.6667	40.002	6567		1.46			.0392
033	.75	45	.74	14.62		.06		.0392
034	.8333	49.998	.8233	14.63	1.47	.05	.0329	.0327
035	.9167	55.002	.9067	14.63	1.47	.05	.0329	.0327
036	1	60	.99	14.63	1.47	.05	.0329	.0327
037	1.0833	64.998	1.0733	14.65	1.49	.03	.0197	.0196
038	1.1667	70.002	1.1567	14.65	1.49	.03	.0197	.0196
039	1.25	75.002	1.24	14.65	1.49	.03	.0197	.0196
040	1.3333	79.998	1.3233	14.65	1.49	.03	.0197	.0196
041	1.4167	85.002	1.4067	14.65	1.49	.03	.0197	.0196
041	1.5	90	1.49	14.65	1.49	.03	.0197	.0196
V76	4.0							
043	1.583	94.98	1.573	14.65	1.49	.03	.0197	.0196

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0200 1201 (.01.				H,			
SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD R EA DING	A/B DATUM TRANS.	H TRANS.	H/H(0) TRANS.	H/H(0) THE(:.
								=======================================
045	1.75	105	1.74	14.67	1.51	.01	.0066	.0065
046	1.833	109.98	1.823	14.67	1.51	.01	.0066	.00(
047	1.9167	115.002	1.9067	14.67	1.51	.01	.0066	.0065
048	2	120	1.99	14.67	1.51	.01	.0066	.0065
049	2.5	150	2.49	14.67	1.51	.01	.0066	.00(
050	3	180	2.99	14.67	1.51	.01	.0066	.0065
051	3.5	210	3.49	14.67	1.51	.01	.0066	.0065
052	4	240	3.99	14.67	1.51	.01	.0066	.000
053	4.5	270	4.49	14.67	1.51	.01	.0066	.006.
054	5	300	4.99	14.67	1.51	.01	.0066	.0065
055	5.5	330	5.49	14.67	1.51	.01	.0066	.00€
056	6	360	5.99	14.68	1.52	4.4409e-16	0	0
057	6.5	390	6.49	14.68	1.52	4.4409e-16	õ	Ó
୍ର58	7	420	6.99	14.68	1.52	4.4409e-16	Ô	Ó
0 59	7.5	450	7.49	14.67	1.51	.01	.0066	.00€
0 60	8	480	7.99	14.68	1.52	4.4409e-16	0	0
061	8.5	510	8.49	14.68	1.52	4.4409e-16	Ō	Ō
062	9	540	8.99	14.68	1.52	4.4409e-16	Ō	Ō
063	9.5	570	9.49	14.68	1.52	4.4409e-16	Ō	Ö
064	10	600	9.99	14.68	1.52	0	0	Ö
065	12	720	11.99	4	0	Ō	Ō	ŏ
066	14	840	13.99		Ö	Ö	Ō	Ö
967	16	960	15.99		Ö	Ō	Ō	Ō
068	18	1080	17.99		Ö	Ö	Ō	Ó
069	20	1200	19.99		0	0	0	Ö
070	22	1320	21.99		Ó	Ö	Ö	Ö
071	24	1440	23.99		0	Ō	0	Ö
9 72	26	1560	25.99		Ò	Ō	0	Ú
073	28	1680	27.99		0	0	0	0
074	30	1800	2 9.9 9		Ō	0	Q	ō
075	32	1920	31.99		0	0	0	Ö
076	34	2040	3 3.9 9		0	0	O	o.
077	36	2160	3 5.9 9		0	0	0	0
0 78	38	2 28 0	37.99		0	0	0	0
9 79	40	2400	3 9.9 9		O	0	0	0
080	42	2520	41.99		0	0	0	0
081	44	2 64 0	43.99		0	0	0	0
082	46	2760	45.99		0	0	0	0
083	48	2880	47.99		0	0	0	0
084	50	3000	49.99		0	0	0	0
085	52	3120	51.99		0	0	0	0
086	54		53.99		0	0	0	0
087	56		55.99		0	0	0	0
088	58	3480	57.99		0	0	0	0
089	60		59.99		0	0	0	0
							0	



SLUGH SET FRAT / Well no. nw-00

Casing planeter = 0 is. - .12, % . Casing radius $(r_e) \approx .053 \cdot t$. Length of screen $(u) \approx .050 \cdot t$. Height of water from page of screen $(u) \approx .5.50 \cdot t$. Radius of borenoie $(r_u) \approx .044 \cdot t$. Thickness of Adulter $(y) \approx .5.40 \cdot t$. C = 1.75 $y_e = 0.40 \cdot t \approx .12 \text{ sec.}$

= 2.03

K = HYDRAULIC CONDUCTIVITY

T = TRANSMISSIVITY

T = (K)/(D)/(2.48 gpa/ft)

T = (11.75) (8.80) (7.48)

T = 773.43 apd/ft

BLUG IN TEST

MONITOR WELL NUMBER:	April 1
ELEVATION (OF OF CASING:	
ELEVATION WATER (IN):	12.28 FLEVATION WATER CONTICE
DEPTH OF WELL (TOC):	27.96 GIAMHTER OF CASING: .167 FEET
SCREEN LENGTH AND INTERVAL:	10 FEET. 15.0 TO 25.0 FEET BELOW GRADE
BOREEN FILTER TIPE:	4 10 PHILE RENEURALITHON 20040 BRADE RILICA HAND
AQUIFER TYPE AND THICKNESS:	CLAYEY HILT AND SILTY CAND. 16 TO 24 FEET BELOW GRADE
H(0) TRANSLATION:	i.1 H(0) THEORETICAL: 1.53
INITIAL CONSISTENT VALUE:	13.42 TRANS. METH. (SLUG IN) T(0): .0667
FINAL TRANSDUCER VALUE:	12.32

d.

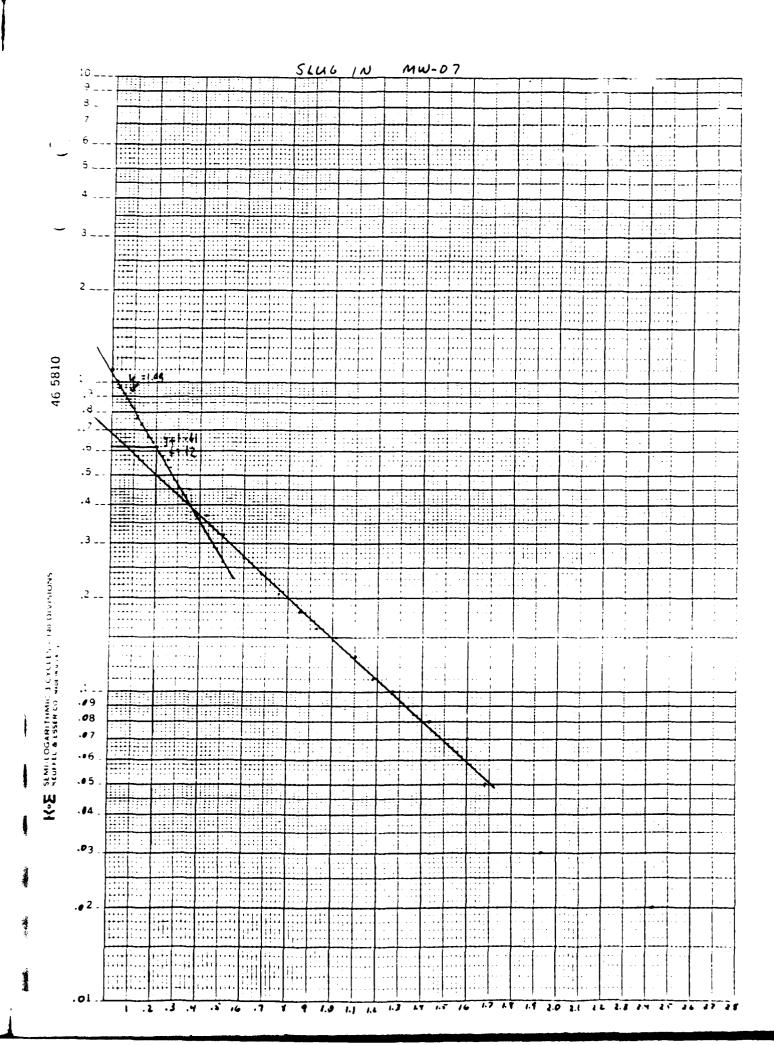
SLUG TEST IN-

SAMPLE TIME	SLUG TEST	IN:							
NUMBER	CAMDIE	MTM.	mrve	m	145	H.	••	11.61.6	11.41.40
000	SAMPLE	11DE	(SECONDS)	TRANC	ERADING	A/B DATUM	TPANC		
000	######################################		(3500123)	IMMS.	TEADING	IRANS.			
901 .0033 1.98 0634 1.3.80 .38 .72 .6545 .4706 002 .2067 .402 0667 13.69 .86 .24 .2182 .1569 003 .21 .6 0567 13.69 .27 .83 .7545 .5425 004 .0133 .798 0534 13.88 .46 .64 .5818 .4183 005 .0167 1.002 047 13.86 .4 .7 .6364 .4575 007 .0233 1.388 0434 13.89 .27 .83 .7545 .5425 008 .0267 1.602 04 14.15 .73 .37 .3364 .2418 009 .03 1.8 0367 13.45 .03 1.07 .9727 .6993 010 .0333 1.98 .0167 13.32 .1 1 .9091 .6536 012 .0667 4.002									
901 .0033 1.98 0634 1.3.80 .38 .72 .6545 .4706 002 .2067 .402 0667 13.69 .86 .24 .2182 .1569 003 .21 .6 0567 13.69 .27 .83 .7545 .5425 004 .0133 .798 0534 13.88 .46 .64 .5818 .4183 005 .0167 1.002 047 13.86 .4 .7 .6364 .4575 007 .0233 1.388 0434 13.89 .27 .83 .7545 .5425 008 .0267 1.602 04 14.15 .73 .37 .3364 .2418 009 .03 1.8 0367 13.45 .03 1.07 .9727 .6993 010 .0333 1.98 .0167 13.32 .1 1 .9091 .6536 012 .0667 4.002	აბა	0	0	- 0667	14.56	1 14	04	- 0364	0261
002 .0067 .402 06 1.4.28 86 .24 .2122 .1569 003 .01 .6 0567 13.69 .27 .63 .7545 .5425 004 .0133 .798 0534 13.88 .46 .64 .5818 .4183 005 .0167 1.002 05 14.14 .72 .38 .3455 .2484 006 .02 1.2 0467 13.82 .4 .7 .6364 .4575 007 .2233 1.386 0434 13.69 .27 .83 .7545 .5425 008 .2267 1.602 034 .4.18 .76 .3 .37 .3364 .2418 009 .33 1.8 0367 13.45 .03 1.07 .9727 .6993 010 .3333 1.98 0334 14.18 .76 .24 .3091 .222 .011 .9991 .6536									
908 .01 .6 0567 :3.69 .27 .83 .7545 .5425 004 .0133 .798 053 13.88 .46 .64 .518 .484 006 .02 1.2 0467 13.82 .4 .7 .6364 .4575 007 .0233 1.398 0434 13.69 .27 .83 .7545 .5425 008 .0267 1.602 04 14.15 .73 .37 .3364 .2418 009 .33 1.8 0334 14.18 .76 .34 .3091 .2222 011 .05 3 0167 13.32 .1 1 .3091 .6536 012 .0667 4.002 0 13.42 0 1.1 1 .719 013 .0833 4.998 .0166 13.32 .1 1 .9091 .6536 014 .1 1 .0333 <							^4		
004 .0133 .798 0534 13.86 .46 .64 .5818 .4183 005 .0167 1.002 045 14.11 .72 .38 .3455 .2484 006 .02 1.2 0434 13.69 .27 .83 .7545 .5425 008 .0267 1.602 044 13.69 .27 .83 .7545 .5425 008 .033 1.89 0367 13.45 .03 1.07 .9727 .6993 010 .03333 1.998 0334 14.18 .76 .34 .3091 .2222 011 .05 3 0167 13.32 1 1 .9091 .6536 012 .0667 4.002 9 13.42 0 1.1 1 .719 013 .0833 4.998 .0166 13.32 .1 1 .96 .8727 .6275 015 .1167 7.		.01	6						
005 .0167 1.002 05 14.14 .72 .38 .3455 .2484 006 .02 1.2 0467 13.82 .4 .7 .6364 .4575 008 .0267 1.602 04 14.15 .73 .37 .3364 .2418 009 .03 1.8 0367 13.45 .03 1.07 .9727 .6993 010 .03333 1.998 0334 1.4.18 .76 .34 .3091 .2222 011 .05 3 0167 13.32 .1 1 .9091 .6536 012 .0667 4.002 9 13.42 0 1.1 1 .719 013 .0833 4.998 .0166 13.32 .1 1 .9091 .6536 014 .1 6 .0333 13.28 .14 .96 .8727 .6275 015 .1167 7.002 .05		.0133	.798	_					
007 .0233 1.388 0434 13.69 .27 .83 .7545 .5425 008 .0267 1.602 04 14.15 .73 .37 .3364 .2418 009 .03 1.8 0367 13.45 .03 1.07 .9727 .6993 010 .03333 1.988 0167 13.32 .1 1 .3091 .6536 012 .0667 4.002 9 13.42 0 1.1 1 .719 013 .0833 4.998 .0166 13.32 .1 1 .9091 .6536 014 .1 6 .0333 13.28 .14 .96 .8727 .6275 015 .1167 7.002 .05 13.23 .19 .91 .8273 .5948 016 .1333 7.998 .0666 13.20 .2 .88 .8 .5752 017 .15 9 .0833		.0167	1.002	05	14.14	.72			
007 .0233 1.388 0434 13.69 .27 .83 .7545 .5425 008 .0267 1.602 04 14.15 .73 .37 .3364 .2418 009 .03 1.8 0367 13.45 .03 1.07 .9727 .6993 010 .03333 1.988 0167 13.32 .1 1 .3091 .6536 012 .0667 4.002 9 13.42 0 1.1 1 .719 013 .0833 4.998 .0166 13.32 .1 1 .9091 .6536 014 .1 6 .0333 13.28 .14 .96 .8727 .6275 015 .1167 7.002 .05 13.23 .19 .91 .8273 .5948 016 .1333 7.998 .0666 13.20 .2 .88 .8 .5752 017 .15 9 .0833		.02	1.2	0467	13.82	.4	. 7	. 6364	
008 .0267 1.602 04 14.15 .73 .37 .3364 .2418 009 .03 1.8 0367 13.45 .03 1.07 .9727 .6993 010 .0333 1.998 0167 13.32 .1 1 .9091 .6536 012 .0667 4.002 9 13.42 0 1.1 1 .9091 .6536 014 .1 6 .0333 13.28 .1 1 .9091 .6536 014 .1 6 .0333 13.28 .14 .96 .8727 .6275 015 .1167 7.002 .05 13.23 .19 .91 .8273 .5948 016 .1333 7.998 .0666 13.20 .22 .88 .8 .5752 017 .15 9 .0833 13.15 .27 .83 .7545 .5425 018 .1667 10.002			1.398	0434	13.69	.27	.83	.7545	
009 .73 1.8 0367 13.45 .03 1.07 .9727 .6993 010 .0333 1.998 0334 14.18 .76 .34 .3091 .2222 011 .05 3 0167 13.32 .1 1 .9091 .6536 012 .0667 4.002 9 13.42 0 1.1 1 .9091 .6536 014 .1 6 .0333 13.28 .14 .96 .8727 .6275 015 .1167 7.002 .05 13.23 .19 .91 .8273 .5948 016 .1333 7.998 .0666 13.20 .22 .88 .8 .5752 017 .15 9 .0833 13.15 .27 .83 .7545 .5425 018 .1667 10.002 .1 13.12 .3 .8 .7273 .5229 019 .1833 10.998	908	.0267	1.602	04	14.15	.73	. 37	. 3364	
010 .0333 1.998 0334 14.18 .76 .34 .3091 .5222 011 .05 3 0167 13.32 .1 1 .9091 .6536 012 .0667 4.002 0 13.42 0 1.1 1 .719 013 .0833 4.998 .0166 13.32 .1 1 9091 .6536 014 .1 6 .0333 13.28 .14 .96 .8727 .6275 015 .1167 7.002 .05 13.23 .19 .91 .8273 .5948 016 .1333 7.998 .0666 13.20 .22 .88 .8 .5752 017 .15 9 .0833 13.15 .27 .83 .7545 .5425 018 .1667 10.002 .1 13.12 .3 .8 .7273 .5229 019 .1833 10.998 .1166	909								
011 .055 3 0167 13.32 .1 1 .9091 .6536 012 .0667 4.002 ? 13.42 0 1.1 1 .719 013 .0833 4.998 .9166 13.32 .1 1 .9091 .6536 014 .1 6 .0333 13.28 .14 .96 .8727 .6275 015 .1167 7.002 .05 13.23 .19 .91 .8273 .5948 016 .13333 7.998 .0666 13.20 .22 .88 .8 .5752 017 .15 9 .0833 13.15 .27 .83 .7545 .5425 018 .1667 10.002 .1 13.12 .3 .8 .7273 .5229 019 .1833 10.998 .1166 13.09 .33 .77 .7 .7 .5033 020 .2 12 .1333<	010	. 3333	1.998						
012 .0667 4.002 0 13.42 0 1.1 1 .718 013 .0833 4.998 .0166 13.32 .1 1 .9091 .6536 014 .1 6 .0333 13.28 .14 .96 .8727 .6275 015 .1167 7.002 .05 13.23 .19 .91 .8273 .5948 016 .1333 7.998 .0666 13.20 .22 .88 .8 .57552 017 .15 9 .0833 13.15 .27 .83 .7545 .5425 018 .1667 10.002 .1 13.12 .3 .8 .7273 .5229 019 .1833 10.998 .1166 13.09 .33 .77 .7 .5033 020 .2 .12 .1333 .15.02 .4 .7 .6364 .4575 022 .2333 .13.998 .1666	011	. 05	3	0167					
013		.0667	4.002	\cap	13.42	0	1.1		
014 .1 6 .0333 13.28 .14 .96 .8727 .6275 015 .1167 7.002 .05 13.23 .19 .91 .8273 .5948 016 .1333 7.998 .0666 13.20 .22 .88 .8 .5752 017 .15 9 .0833 13.15 .27 .83 .7545 .5425 018 .1667 10.002 .1 13.12 .3 .8 .7273 .5229 019 .1833 10.998 .1166 13.09 .33 .77 .7 .5033 020 .2 12 .13333 13.05 .37 .73 .6636 .4771 021 .2167 13.002 .15 13.02 .4 .7 .6364 .4575 022 .2333 13.998 .1666 12.99 .43 .67 .6091 .4379 023 .25 15 .1833	013	.0 83 3	4.998	.0166	13.32	.1	1	.9091	
015 .1167 7.002 .05 13.23 .19 .91 .8273 .5948 016 .1333 7.998 .0666 13.20 .22 .88 .8 .5752 017 .15 9 .0833 13.15 .27 .83 .7545 .5425 018 .1667 10.002 .1 13.12 .3 .8 .7273 .5229 019 .1833 10.998 .1166 13.09 .33 .77 .7 .5033 020 .2 12 .1333 13.05 .37 .73 .6636 .4771 021 .2167 13.002 .15 13.02 .4 .7 .6364 .4575 022 .2333 13.998 .1666 12.99 .43 .67 .6091 .4379 023 .25 .15 .1833 12.96 .46 .64 .5818 .4183 024 .2667 16.002 .2 </td <td>014</td> <td>.1</td> <td>6</td> <td>.0333</td> <td>13.28</td> <td>. 14</td> <td>.96</td> <td>.8727</td> <td>.6275</td>	014	.1	6	.0333	13.28	. 14	.96	.8727	.6275
016 .1333 7.998 .0666 13.20 .22 .88 .8 .5752 017 .15 9 .0833 13.15 .27 .83 .7545 .5425 018 .1667 10.002 .1 13.12 .3 .8 .7273 .5229 019 .1833 10.998 .1166 13.09 .33 .77 .7 .5033 020 .2 12 .1333 13.05 .37 .73 .6636 .4771 021 .2167 13.002 .15 13.02 .4 .7 .6364 .4575 022 .2333 13.998 .1666 12.99 .43 .67 .6091 .4379 023 .25 15 .1833 12.96 .46 .64 .5818 .4183 024 .2667 16.002 .2 12.94 .48 .62 .5636 .4052 025 .2833 16.998 .216e	015	.1167	7.002	.05	13.23	. 19	.91	.8273	. 5948
018 .1667 10.002 .1 13.12 .3 .8 .7273 .5229 019 .1833 10.998 .1166 13.09 .33 .77 .7 .5033 020 .2 12 .1333 13.05 .37 .73 .6636 .4771 021 .2167 13.002 .15 13.02 .4 .7 .6364 .4575 022 .2333 13.998 .1666 12.99 .43 .67 .6091 .4379 023 .25 15 .1833 12.96 .46 .64 .5818 .4183 024 .2667 16.002 .2 12.94 .48 .62 .5636 .4052 025 .2833 16.998 .2166 12.91 .51 .59 .5364 .3856 026 .3 18 .2333 12.99 .52 .58 .5273 .3791 027 .3167 19.002 .	016	.1333	7.998	.0666	13.20	.22	.88		.5752
019 .1833 10.998 .1166 13.09 .33 .77 .7 .5033 020 .2 12 .1333 13.05 .37 .73 .6636 .4771 021 .2167 13.002 .15 13.02 .4 .7 .6364 .4575 022 .2333 13.998 .1666 12.99 .43 .67 .6091 .4379 023 .25 15 .1833 12.96 .46 .64 .5818 .4183 024 .2667 16.002 .2 12.94 .48 .62 .5636 .4052 025 .2833 16.998 .2166 12.91 .51 .59 .5364 .3856 026 .3 18 .2333 12.90 .52 .58 .5273 .3791 027 .3167 19.002 .25 12.88 .54 .56 .5091 .366 028 .3333 19.998 <td< td=""><td>017</td><td>. 15</td><td>9</td><td>.0833</td><td>13.15</td><td>.27</td><td>.83</td><td>. 7545</td><td>. 5425</td></td<>	017	. 15	9	.0833	13.15	.27	.83	. 7545	. 5425
019 .1833 10.998 .1166 13.09 .33 .77 .7 .5033 020 .2 12 .1333 13.05 .37 .73 .6636 .4771 021 .2167 13.002 .15 13.02 .4 .7 .6364 .4575 022 .2333 13.998 .1666 12.99 .43 .67 .6091 .4379 023 .25 15 .1833 12.96 .46 .64 .5818 .4183 024 .2667 16.002 .2 12.94 .48 .62 .5636 .4052 025 .2833 16.998 .2166 12.91 .51 .59 .5364 .3856 026 .3 18 .2333 12.90 .52 .58 .5273 .3791 027 .3167 19.002 .25 12.88 .54 .56 .5091 .366 028 .3333 19.998 <td< td=""><td>018</td><td>.1667</td><td>10.002</td><td>. 1</td><td>13.12</td><td>.3</td><td>.8</td><td>.7273</td><td>.5229</td></td<>	018	.1667	10.002	. 1	13.12	.3	.8	.72 7 3	.5229
021 .2167 13.002 .15 13.02 .4 .7 .6364 .4575 022 .2333 13.998 .1666 12.99 .43 .67 .6091 .4379 023 .25 15 .1833 12.96 .46 .64 .5818 .4183 024 .2667 16.002 .2 12.94 .48 .62 .5636 .4052 025 .2833 16.998 .2166 12.91 .51 .59 .5364 .3856 026 .3 18 .2333 12.90 .52 .58 .5273 .3791 027 .3167 19.002 .25 12.88 .54 .56 .5091 .366 028 .3333 19.998 .2666 12.85 .57 .53 .4618 .3464 029 .4167 25.002 .35 12.77 .65 .45 .4091 .2941 030 .5 .30 <	019	. 1833	10.998	.1166			.77	.7	. 503 3
022 .2333 13.998 .1666 12.99 .43 .67 .6091 .4379 023 .25 15 .1833 12.96 .46 .64 .5818 .4183 024 .2667 16.002 .2 12.94 .48 .62 .5636 .4052 025 .2833 16.998 .2166 12.91 .51 .59 .5364 .3856 026 .3 18 .2333 12.90 .52 .58 .5273 .3791 027 .3167 19.002 .25 12.88 .54 .56 .5091 .366 028 .3333 19.998 .2666 12.85 .57 .53 .4818 .3464 029 .4167 .25.002 .35 12.77 .65 .45 .4091 .2941 030 .5 30 .4333 12.69 .73 .37 .3364 .2418 031 .5833 34.998			12		13.05	.37	.73	. 6636	.4771
023 .25 15 .1833 12.96 .46 .64 .5818 .4183 024 .2667 16.002 .2 12.94 .48 .62 .5636 .4052 025 .2833 16.998 .2166 12.91 .51 .59 .5364 .3856 026 .3 18 .2333 12.90 .52 .58 .5273 .3791 027 .3167 19.002 .25 12.88 .54 .56 .5091 .366 028 .3333 19.998 .2666 12.85 .57 .53 .4818 .3464 029 .4167 .25.002 .35 12.77 .65 .45 .4091 .2941 030 .5 30 .4333 12.69 .73 .37 .3364 .2418 031 .5833 34.998 .5166 12.64 .78 .32 .2909 .2092 032 .6667 40.002				.15	13.02	. 4	.7	. 6364	. 45 75
024 .2667 16.002 .2 12.94 .48 .62 .5636 .4052 025 .2833 16.998 .2166 12.91 .51 .59 .5364 .3856 026 .3 18 .2333 12.90 .52 .58 .5273 .3791 027 .3167 19.002 .25 12.88 .54 .56 .5091 .366 028 .3333 19.998 .2666 12.85 .57 .53 .4818 .3464 029 .4167 .25.002 .35 12.77 .65 .45 .4091 .2941 030 .5 30 .4333 12.69 .73 .37 .3364 .2418 031 .5833 34.998 .5166 12.64 .78 .32 .2909 .2092 032 .6667 40.002 .6 12.59 .83 .27 .2455 .1765 033 .75 45		. 2 33 3						. 6091	. 4379
025 .2833 16.998 .2166 12.91 .51 .59 .5364 .3856 026 .3 18 .2333 12.90 .52 .58 .5273 .3791 027 .3167 19.002 .25 12.88 .54 .56 .5091 .366 028 .3333 19.998 .2666 12.85 .57 .53 .4818 .3464 029 .4167 .25.002 .35 12.77 .65 .45 .4091 .2941 030 .5 30 .4333 12.69 .73 .37 .3364 .2418 031 .5833 34.998 .5166 12.64 .78 .32 .2909 .2092 032 .6667 40.002 .6 12.59 .83 .27 .2455 .1765 033 .75 45 .6833 12.56 .86 .24 .2182 .1569 034 .8333 49.998		. 25	15		12.96	. 46	. 64		
026 .3 18 .2333 12.90 .52 .58 .5273 .3791 027 .3167 19.002 .25 12.88 .54 .56 .5091 .366 028 .3333 19.998 .2666 12.85 .57 .53 .4818 .3464 029 .4167 .25.002 .35 12.77 .65 .45 .4091 .2941 030 .5 30 .4333 12.69 .73 .37 .3364 .2418 031 .5833 34.998 .5166 12.64 .78 .32 .2909 .2092 032 .6667 40.002 .6 12.59 .83 .27 .2455 .1765 033 .75 .45 .6833 12.56 .86 .24 .2182 .1569 034 .8333 .49.998 .7666 12.53 .89 .21 .1909 .1373 035 .9167 .55.002 .85 12.50 .92 .18 .1636 .1176 036		.2667	16.002	.2					
026 .3 18 .2333 12.90 .52 .58 .5273 .3791 027 .3167 19.002 .25 12.88 .54 .56 .5091 .366 028 .3333 19.998 .2666 12.85 .57 .53 .4818 .3464 029 .4167 .25.002 .35 12.77 .65 .45 .4091 .2941 030 .5 30 .4333 12.69 .73 .37 .3364 .2418 031 .5833 34.998 .5166 12.64 .78 .32 .2909 .2092 032 .6667 40.002 .6 12.59 .83 .27 .2455 .1765 033 .75 .45 .6833 12.56 .86 .24 .2182 .1569 034 .8333 .49.998 .7666 12.53 .89 .21 .1909 .1373 035 .9167 .55.002 .85 12.50 .92 .18 .1636 .1176 036		.2833	16.998	.2166					
028 .3333 19.998 .2666 12.85 .57 .53 .4818 .3464 029 .4167 25.002 .35 12.77 .65 .45 .4091 .2941 030 .5 30 .4333 12.69 .73 .37 .3364 .2418 031 .5833 34.998 .5166 12.64 .78 .32 .2909 .2092 032 .6667 40.002 .6 12.59 .83 .27 .2455 .1765 933 .75 45 .6833 12.56 .86 .24 .2182 .1569 034 .8333 49.998 .7666 12.53 .89 .21 .1909 .1373 035 .9167 55.002 .85 12.50 .92 .18 .1636 .1176 036 1 60 .9333 12.48 .94 .16 .1455 .1046 037 1.0833 64.998 1.0166 12.47 .95 .15 .1364 .098 038		. 3	18	. 2333					
029 .4167 25.002 .35 12.77 .65 .45 .4091 .2941 030 .5 30 .4333 12.69 .73 .37 .3364 .2418 031 .5833 34.998 .5166 12.64 .78 .32 .2909 .2092 032 .6667 40.002 .6 12.59 .83 .27 .2455 .1765 933 .75 45 .6833 12.56 .86 .24 .2182 .1569 034 .8333 49.998 .7666 12.53 .89 .21 .1909 .1373 035 .9167 55.002 .85 12.50 .92 .18 .1636 .1176 036 1 60 .9333 12.48 .94 .16 .1455 .1046 037 1.0833 64.998 1.0166 12.47 .95 .15 .1364 .098 038 1.1667 70.002 1.1 12.45 .97 .13 .1182 .085 039									
030 .5 30 .4333 12.69 .73 .37 .3364 .2418 031 .5833 34.998 .5166 12.64 .78 .32 .2909 .2092 032 .6667 40.002 .6 12.59 .83 .27 .2455 .1765 033 .75 45 .6833 12.56 .86 .24 .2182 .1569 034 .8333 49.998 .7666 12.53 .89 .21 .1909 .1373 035 .9167 55.002 .85 12.50 .92 .18 .1636 .1176 036 1 60 .9333 12.48 .94 .16 .1455 .1046 037 1.0833 64.998 1.0166 12.47 .95 .15 .1364 .098 038 1.1667 70.002 1.1 12.45 .97 .13 .1182 .085 039 1.25 75 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>									
031 .5833 34.998 .5166 12.64 .78 .32 .2909 .2092 032 .6667 40.002 .6 12.59 .83 .27 .2455 .1765 033 .75 45 .6833 12.56 .86 .24 .2182 .1569 034 .8333 49.998 .7666 12.53 .89 .21 .1909 .1373 035 .9167 55.002 .85 12.50 .92 .18 .1636 .1176 036 1 60 .9333 12.48 .94 .16 .1455 .1046 037 1.0833 64.998 1.0166 12.47 .95 .15 .1364 .098 038 1.1667 70.002 1.1 12.45 .97 .13 .1182 .085 039 1.25 .75 1.1833 12.43 .99 .11 .1 .0719 040 1.3333 79.998 1.2666 12.42 1 .1 .0909 .0654 041						. 65	. 45	. 4091	
032 .6667 40.002 .6 12.59 .83 .27 .2455 .1765 033 .75 45 .6833 12.56 .86 .24 .2182 .1569 034 .8333 49.998 .7666 12.53 .89 .21 .1909 .1373 035 .9167 55.002 .85 12.50 .92 .18 .1636 .1176 036 1 60 .9333 12.48 .94 .16 .1455 .1046 037 1.0833 64.998 1.0166 12.47 .95 .15 .1364 .098 038 1.1667 70.002 1.1 12.45 .97 .13 .1182 .085 039 1.25 75 1.1833 12.43 .99 .11 .1 .0719 040 1.3333 79.998 1.2666 12.42 1 .1 .0909 .0654 041 1.4167 85.002 1.35 12.42 1 .1 .0909 .0654 042 <									
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034 .8333 49.998 .7666 12.53 .89 .21 .1909 .1373 035 .9167 55.002 .85 12.50 .92 .18 .1636 .1176 036 1 60 .9333 12.48 .94 .16 .1455 .1046 037 1.0833 64.998 1.0166 12.47 .95 .15 .1364 .098 038 1.1667 70.002 1.1 12.45 .97 .13 .1182 .085 039 1.25 75 1.1833 12.43 .99 .11 .1 .0719 040 1.3333 79.998 1.2666 12.42 1 .1 .0909 .0654 041 1.4167 85.002 1.35 12.42 1 .1 .0909 .0654 042 1.5 90 1.4333 12.40 1.02 .08 .0727 .0523 043 1.583 94.98 1.5163 12.40 1.02 .08 .0727 .0523			40.002	.6	12.59				
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037 1.0833 64.998 1.0166 12.47 .95 .15 .1364 .098 038 1.1667 70.002 1.1 12.45 .97 .13 .1182 .085 039 1.25 75 1.1833 12.43 .99 .11 .1 .0719 040 1.3333 79.998 1.2666 12.42 1 .1 .0909 .0654 041 1.4167 85.002 1.35 12.42 1 .1 .0909 .0654 042 1.5 90 1.4333 12.40 1.02 .08 .0727 .0523 043 1.583 94.98 1.5163 12.40 1.02 .08 .0727 .0523									
038 1.1667 70.002 1.1 12.45 .97 .13 .1182 .085 039 1.25 75 1.1833 12.43 .99 .11 .1 .0719 040 1.3333 79.998 1.2666 12.42 1 .1 .0909 .0654 041 1.4167 85.002 1.35 12.42 1 .1 .0909 .0654 042 1.5 90 1.4333 12.40 1.02 .08 .0727 .0523 043 1.583 94.98 1.5163 12.40 1.02 .08 .0727 .0523		-							
039 1.25 75 1.1833 12.43 .99 .11 .1 .0719 040 1.3333 79.998 1.2666 12.42 1 .1 .0909 .0654 041 1.4167 85.002 1.35 12.42 1 .1 .0909 .0654 042 1.5 90 1.4333 12.40 1.02 .08 .0727 .0523 043 1.583 94.98 1.5163 12.40 1.02 .08 .0727 .0523									
040 1.3333 79.998 1.2666 12.42 1 .1 .0909 .0654 041 1.4167 85.002 1.35 12.42 1 .1 .0909 .0654 042 1.5 90 1.4333 12.40 1.02 .08 .0727 .0523 043 1.583 94.98 1.5163 12.40 1.02 .08 .0727 .0523									
041 1.4167 85.002 1.35 12.42 1 .1 .0909 .0654 042 1.5 90 1.4333 12.40 1.02 .08 .0727 .0523 043 1.583 94.98 1.5163 12.40 1.02 .08 .0727 .0523									
042 1.5 90 1.4333 12.40 1.02 .08 .0727 .0523 043 1.583 94.98 1.5163 12.40 1.02 .08 .0727 .0523									
043 1.583 94.98 1.5163 12.40 1.02 .08 .0727 .0523									
044 1.6667 100.002 1.6 12.39 1.03 .07 .0636 .0458									
	044	1.6667	100.002	1.6	12.39	1.03	.07	.0636	.0458

SLUG TEST IN

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SLUG TEST	IN:							
CAMPLE	MTMP.	m*\.n			H1			
SAMPLE NUMBER	TIME	TIME	T(0)	XD	A/B DATUM	H	H/H(0)	H/H(0)
NOIDER	HINOIES	SECONDS	TRANS.	READING	TRANS.	TRANS.	TRANS.	THEOR.
								========
045	1.75	105	1.6833	12.39	1.05	.05	.0455	.0327
046	1.833	109.98	1.7663	12.37	1.05	.05	. 0455	.0327
047	1.9167	115.002	1.85	12.37	1.05	.05	. 0455	.0327
048	2	120	1.9333	12.37	1.07	.03	.0273	.0196
049	2.5	150	2.4333	12.35	1.08	. 92	.0182	.0131
050	3	180	2.9333	12.34	1.08	.02	.0182	.0131
051	3.5	210	3.4333	12.34	1.08	.02	.0182	.0131
952	4	240	3 .933 3	12.34	1.08	.02	.0182	.0131
053	4.5	270	4.4333	12.34 12.34	1.08	.02	. 0182	.0131
054	5	300	4.9333	12.34	1.1	4.4409e-16	Ą.	ì
055	5.5	330	5.4333	12.32	1.1	4.4409e-16)	ξ
056	6	360	5.9333	12.32	1.1	4.4409e-16	Q.	0
057	6.5	390	6.4333	12.32	1.1	4.4409e-16	Ú	9
058	7	420	6.9333	12.32	1.1	4.4409e-16	Ú	0
059	7.5	450	7.4333	12.32	1.1	4.4409e-16)	0
060	8	480	7.9333	12.32	1.1	4.4409e- 16	0	0
061	8.5	510	8.4333	12.32	1.1	4.4409e-16)	0
962	9	540	8.9333	12.32	1.1	4.4409e-16	9	0
063	9.5	570	9.4333	12.32	1.1	4.4409e-16	0	0
064	10	600	9.9333	12.32	0	0	Ò	0
065	12	720	11.9333		0	0	9	O
966	14	840	13.9333		0	Ò	Ö	Ō
067	16	960	15.9333		0	9	U.	0
968 969	18	1080	17.9333		0	Ö	j	n
0 69 0 70	20 2 2	1200	19.9333		0	9		ij
071	22	1320	21.9333		9	Ç	Ĵ	ú
072	24 26	1440	23.9333		0	Ú.	0	Ŏ
073	28	1560 1680	25.9333		0	Ó	Ö.	0
074	30	1800	27.9333 29.9333		0	0	Ů.	Ó
075	32	1920	31.9333		0 0	0 0	0 0	0 Ú
076	34	2040	33.9333		Ö	9	9	0
9 77	36	2160	35.9333		0	0	9	0
078	38	2280	37.9333		0	9	9	0
079	40	2400	39.9333		0	ó	0	Ö
080	42	2520	41.9333		ő	Ö	Õ	0
081	44	2640	43.9333		ő	ő	Ò	Ö
082	46	2760	45.9333		ŏ	Ö	ó	Ŏ
083	48	2880	47.9333		ŏ	ő	ő	Ő
084	50	3000	49.9333		ŏ	ŏ	ŏ	ő
085	52	3120	51.9333		ŏ	ŏ	ŏ	Ŏ
086	54	3240	53.9333		ŏ	ŏ	Ő	ő
087	56	3360	55.9333		ŏ	ŏ	Õ	ŏ
088	58	3480	57.9333		ŏ	ŏ	ò	Ŏ
089	60	3600	59.9333		ó	Ö	ō	Ō



SLUG- IN Well No. MW-07

Casing Diameter = 2 in. = .167 ft. Casing radius (r_e) = .083 ft. Length of screen (L) = 10.0 ft. Height of water from base of screen (H) = 14.08 ft. Radius of borenole (r_w) = .344 ft. Thickness of Aquifer (D) = 8.0 ft. C = 1.9 $y_e = 1.08$ $y_e = 0.61$ t = 12 sec.

= 2.77

K = HYDRAULIC CONDUCTIVITY

T = TRANSMISSIVITY

$$T = (K) (D) (7.48 \text{ gpd/ft})$$

 $K = 1.38 \times 10^{-3} \text{ cm./sec.}$

$$T = (3.92) (8.0) (7.48)$$

T = 234.57 gpd/ft

.

1

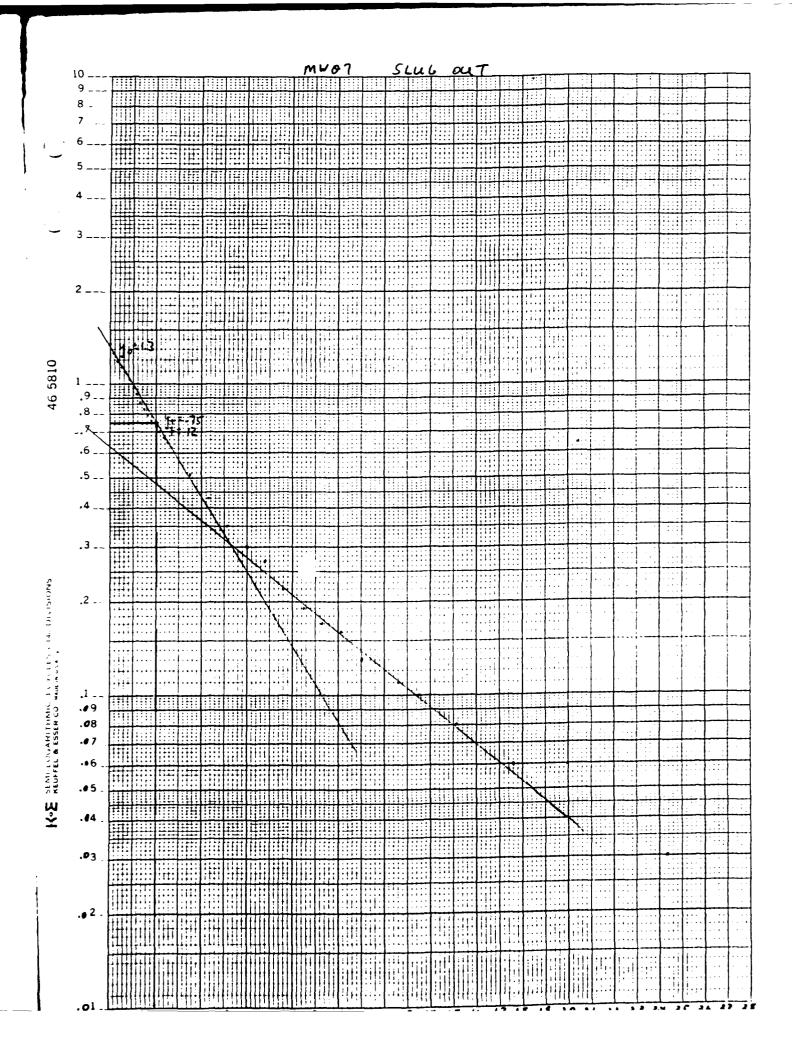
BLUG OUT TEST

MONITOR WELL NUMBER:	₹ ₩ -07
ELEVATION FOR OF CASING:	
: ELEVATION WATER (IN):	
DEPTH OF WELL (TOC):	27.96 DIAMETER OF CASING: .167 FEET
SCREEN LENGTH AND INTERVAL:	10 FEET. 15.9 TO 25.0 FEET SELOW GRADE
SCREEN/FILTER (1986)	# 10 FOLL: "EMETRALING/ CO/40 GRADE SILICA SAND
AGUIFER FORE AND THICKNESS:	CLAYEY SILT AND SILTY SAND. 15 TO 24 FEET SELOW GRADE
HEO) TRANSLATION:	1.35 H(0) THEORETICAL: 1.53
INITIAL CONSISTENT VALUE:	10.97 TRANS. METH. (SLUG OUT) T(0): .0667
FINAL TRANSDUCER VALUE:	12.32

NUMBER	(MINUTES)	(SECONDS)	TRANS.	READING	A/B DATUM TRANS.	TRANS.	TRANS.	THE(
000	0	0		11.94	.97	.38	.2815	.248
001	.0033	.198	0634	11.70	.73	.62	. 4593	. 405
002	.0067	. 402	06	11.62	. 65	.7	.5185	. 457
003	.01	.6	0567	11.22	.25	1.1	.8148	.719
004	.0133				. 38		. 7185	.60
005	.0167	1.002	05	11.75	.78	.57	. 4222	.372:
006	.02	1.2	0467 0434 04 0367	12.75	1.78	43	3185	28
007	.0233	1.398	0434	11.25	1.76 .28 1.02 1.51 .43	1.07	. 7926	.699
800	.0267	1.602	04	11.99	1.02	. 33	.2444	.215
009	.03	1.8	0367	12.48	1.51	16	1185	104
010	.0333	1.998	0334	11.40	.43	.92	.6815	.601
011	.05	3	0167	10.73	44	1.59	1.1/10	1.03
012	.0667	4.002	0	10.97	0	1.35	1	.8824
013	.0833	4.998	.0166	11.05	.08	1.27	.9407	
014	.1	6	.0333	11.13	.16	1.19	.8815	.777
015	.1167	7.002	.05	11.19	.22	1.13		
016	. 1333	7.998	.0666	11.25	.28	1.07		.6993
017	15	q	.0833	11.30		1.02	.7556	.66€
018	.1667	10.002	.1	11.35	.38	.97	7185	.63
019	.1833	10.998	1166	11.40	43	.97 .92 .87	.7185 .6815	.6013
020	.2	12	1333	11 45	48	.0 <u>_</u> 87	.6444	.568
021	.2167	13 002	.1 .1166 .1333 .15	11 49	. 1 0	.83	.6148	.542
022	.2333	13 998	.1666	11.53	56	70	.5852	.5163
023	.25		.1833		.50 50	76	.563	.496
024	.2667			11.59		.73		
025	.2833		.2166					
026	.3	18.330	.2333		. 65	.7	.5185 .4963	
027	.3167				. 68	.67	.4900	
028	.3333		. 2666	11.67	.7 .73 .84 .92	.65	.4815	. 424
028 02 9	.4167		.2000	11.70	. 13	.62	. 4593	. 4052
030	.5	25.002 30	. 35	11.01	.04	.51	.3778	. 3333
	.5833		.4333	11.89	.92	.43	.3185	.28
			.5166	11.97	1 1,05	. 35	. 2593	
	.6667		.6			.3		. 1961
	.75				1.08		.2	
034	.8333	49.998	. 7666	12.10	1.13	.22	.163	.143
035	.9167	55.002	.85	12.13	1.16	. 19	.1407	.1242
036	1	60	.9333	12.15	1.18	.17	. 1259	.1111
037	1.0833	64.998	1.0166	12.16	1.19	. 16	.1185	.104
038	1.1667		1.1	12.19	1.22	. 13	.0963	.08
039	1.25		1.1833	12.19	1.22	. 13	.0963	.085
040	1.3333		1.2666	12.21	1.24	. 11	.0815	.071
041	1.4167		1.35	12.22	1.25	.1	.0741	. 065 .
042	1.5		1.4333	12.22	1.25	.1	.0741	.0654
043	1.583		1.5163	12.24	1.27	.08	.0593	.052
044	1.6667	100.002		12.24	1.27	.08	.0593	.052

SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD READING	H' A/B DATUM TRANS.	H TRANS.	H/H(O) TRANS.	H/H(0 THEOR
045	1.75	105	1.6833	12.24	1.27	.08	.0593	.0523
046	1.833	109.98	1.7663	12.26	1.29	.06	. 0444	.0392
047	1.9167	115.002	1.85	12.26	1.29	.06	.0444	.0392
048	2	120	1.9333	12.26	1.29	.06	.0444	.0392
049	2.5	150	2.4333	12.29	1.32	.03	.0222	.0196
050	3	180	2.9333	12.30	1.33	.02	.0148	.0131
051	3.5	210	3.4333	12.30	1.33	.02	.0148	.0131
052	4	240	3.9333	12.30	1.33	.02	.0148	.0131
053	4.5	270	4.4333	12.30	1.33	.02	.0148	.0131
054	5	300	4.9333	12.30	1.33	.02	.0148	.0131
055	5.5	3 3 0	5.4333	12.30	1.33	.02	.0148	.0131
056	6	360	5.9333	12.32	1.35	4.4409e-16	0	0
057	6.5	390	6.4333	12.32	1.35	4.4409e-16	0	0
058	7	420	6.9333	12.32	1.35	4.4409e-16	0	0
059	7.5	450	7.4333	12.32	1.35	4.4409e-16	0	0
060	8	480	7.9333	12.32	1.35	4.4409e~16	0	0
061	8.5	510	8.4333	12.32	1.35	4.4409e-16	0	0
062	9	540	8.9333	12.32	1.35	4.4409e-16	0	0
063	9.5	570	9.4333	12.32	1.35	4.4409e-16	Ō	0
064	10	600	9.9333	12.32	1.35	0	0	Ō
065	12	720	11.9333	22.00	0	Ö	Ö	Ô
066	14	840	13.9333		ŏ	Ö	ŏ	0 0 0
067	16	960	15.9333		Ö	Ö	ŏ	Õ
068	18	1080	17.9333		ŏ	ŏ	ŏ	0
069	20	1200	19.9333		ŏ	ŏ	ŏ	ő
070	22	1320	21.9333		ő	ŏ	ŏ	ő
071	24	1440	23.9333		õ	ő	0	o
072	26	1560	25.9333		ő	Ŏ	0	ŏ
073	28	1680	27.9333		0	0	Ò	0
074	30	1800	29.9333		0	ő	0	
075	3 2	1920				Ö	0	0
076	3 4	2040	31.9333 33.9333		0	0	0	0
077	36	2160	35.9333		0	0	0	0 0
078	38				0			
079			37.9333		0	0	0	0
	40	2400	39.9333		0	0	0	0
080	42	2520	41.9333		0	0	0	0
081	44	2640	43.9333		0	0	0	0
082	46	2760	45.9333		0	0	0	0
083	48		47.9333		0	0	0	0
084	50		49.9333		0	0	0	0
085	52		51.9333		0	0	0	0
086	54		53.9333		0	0	0	0
087	56		55.9333		0	0	0	0
088	58		57.9333		0	0	0	0
089	60	3600	59.9333		0	0	0	0
					0		0	

į



5LUG- 0UT Well No. 69-07

Casing Diameter = 2 in. = .107 ft.

Casing radius (r_e) = .083 ft.

Cength of screen (L) = 10.0 ft.

Height of water from base of screen .H) = 14.08 ft.

Radius of borehole (r_w) = .344 ft.

Thickness of Aquiter (D) = 8.0 ft.

C = 1.9 r_0 = 1.30 r_0 = 0.75 r_0 = 12 sec.

= 2.77

K = HYDRAULIC CONDUCTIVITY

$$K = \frac{r_e^2 \ln(R_e/r_e)}{2L} + \frac{1}{2 \cdot (.085) \cdot 8 \cdot (2.77)} = \frac{1}{12}$$

$$K = \frac{1}{2 \cdot (10.0)} + \frac{1}{12}$$

$$K = \frac{4.37 \times 10^{-6} \text{ ft./sec.}}{12}$$

$$K = \frac{3.79}{12} + \frac{1}{12}$$

 $K = 1.33 \times 10^{-3} \text{ cm./sec.}$

T = TRANSMISSIVITY

$$T = (K) (D) (7.48 \text{ gpd/ft})$$

$$T = (3.79) (8.0) (7.48)$$

T = 226.79 gpd/ft

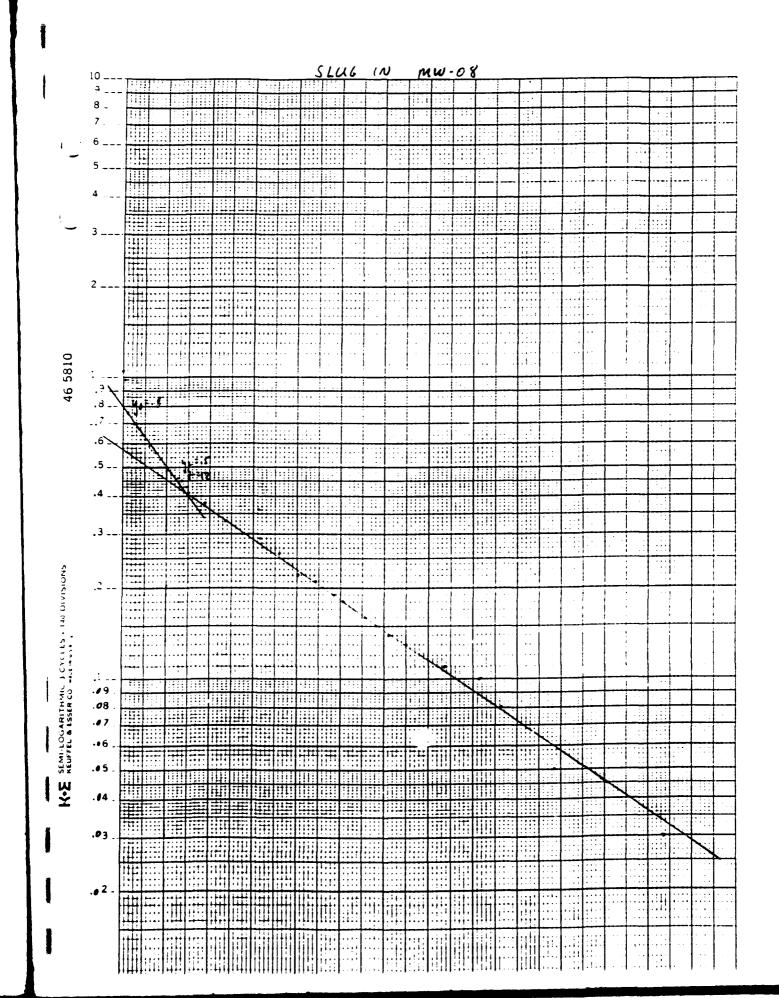
BLUG IN TEST

MONITOR WELL NUMBER:	:====================================	
	23.31	
; ELEVATION WATER (IN):	2.66 ELEVATION WATER (OUT):	
DEPTH OF WELL (TOC):	_7.35 OTAMETER OF CASING: .167 FEET	
SCREEN LENGTH AND INTERVAL:	10 FEET, 10 TO 25.0 FEET BELOW GRADE	
SCREEN/FILTER TYPE:	# 10 PARTIALL: PENETRATING/ 21/40 GRADE SILICA SAND	
AQUIFER TUFE AND THICKNESS:	PLATER PILT HND SILTY SAND. 15 TO 29 FEET BELOW GRADE	
H(0) TRANSLATION:	1.05 H(O) THEORETICAL: 1.53	
	10.72 TRANS. METH. (SLUG IN) T(0): .03	
FINAL TRANSDUCER VALUE:		

SLUG TEST	IN:							
SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.		H' A/B DATUM TRANS.		H/H(0) TRANS.	H/H(0) THEOR.
						·		
000	0	0	03	10.80	.08	.97	.9238	. 634
001	.0033	. 198	0267	13.34	2.62	-1.57	-1.4952	-1.0261
002	.0067	. 402	0233	12.55	1.83	78	7429	5098
003	.01	.6	02		.11	.94	.8952	.6144
004	.0133	.798		9.70	1.02	.03	.0286	.0196
005	.0167	1.002	0133		. 29	.76	.7238	. 4967
006	.02	1.2	01	11.52	.8	. 25	.2381	.1634
007	.0233	1.398	0067	10.80	.08	.97	.9238	.634
008	.0267	1.602	~.0033	10.58	.14	.91	.8667	. 5948
009	.03	1.8	0	10.72	0	1.05	1	.6863
010	.0333	1.998	.0033	10.66	.06	.99	.9429	.6471
011	.05	3	.02	10.43	. 29	.76	.7238	. 4967
012	.0667	4.002	.0367	10.42	.3	.75	.7143	.4902
013	.0833	4.998	.0533	10.37	. 35	.7	.6667	.4575
014	.1	6	.07	10.34	. 38	.67	.6381	.4379
015	.1167	7.002	.0867	10.31	.41	.64	. 6095	.4183
016	.1333	7.998	. 1033	10.29	. 43	.62	.5905	.4052
017	.15	9	. 12	10.26	.46	.59	.5619	. 3856
018	.1667	10.002	.1367	10.24	. 48	.57	.5429	.3725
019	.1833	10.998	. 1533	10.23	. 49	.56	.5333	.366
020	.2	12	.17	10.20	.52	.53	.5048	.3464
021	.2167 .2 33 3	13.002	. 1867	10.18	.54	.51	.4857	.3333
0 22 0 23	.2533	13.998	. 2033	10.16	.56	. 49	. 4667	.3203
023 024	.2667	15	.22	10.15	.57	. 48	. 4571	.3137
02 4 0 25	.2833	16.002 16.998	. 2367	10.15	.57	. 48	.4571	.3137
025	.3	18.996	.2533	10.13	.59	. 46	. 4381	.3007
026	.3 .3167	19.002	.27 .2867	10.12	.6	. 45	. 4286	.2941
0 27	.3333	19.002	. 3033	10.10	. 62	.43 .41	. 4095 . 3905	.281 .268
0 28 0 29	.4167	25.002	. 3033	10.08	. 64 . 67	.38	.3619	.2484
030	.5	30	.47	10.05 10.00	.72	.33	.3143	.2157
031	.5833	3 4 .998		9.97	.75	.3	.2857	.1961
032	.6667	40.002		9.96	.76	.29	.2762	.1895
033	.75	45	.72	9.93	.79	.26	.2476	. 1699
034	.8333	49.998	.8033	9.89	.83	.22	.2095	.1438
035	.9167	55.002	.8867	9.88	.84	.21	.2	.1373
036	1	60	.97	9.86	.86	.19	. 181	.1242
037	1.0833	64.998	1.0533	9.85	.87	.18	.1714	.1176
038	1.1667	70.002	1.1367	9.83	.89	.16	. 1524	.1046
039	1.25	75	1.22	9.81	.91	.14	.1333	.0915
040	1.3333	79.998	1.3033	9.80	.92	.13	. 1238	.085
041	1.4167	85.002	1.3867	9.80	.92	.13	. 1238	.085
042	1.5	90	1.47	9.78	.94	.11	.1048	.0719
043	1.583	94.98	1.553	9.78	.94	.11	.1048	.0719
044	1.6667	100.002	1.6367	9.77	.95	.1	.0952	.0654

SLUG TEST IN:

SLUG TEST	IN:							
SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD R EADIN G	H' A/B DATUM TRANS.	H TRANS.	H/H(0) TRANS.	H/H(0) THEOR.
045	1.75	105	1.72	9.77	.97	.08	.0762	.0523
046	1.833	109.98	1.803	9.75	.97	.08	.0762	.0523
047	1.9167	115.002	1.8867	9.75	.97	.08	.0762	.0523
048	2	120	1.97	9.75	1	.05	.0476	.0327
049	2.5	150	2.47	9.72	1.02	.03	.0286	.0196
050	3	180	2.97	9.70	1.03	.02	.019	.0131
051	3.5	210	3.47	9.69	1.03	.02	.019	.0131
052	4	240	3.97	9 .69	1.05	-6.661e-16	0	ŋ
053	4.5	270	4.47	9.67	1.05	-6. 661e- 16	0	0
054	5	300	4.97	9.67	1.05	-6.661e-16	0	0
055	5.5	330	5.47	9.67	1.05	-6.661e-16	0	0
056	6	360	5.97	9.67	1.05	-6.661e- 16	0	0
057	6.5	390	6.47	9.67	1.05	-6.661e-16	0	0
058	7	420	6.97	9.67	1.05	-6.661e-16	0	0
059	7.5	450	7.47	9.67	1.05	-6.661e- 16	0	0
060	8	480	7.97	9.67	1.05	-6.661e- 16	0	0
061	8.5	510	8.47	9.67	1.05	- 6.661e- 16	0	0
062	9	54 0	8.97	9.67	1.05	-6.661e-16	0	0
063	9.5	570	9.47	9.67	1.05	-6.661e- 16	0	0
064	10	600	9.97	9.67	0	0	0	0
065	12	720	11.97		0	0	0	0
066	14	840	13.97		0	0	0	0
067	16	960	15.97		0	0	0	0
0 68	18	1080	17.97		0	0	0	Ú
0 69	20	1200	19.97		0	0	0	0
070	22	1320	21.97		0	0	0	0
071	24	1440	23.97		0	0	С	0
072	26	1560	25.97		0	0	0	0
073	28	1680	27.97		0	0	0	0
074	30	1800	29.97		0	0	0	0
075	32	1920	31.97		0	0	0	0
076	34	2040	33.97		0	0	0	0
077	36	2160	35.97		0	0	0	0
078	38	2280	37.97		0	0	0	0
079	40	2400	39.97		0	0	0	0
080	42	2520	41.97		0	0	0	0
081	44	2640	43.97		0	0	0	0
082	46	2760	45.97		0	0	0	0
083	48	2880	47.97		0	0	0	0
084	50	3000	49.97		0	0	0	0
085 086	52	3120	51.97		0	0	0	0
086 087	5 4	3240	53.97		0	0	0	0
08 <i>1</i> 088	56 50	3360	55.97		0	0	0	0
	58 60	3480	57.97		0	0	0	0
089	60	3600	59.97		0	0	0	0



SLub- in Well No. .W-ve

Casing prameter = 2 in. = .167 ft.

Lasing radius (rg) = .083 ft.

Length of screen (L) = 10.0 ct.

Helght of water from pase of screen (H) = 10.70 vt.

Addius of borenoie (rw) = 10.44 ct.

Thickness of Aguirer (0.44 ct.)

C = 10.70 vc = 0.80 vc = 0.80 vc = 10.80 ct.

=1 ln(R⊕ ru, = ------ + ---ln H ru = ±/ru

= \\ \frac{1.1}{\cdot \text{i.9}} \\ \text{in(10.79/.344)} \\ \text{(10.0/.344)} \\ \tex

= 2.59

K = HYDRAULIC CONDUCTIVITY

$$K = \frac{re^{2} \ln(R_{\bullet}, r_{\bullet})}{2L} + \frac{1}{t} + \ln(v_{\bullet}/y_{\bullet})$$

$$= \frac{(.085)^{2} \cdot (1.5)}{t} + \frac{1}{t}$$

$$K = \frac{10.00}{2(10.0)} + \frac{1}{12}$$

$$K = 3.49 \times 10^{-9} \text{ ft./sec.}$$

T = TRANSMISSIVITY

T = (K) (D) (7.48 gpd/ft)

K = 3.02 ft./da.

 $K = 1.07 \times 10^{-3} \text{ cm./sec.}$

T = + 3.02) (13.0) (7.48)

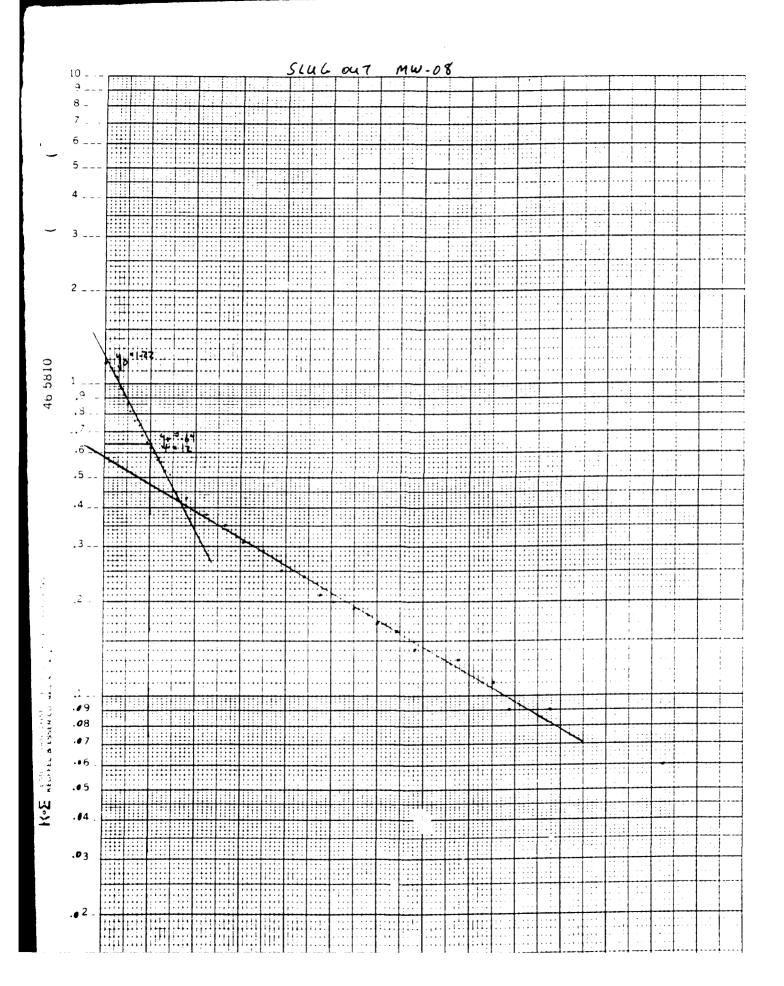
T = 193.60 apd/ft

BLUG OUT TEST

100 00 (0)	
MONITOR WELL NUMBER:	ศพ-บร์
ELEVATION TOP OF CASING:	
ELEVATION WATER (IN):	SLEVATION WHITER (OUT): 9.66
DEPTH OF WELL (TOC):	17.35 VIAMETER OF CASING: .167 FEET
SCREEN LENGTH AND INTERVAL:	10 FEET. 15.0 TG 05.0 FEET RELOW GRADE
SCREEN FILTER FUTE:	≈ 10 F # (IHCL TEMETRA)[NO/ 20/40 BRADE SILICA SAND
AQUITER TYPE AND THICKNESS:	CARRY RELT AND SELTY SAND. IS TO 29 FEET FELOW GRADE
H(O) TRANSLATTON:	1.18 H(0) (HEORETICAL: 1.53
INITIAL CONSISTENT VALUE:	3.49 TRANS. METH. (SLUG OUT) T(0): .05
FINAL TRANSDUCER VALUE:	9.67

J1	NG TEST C	, o i .		н.						
	NUMBER	TIME (MINUTES)	(SECONDS)	TRANS.	READING	A/B DATUM	TRANS.	TRANS.	H/H(0) THE(.	
	000	0	0	05	9 64	1.15	.03	.0254	.015	
	001		. 198		8 97	48	.7	.5932	. 45%	
	002	.0067	. 402	0433	8 94	45	.73	.6186	.4771	
	003	.01	.6	04	9.05	.56	.7 .73 .62 .76	. 5254	.4052	
	004	.0133	.798	0367	8.91	.42	.76	. 6441	. 496	
	005	.0167	1.002	0333	9.29	R	. 38	. 322	. 2464	
	006	.02	1.2		9.85	1.36	18	1525	1176	
	007	.0233		0267	8.92		. 75	. 6356		
	008	.0267	1.602			. 29		. 7542		
	009	.03	1.8		10.07		4	339		
	010	.0333			9.08		. 59	.5	. 385	
	011	.05	3	0	8.49			1	.771	
	012	.0667	4.002	.0167	8.49 8.45	04	1.18	1.0339	.7974	
	013	.0833	4.998	.0333	8.54	(In	1.10	.9576	.7381	
	014	.1	6	05	8.54 8.62	. 13	1.05	. 8 89 8	. 68€	
	015		7.002	.0667	8.70	.21	.97	. 822		
	016	.1333	7.998	.0833	8.76	. 27	.91	.7712		
	017	. 15	9	.1	8.81				. 562	
	018		10.002		8.86					
	019	.1833	10.998			. 42		.6441		
	020	.2	12		8.94	. 45		. 6186	. 477	
	021	.2167	13.002	. 1667	8.99	5	68	.5763	. 444	
	022	.2333	13.998	. 1833	9.02 9.05 9.07	.53	.65 .62 .6	. 5508	. 4248	
	023	. 25	15	.2	9.05	. 5 6 . 58	. 62	. 5254	. 405^	
	024	.2667	16.002	.2167	9.07	.58	.6	. 5085	. 3 9 2	
	025	. 2833	16.998	. 2333	9.10	.61	. 57	. 4831		
	026	.3	18	. 25	9.11	. 62	.56	.4746		
	027	.3167	19.002	. 2667	9.15			. 4407		
	028	. 3 33 3	19.998	. 2833	9.16	.67				
	0 29	. 4167				. 75		. 3644	. 281	
	030	.5	30			.8	. 38	. 322	. 248	
	031	.5833	34.998	. 5333	9.32	.83	. 35	. 2966	. 228	
	032	. 6667	40.002	.6167	9.35	.86	. 32	.2712	. 2092	
	033	.75	45	.7	9.38	. 89	. 29	.2458	. 189~	
	034	.8333	49.998	. 7833	9.42	.93	. 25	.2119	. 163	
	035	.9167	55.002	.8667	9.43	.94	. 24	. 2034	. 1569	
	036	1	60	.95	9.45	.96	. 22	. 1864	. 143°	
	037	1.0833	64.998	1.0333	9.46	.97	.21	. 178	.137	
	038	1.1667	70.002	1.1167	9.48	.99	. 19	. 161	.1242	
	0 39	1.25	75	1.2	9.50	1.01	. 17	.1441	. 1111	
	040	1.3333	79.998	1.2833	9.51	1.02	. 16	. 1356	. 104	
	041	1.4167	85.002	1.3667	9.53	1.04	.14	.1186	.091	
	042	1.5	90	1.45	9.53	1.04	.14	.1186	.0915	
	043	1.583	94.98	1.533	9.54	1.05	.13	.1102	.08	
	044	1.6667	100.002	1.6167	9.54	1.05	.13	. 1102	.08	

SLUG TEST OF	UT:							
SAMPLE NUMBER	TIME MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD R EA DING	H' A/B DATUM TRANS.	H TRANS.	H/H(O) TRANS.	H/H(0) THEOR.
	=========	:=:=====						
045	1.75	105	1.7	9.56	1.07	.11	.0932	.0719
046	1.833	109.98	1.783	9.58	1.09	.09	.0763	.0588
047	1.9167	115.002	1.3667	9.58	1.09	.09	.0763	.0588
048	2	120	1.95	9.58	1.09	.09	.0763	.0588
049	2.5	150	2.45	9.61	1.12	.06	.0508	.0392
050	3	180	2.95	9.62	1.13	.05	.0424	.0327
051	3.5	210	3.45	9.64	1.15	.03	.0254	.0196
052	4	240	3.95	9.64	1.15	.03	.0254	.0196
053	4.5	270	4.45	9.65	1.16	.02	.0169	.0131
054	5	300	4.95	9.65	1.16	.02	.0169	.0131
055	5.5	330	5.45	⊋.65	1.16	. 02	.0169	.0131
056	6	360	5 .95	3.67	1.18	2.2204e-16	0	0
957	6.5	3 9 0	5.45	9.67	1.18	2. 2204e- 16	ij	0
058	7	420	6.95	9. 67	1.18	2. 2204e- 16	0	0
059	7.5	450	7.45	9.67	1.18	2. 2204e- 16	0	0
0 60	8	480	7.95	9.67	1.18	2. 2204e- 16	0	0
061	8.5	510	8.45	9.67	1.18	2.2204e-16	0	0
062	9	540	8.95	9.67	1.18	2.2204e-16	0	0
063	9.5	570	9.45	9.67	1.18	2.2204e-16	0	0
0 64	10	600	9.95	9.67	1.18	0	0	0
065	12	720	11.95		0	0	0	0 0
066	14	840	13.95		0	0	0	0
067	16	960	15.95		0	0	0 0	0
0 68	18	1080	17.95		0	0	0	0
0 69	20	1200	19.95		9	0	0	0
0 70	22	1320	21.95		0	0	0	Ó
071	24	1440	23.95		0 0	0	Ö	ŏ
072	26	1560	25.95		0	0	0	ŏ
073	28	1680	27.95		9	0	Ő	ŏ
074	30	1800	29.95		0	Ö	ŏ	ŏ
075	32	1920	31.95 3 3. 95		Ö	ŏ	Ö	Ö
076 077	34 36	2040 21 6 0	35.95		Ö	ŏ	Č	0
077	38	2280	37.95		ŏ	Õ	Ö	0
078	40	2 4 00	39.95		ŏ	Ö	Ö	0
080	42	2520	41.95		ŏ	Ö	Ú	0
0 81	44	2 64 0	43.95		ŏ	Ö	0	0
082	46	2760	45.95		ŏ	Ŏ	0	0
083	48	2880	47.95		Ö	0	0	0
084	50	3000	49.95		ŏ	Ō	0	0
085	52	3120	51.95		ŏ	0	0	0
086	5 4	3240	53.95		Ŏ	0	0	0
087	56	3360	55.95		Ö	0	0	0
088	58	3480	57.95		ŏ	Ō	0	0
089	60	3600	59.95		Ö	0	0	0
000							0	



3206- 007 Well No. 04-00

taking frameter = 0.15. = .167 %. Laking reduce (r_0) = .083 ft. Length of screen (c) = .000 ft. Height of water from pase of screen (c) = .0.00 ft. Radius of borenole (r_0) = .044 ft. Thickness of Adulter (b) = .13.00 ft. c = .17 sec.

= ...59

K = HYDRAULIC CONDUCTIVITY

T = TRANSMISSIVITY

T = (3) (7.48 qpd/ft)

T = -4.14) (13.0) (2.48)

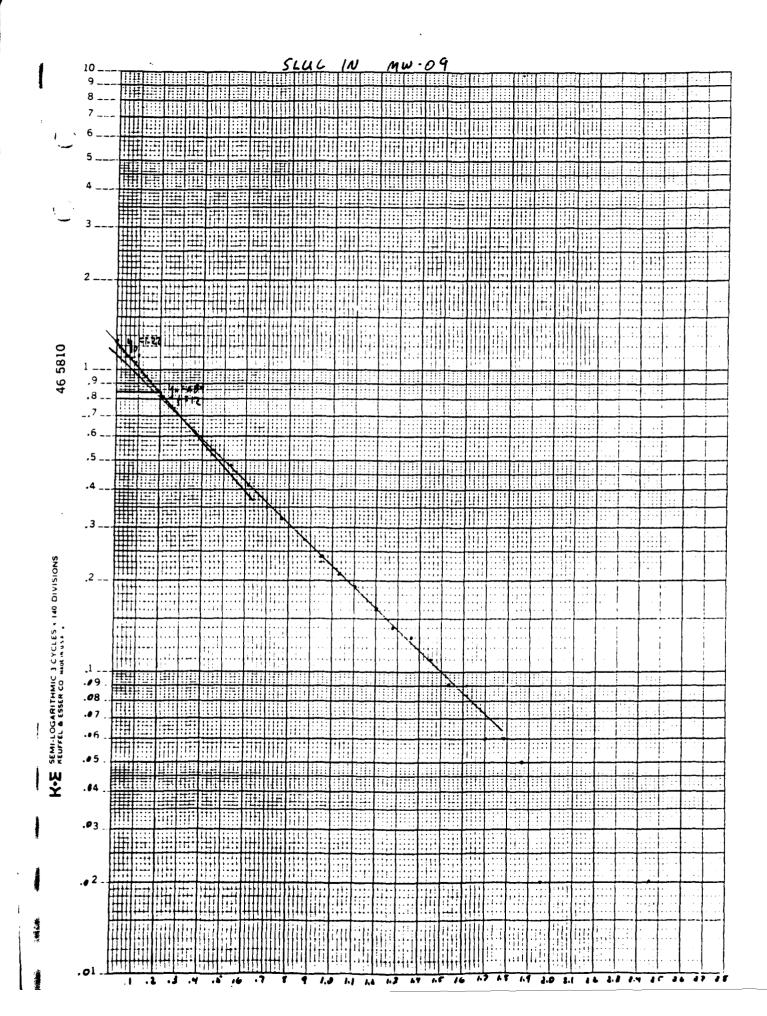
SLUG IN TEST

' ====================================	
MONITOR WELL NUMBER:	MW -09
ELEVATION TOP OF CASING:	25.27
ELEVATION WATER (IN):	8.67 ELEVATION WATER (OUT):
DEPTH OF WELL (TOC):	32.53 DIAMETER OF CASING: .167 FEET
SCREEN LENGTH AND INTERVAL:	10 FEET, 20.0 TO 30.0 FEET BELOW GRADE
SCREEN/FILTER TYPE:	# 10 PARTIALLY PENETRATING/ 20/40 GRADE SILICA SAND
AQUIFER TYPE AND THICKNESS:	CLAYEY SILT AND SILTY SAND, 19 TO ? FEET BELOW GRADE
H(0) TRANSLATION:	1.24 H(0) THEORETICAL: 1.53
INITIAL CONSISTENT VALUE:	9.89 TRANS. METH. (SLUG IN) T(0): .05
FINAL TRANSDUCER VALUE:	8.65

SLUG TES	T IN:							
SAMPL NUMBE		TIME (SECONDS)			H' A/B DATUM TRANS.	H TRANS.	H/H(0) TRANS.	H/H(0) THEOR.
						=======		=======
000	0	0	05	11.51	1.62	38	3065	2484
001	.0033	. 198	0467	11.30	1.41	17	1371	1111
002	.0067	.402	0433	10.99	1.1	. 14	. 1129	.0915
003	.01	.6	04	9.00	.89	. 35	. 2823	. 2288
004	.0133	.798	0367	10.25	. 36	.88	.7097	.5752
005	.0167	1.002	0333	10.35	. 46	.78	.629	.5098
006	.02	1.2	03	8.81	1.08	. 16	. 129	. 1046
007	.0233	1.398	0267	9.76	. 13	1.11	. 8952	. 725 5
800	.0267	1.602	0 23 3	10.53	. 64	.6	. 4839	. 3922
009	.03	1.8	02	3.67	.22	1.02	.8226	. 6667
010	.9 333	1.998	0167	3.79	. 1	1.14	.9194	.7451
911	.05	3	0	9.89	Ō	1.24	1	.8105
012	.0667	4.002	.0167	9.84	.05	1.19	. 3597	.7778
013	.0833	4.998	.0333	9.81	.08	1.16	. 9 35 5	.7582
014	.1	6	.05	9.76	.13	1.11	.8952	.7255
015	.1167	7.002	.0667	9.73	.16	1.08	.871	. 7059
016	.1333	7.998	.0833	9.70	.19	1.05	. 8468	. 686 3
017	.15	9	.1	9.67	.13	1.11	.8952	.7255
018	.1667	10.002	.1167	9.63	.26	.98	.7903	.6405
019	.1833	10.998	. 1333	9.60	.29	.95	.7661	.6209
020	.2	12	. 15		.32	.92	.7419	.6013
021	.2167	13.002	.1667	9.54	.35	.89	.7177	.5817
022	.2333	13.998	. 1833	9.51	. 38	.86	. 6935	.5621
023	.25	15	.2	9.49	. 4	.84	. 6774	.549
024	.2667	16.002	.2167	9.46	.43	.81	.6532	.5294
025	. 2833	16.998	. 2333	9.44	. 45	. 79	.6371	.5163
026	.3	18	.25	9.41	.48	. 76	.6129	. 4967
027	.3167	19.002	.2667	9.40	. 49	. 75	. 6048	.4902
028	. 3333	19.998	.2833	9.36	.53	.71	.5726	. 4641
029	.4167	25.002	. 3667	9.27	. 62	.62	.5	.4052
030	.5	30	.45	9.19	.7	.54	. 4355	. 3529
031	. 5833	34.998		9.13	.76	. 48	. 3871	.3137
032	. 6667	40.002	.6167	9.06	.83	. 41	. 3306	. 268
033	.75	45	.7	9.00	.89	. 35	. 2823	. 2288
034	.8 33 3	49.998	.7833	8.97	.92	. 32	.2581	.2092
035	.9167	55.002	.8667	8.92	.97	.27	.2177	.1765
036 037	1	60	.95	8.89	1	.24	. 1935	. 1569
	1.0833	64.998	1.0333	8.86	1.03	.21	. 1694	.1373
038 039	1.1667	70.002	1.1167	8.84	1.05	. 19	. 1532	.1242
	1.25	75 70,000	1.2	8.81	1.08	.16	.129	.1046
040	1.3333	79.998	1.2833	8.79	1.1	.14	. 1129	.0915
041 042	1.4167	85.002	1.3667	8.78	1.11	.13	.1048	.085
	1.5	90	1.45	8.76	1.13	.11	.0887	.0719
0 43 0 44	1.583	94.98	1.533	8.74	1.15	.09	.0726	.0588
944	1.6667	100.002	1.6167	8.74	1.15	.09	.0726	.0588

SLUG TEST IN:

S	LUG TEST	IN:							
=:	SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD READING	H' A/B DATUM TRANS.	H TRANS.	H/H(O) TRANS.	H/H(0) THEOR.
	045	1.75	105	1.7	8.73	1.18	.06	.0484	.0392
	046	1.833	109.98	1.783	8.71	1.18	.06	.0484	.0392
	047	1.9167	115.002	1.8667	8.71	1.19	.05	.0403	.0327
	048	2	120	1.95	8.70	1.22	.02	.0161	.0131
	049	2.5	150	2.45	8.67	1.22	.02	.0161	.0131
	050	3	180	2.95	8.67	1.24	-2.220e-16	0	0
	051	3.5	210	3.45	8.65	1.24	-2.220e-16	0	Ō
	052	4	240	3.95	8.65	1.24	-2.220e-16	0	0
	053	4.5	270	4.45	8.65	1.24	-2.220e-16	0	0
	054	5	300	4.95	8.65	1.24	-2.220e-16	0	9
	055	5.5	330	5.45	8 .65	1.24	-2.220e-16	0	Ó
	056	6	360	5.95	8.65	1.24	-2.220e-16	0	0
	057	6.5	390	6.45	8.65	1.24	-2.220e-16	0	0
	058	7	420	6.95	8.65	1.24	-2.220e- 16	0	0
	059	7.5	450	7.45	8.65	1.24	-2.220e-16	0	0
	060	8	480	7.95	8.65	1.24	-2.220e- 16	0	0
	061	8.5	510	8.45	8.65	1.24	-2.220e- 16	0	0
	062	9	540	8.95	8.65	1.24	-2.220e-16	0	0
	063	9.5	570	9.45	8.65	1.24	-2.220e-16	0	0
	0 64	10	600	9.95	8.65	0	0	0	0
	065	12	720	11.95		0	0	0	0
	066	14	840	13.95		0	0	0	0
	067	16	960	15.9 5		0	0	0	0
	0 68	18	1080	17.95		0	0	0	0
	0 69	20	1200	19.95		0	0	Q	0
	070	22	1320	21.95		0	0	0	0
	071	24	1440	23.95		0	0	0	0
	072	26	1560	25.95		0	0	0	0
	073	28	1680	27.95		0	0	0	0
	074	30	180 0	29. 95		0	0	0	0
	075	32	1920	31.95		0	0	0	0
	076	34	2040	33. 95		0	0	0	0
	077	36	2160	35. 95		0	0	0	0
	078	38	2280	37.95		0	0	0	0
	079	40	2400	39. 95		0	0	0	0
	080	42	2520	41.95		0	0	0	0
	081	44	2640	43.95		0	0	0	0
	082	46	2760	45.95		0	0	0	0
	083	48	2880	47.95		0	0	0	0
	084	50	3000	49. 95		0	0	0	0
	085	52	3120	51.95		0	0	0	0
	086	54	3240	53.95		0	0	0	0
	087	56	3360	55.95		0	0	0	0
	088	58	3480	57.95		0	0	0	0
	089	60	3600	59.95		0	0	0	0



SLUG- IN Well No. MW-09

Casing Diameter = 2 in. = .167 ft.

Casing radius (r_e) = .083 ft.

Length of screen (L) = 10.0 ft.

Height of water from base of screen (H) = 12.93 ft.

Radius of borehole (r_e) = .344 ft.

Thickness of Aquifer (D) = 14.0 ft.

C = 1.9 y_e = 1.22 y_t = 0.84 ft = 12 sec.

1.1 1.7 1.7 1 1.7

= 2.71

K = HYDRAULIC CONDUCTIVITY

$$K = \frac{re^{2} \ln(R_{\bullet}/r_{\bullet})}{2L} + \frac{1}{t}$$

$$\frac{2L}{t} + \frac{1}{t}$$

$$\frac{2L}{t} + \frac{1}{t}$$

$$\frac{2(10.0)}{2(10.0)} + \frac{1}{12}$$

$$K = \frac{2.90 \times 10^{-9} \text{ ft./sec.}}{t}$$

$$K = \frac{2.51}{t} + \frac{1}{t} \cdot \frac{1}{t}$$

$$K = \frac{3.85 \times 10^{-9} \text{ cm./sec.}}{t}$$

T = TRANSMISSIVITY

 $T \approx (K)$ (D) (7.48 qpd/ft)

T = (2.51) (14.0) (7.48)

T = 262.85 apd/ft

SLUG OUT TEST

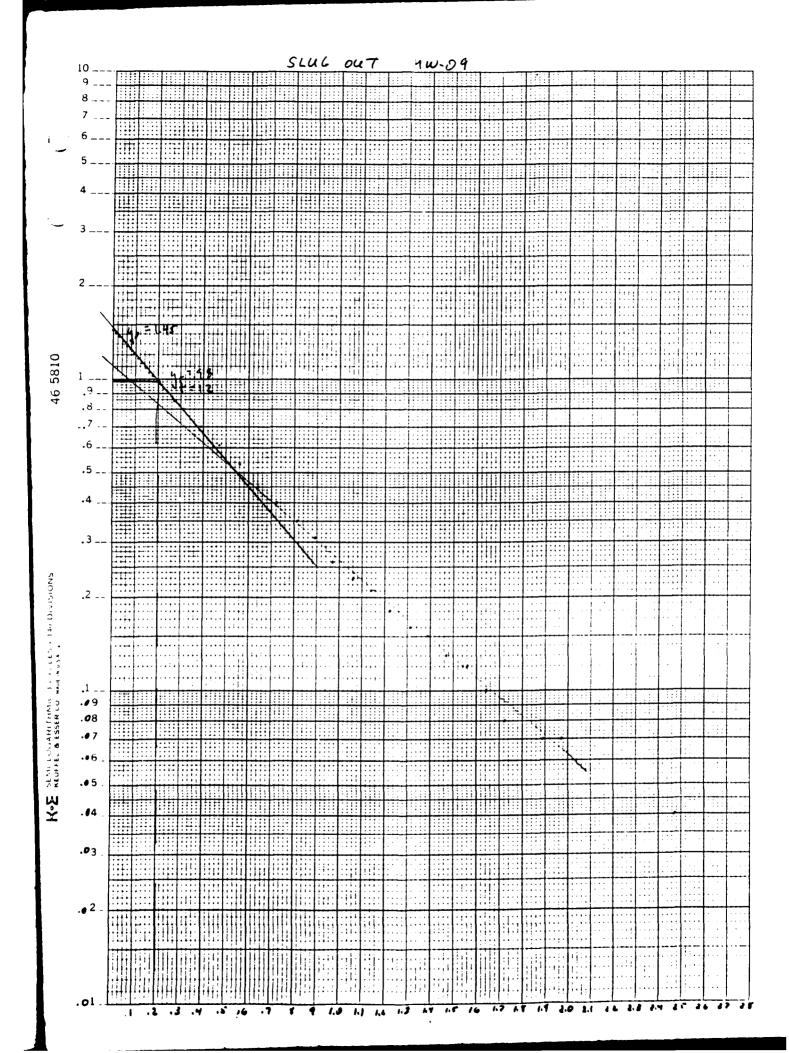
MONITOR WELL NUMBER: MW-09 ELEVATION TOP OF CASING: 25.27 ELEVATION WATER (IN): ELEVATION WATER (OUT): 8.67 ------DEPTH OF WELL (TOC): 32.53 DIAMETER OF CASING: .167 FEET ·----SCREEN LENGTH AND INTERVAL: 10 FEET, 20.0 TO 30.0 FEET BELOW GRADE SCREEN/FILTER TYPE: # 10 PARTIALLY PENETRATING/ 20/40 GRADE SILICA SAND 'AQUIFER TYPE AND THICKNESS: CLAYEY SILT AND SILTY SAND, 19 TO ? FEET BELOW GRADE H(0) TRANSLATION: 1.47 H(0) THEORETICAL: 1.53 INITIAL CONSISTENT VALUE: 7.2 TRANS. METH. (SLUG OUT) T(0): .0233 -----FINAL TRANSDUCER VALUE: 8.67

SLUG TEST OUT:

SLUG TEST	OUT:				н,			
NUMBER	(MINUTES)	(SECONDS)	TRANS.	READING	A/B DATUM TRANS.	TRANS.	TRANS.	THEOR.
000	0	0	0233	8.06	.86 .21 14	.61	.415	. 3987
001	.0033	.198	02	7.41	.21	1.26	.8571	.82^5
002	.0033 .0067	.402	0166	7.06	14	1.61	1.0952	1.0 23
003	.01	.6	0133	7.39	. 19	1.28	.8707	.8366
004	.0133	.798	01	7.08	_ 12	1 50	1 0816	1.0392
0 05	.0167	1.002	0066	7.19	01	1.48	1.0068 1 1 .9864 .9796 .966 .932	. 96 3
006	.02	1.2	0003	7.20	0	1.47	1	.96ამ
007	.0233	1.398	0	7.20	0 .02	1.47	1	.9 6 08
800	.0267		.0034	7.22	.02	1.45	. 9864	.94 7
009	.03	1.8	.0067	7.23	.03 .05 .1	1.44	.9 79 6	.94 . 2
010			.01	7.25	. 05	1.42	.966	.9281
011	.05	3	.01 .0267	7.30	.1	1.37	. 932	.89~1
012	.0667	4.002	.0434	7.35	. 15	1.32	.898	.86 7
013		4.998	.06	7.39	. 19	1.28	.8707	. 8 36 6
014	.1	6			.22			.817
015	.1167			7.47	.27	1.2	.8163	.78 3
016	.1333		.11	7.50	.3	1.17	. 7959	. 764 7
017	. 15	9	. 1267	7.55	. 35	1.12	.7619 .7415 .7143	. 732
018	.1667	10.002	. 1434	7.58	. 38	1.09	.7415	.71 4
019	. 1833	10.998	. 16	7.62	.42	1.05	.7143	. 68 .3
020	2	12	1767	7.65	.45	1.02	.6939	.6667
021	.2167	13.002	. 1934	7.68	. 48	.99	. 6 73 5	.64-1
022	.2333	13.998	.21	7.71	. 42 . 45 . 48 . 51	.96	. 6531	
023	.25	15	.2267	7.74	.54	.93	. 6327	
	.2667				.56		.619	
	.2833				.59			
026	.3				.62			
027	. 3167			7.84		.83		
028	. 3333	19 998	31	7 87	67	R	5442	52 →
029	. 4167	25.002	3934	7 97	77	.7	. 4762	. 45 م
030	_	30	4767	8.06	86	.61	.415	. 3987
031	.5 .5833 .6667	34.998	56	8 14	.77 .86 .94	.53	3605	. 34
032	6667	40 002	6434	8 22	1 02	.45	. 3061	. 29,
033	75	45	7267	8 27	1.07	.4	.2721	.2614
034	.8333	49.998	.81	8.32	1.12	. 35	.2381	.2289
035	.9167	55.002	.8934	8.36	1.16	.31	.2109	.20: 3
036	1	60	.9767	8.41	1.21	.26	.1769	. 1699
037	1.0833	64.998	1.06	8.44	1.24	.23	. 1565	.1503
038	1.1667	70.002	1.1434	8.46	1.26	.21	.1429	. 13' }
039	1.25	75	1.2267	8.49	1.29	. 18	. 1224	د ،11'،
040	1.3333	79.998	1.31	8.51	1.31	.16	.1088	.1046
041	1.4167	85.002	1.3934	8.52	1.32	.15	. 102	.05 •
042	1.5	90	1.4767	8.54	1.34	.13	.0884	.08
043	1.583	94.98	1.5597	8.55	1.35	.12	.0816	.0784
044	1.6667	100.002		8.57	1.37	.1	.068	.06F 1
V 1 1	2.000		1.0101	0.0,				

SLUG TEST OUT:

SAMPLE NUMBER	TIME MINUTES)	TIME (SECONDS)		XD R EA DING	A/B DATUM TRANS.	H TRANS.	H/H(0) TRANS.	H/H(THEO
045	1.75	105	1.7267	8.59	1.39	.08	.0544	.052
046	1.833	109.98	1.8097	8.59	1.39	. 08	. 0544	. 052
047	1.9167	115.002	1.8934	8. 6 0	1.4	.07	.0476	. 045
048	2	120	1.9767	8. 6 0	1.4	.07	.0476	.045
049	2.5	150	2.4767	8.63	1.43	.04	.0272	.026
050	3	180	2.9767	8. 6 5	1.45	.02	.0136	.013
051	3.5	210	3.4767	8. 65	1.45	.02	.0136	.013
052	4	240	3.9767	8.67	1.47	2.2204e-16	0	0
053	4.5	270	4.4767	8.67	1.47	2.2204e-16	0	0
054	5	300	4.9767	8.67	1.47	2.2204e-16	0	0
055	5.5	330	5.4767	8.67	1.47	2.2204e-16	0	0
056	6	360	5.9767	8.67	1.47	2.2204e-16	0	0
057	6.5	390	6. 4 767	3.67	1.47	2.2204e-16	0	O
058	7	420	6.9767	გ.67	1.47	2.2204e-16	0	0
0 59	7.5	450	7.4767	8.67	1.47	2.2204e-16	0	0
060	8	480	7.9767	8.67	1.47	2.2204e-16	0	0
061	8.5	510	8.4767	8.67	1.47	2.2204e-16	0	0
062	9	540	8.9767	8.67	1.47	2.2204e-16	0	0
063	9.5	570	9.4767	8.67	1.47	2.2204e-16	0	0
064	10	600	9.9767	8.67	1.47	0	0	0
065	12	720	11.9767		0	0	0	0
066	14	840	13.9767		Ō	0	0	0
067	16	960	15.9767		Ö	Ö	0	0
068	18	1080	17.9767		Ö	Ō	Ō	0
069	20	1200	19.9767		ŏ	Ö	Ŏ	Ö
070	22	1320	21.9767		ŏ	Ó	Ó	0
071	24	1440	23.9767		Ö	Õ	Ó	Ó
072	26	1560	25.9767		ő	Õ	Ō	ij
072	28	1680	27.9767		Õ	Ő	Ŏ.	ó
074	30	1800	29.9767		Ö	Ą	ñ	Ö
075	32	1920	31.9767		Ő	ó	ó	ò
076	34	2040	33.9767		ő	ó	Ò	Ó
077	36	2160	35.9767		o O	ő	Ö	Ó
077	38				ő	Ô	ŏ	Ô
		2280	37.9767		•	Ö	Ö	Ô
079	40	2400	39.9767		0	0	Ö	Ó
080	42	2520	41.9767		0 0	Ö	Ô	Ó
081	44	2640	43.9767		•		ő	Ö
082	46	2760	45.9767		0	0	0	ő
083	48	2880	47.9767		0	0		0
084	50	3000	49.9767		0	0	0	
085	52	3120	51.9767		0	0	0	0
086	54	3240	53.9767		0	0	0	0
087	56	3360	55.9767		0	0	0	0
088	58	3480	5 7.976 7		0	0	0	0
089	60	3600	59.9767		0	0	0	0



BLUG- BUT well No. MW-0-

Casing planeter = 1 in. = .107 m.

Casing radius (r_e) = .083 ft.

Wendth of screen (L) = .10.0 ft.

Heldht of water from base of screen (H) = (2.95 ft.

Radius of borehole (r_w) = .344 ft.

Thickness of Adulfer (D) = .14.0 ft. C = .17 Y_a = 1.45 Y_b = 0.78 T_a = .12 sec.

= 2.71

K = HYDRAULIC CONDUCTIVITY

T = TRANSMISSIVITY

$$T = (K) (D) (7.48 \text{ apa/rt})$$

$$T = (2.65) (14.0) (7.48)$$

T = 275.41 gpa/ft

ELUG IN TEST

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- · · · · · · · · · · · · · · · · · · ·

SLUG TEST	IN:							
SAMPLE NUMBER		(SECONDS)	TRANS.	READING	H' A/B DATUM TRANS.	TRANS.	TRANS.	
000	0	0	05	15.44	5.14	-4.06	-3.7593	-2.6536
		. 198		13.34	3.04			-1.281
002	.0067	.402		3.99	.31	.77	.713	.5033
003	.01	.6	04		06	1.02	.9444	.6667
J 04	.0133	.798	0367		.99	.09	.0 83 3	.0588
005	.0167	1.002	0333	10.69	. 39	. 69	. 6389	. 451
006	.02	1.2	03	10.73	.43	. 65	.6019	. 4248
007	.0233	1.398	0267	10.59	. 29			
800	.0267		0233		. 26			
90 9	.03				0	1.08	1	. 7059
010	.0333	1.998	0167	10.46			.8519	.6013
011	.05	3	0	10.30		1.08	1	. 7059
012	.0667	4.002	.0167	10.29	.01	1.07	.9907	. 699 3
013	.0833	4.998	.0333	10.24	.06	1.02	.9444	.6667
014	.1	6	.05	10.21	.09	.99	.9167	. 6471
015	.1167	7.002	.000/	10.18	.12	.96	.8889	.6275
016	.1333		.0833	10.14	. 16	.92	.8519	
017	. 15	9	.1		. 19			
018	. 1667	10.002	.1167	10.08	.22			
019	. 1833		. 1333	10.05	. 25		. 768 5	.5425
020	.2		.15		.27		. 75	
021	.2167	13.002	. 1667	10.00	.3	.78	.7222	.50 9 8
022	.2333		. 1833	9.99	. 31	.77	.713	.5033
0 23	. 25	15		9.95	. 35	.73	. 6759	.4771
024	.2667	16.002	.2167	9.94	. 36	.72	. 6667	.4706
025	.2833	16.998	. 2333	9.92	. 38	.7	.6481	. 4575
026	.3	18	.25	9.89	.41	.67	.6204	.4379
027	.3167	19.002	. 2667		. 43			
028	. 3333		.2833	9.86	. 44			
029	.4167		. 3667		.52			
030	.5			9.70	.6		. 4444	.3137
031		34.998	.5333		. 65	.43	.3981	.281
032	.6667	40.002	.6167	9.60	.7	.38	. 3519	.2484
			.7		.74	.34	.3148	.2222
034	.8333	49.998	.7833	9.52	.78	.3	.2778	.1961
035	.9167	55.002	.8667	9.49	.81	.27	.25	.1765
036	1	60	.95	9.46	.84	.24	. 2222	.1569
037	1.0833	64.998	1.0333	9.45	.85	.23	.213	.1503
038	1.1667	70.002	1.1167	9.41	.89	. 19	.1759	.1242
039	1.25	75 70, 000	1.2	9.40	.9	.18	. 1667	.1176
040	1.3333	79.998	1.2833	9.38	.92	.16	.1481	.1046
041	1.4167	85.002	1.3667	9.37	.93	.15	.1389	.098
042	1.5	90	1.45	9.35	.95	.13	.1204	.085
043 044	1.583 1.6667	9 4. 98 100.002	1.533 1.6167	9.35 9.33	.95 .97	.13 .11	. 1204 . 1019	.085 .0719

SLUG TEST IN:

=	SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD R EA DING	H' A/B DATUM TRANS.	H TRANS.	H/H(O) TRANS.	H/H(O) THEOR.
									
	045	1.75	105	1.7	9.32	.98	.1	.0926	.0654
	046	1.833	109. 98	1.783	9.32	.98	.1	.0926	.0654
	047	1.9167	115.002	1.8667	9.32	1	.08	.0741	.0523
	048	2	120	1.95	9.30	1.01	.07	.0648	.0458
	049	2.5	150	2.45	9.29	1.03	.05	.0463	.0327
	050	3	180	2.95	9.27	1.05	.03	.0278	.0196
	051	3.5	210	3.45	9.25	1.05	.03	.0278	.0196
	052	4	240	3.95	9.25	1.06	.02	.0185	.0131
	053	4.5	270	4.45	9.24	1.06	.02	.0185	.0131
	05.4	5	300	4.95	9.24	1.06	.02	.0185	.0131
	055	5.5	330	5.45	9.24	1.06	.02	.0185	.0131
	058	6	360	5.95	9.24	1.08	0	0	0
	057	6.5	3 9 0	6.45	9.22	1.08	0	0	0
	058	7	420	6.95	9.22	1.03	0	0	0
	059	7.5	45 0	7.45	9.22	1.08	0	0	0
	060	8	480	7.95	9.22	1.08	0	0	0
	061	8.5	510	8.45	9.22	1.08	0	0	0
	062	9	5 4 0	8.95	9.22	1.08	0	0	0
	063	9.5	570	9.45	9.22	1.08	0	0	0
	064	10	600	9.95	9.22	0	0	0	0
	065	12	720	11.95		0	0	0	0
	066	14	840	13.95		0	0	0	0
	067	16	960	15.95		0	0	0	0
	830	18	1080	17.95		0	0	0	0
	069	20	1200	19.95		0	0	0	0
	070	22	1320	21.95		0	0	0	0
	0 71	24	1440	23.95		0	0	0	0
	072	26	1560	25.95		0	0	0	0
	073	28	1680	27.95		0	0	0	0
	074	30	1800	29.95		0	0	0	0
	075	32	1920	31.95)	0	0	0
	076	34	2040	33.95		0	0	0	0
	077	36	2160	35.95		0	0	0	0
	078	38	2280	37.95		0	0	0	0
	079	40	2400	39.95		0	0	0	0
	080	42	2520	41.95		0	0	0	0
	081	44	2640	43.95		0	0	0	0
	082	46	2760	45.95		0	0	0	0
	083	48	2880	47.95		0	0	0	0
	084	50	3000	49.95		0	0	0	0
	0 85	52	3120	51.95		0	0	0	0
	086	5 4	3240	53.95		0	0	0	0
	087 088	56 58	3360	55.95		0	0	0	0
	-			- · un					

SLUG- IN Well No. nW-10

Casing Diameter = 1 in. = .167 ft.
Casing radius (r_e) = .083 ft.
Length of screen (L) = 10.0 ft.
Height of water from base of screen (H) = 13.45 ft.
Radius of borehole (r_w) = .344 ft.
Thickness of Aguifer (D) = .13.3 ft.
C = 1.7
y_o = 1.10 y_c = 0.74 ft = .12 sec.

= 2.74

K = HYDRAULIC CONDUCTIVITY

$$K = \frac{r_e^2 \ln(R_e/r_w)}{2L} + \frac{1}{t}$$

$$(.083)^2 (2.74) + 1$$

$$K = \frac{r_e^2 \ln(R_e/r_w)}{2L} + \frac{1}{t}$$

$$(.083)^2 (2.74) + 1$$

$$2(10.7) + 12$$

$$K = 2.12 \times 10^{-9} \text{ ft./sec.}$$

$$K = 2.69 + \text{ft./da.}$$

$$K = 9.50 \times 10^{-4} \text{ cm./sec.}$$

T = TRANSMISSIVITY

$$T = (K) (D) (7.48 \text{ apd/ft})$$

$$T = (2.69) (13.5) (7.48)$$

T = 271.64 apd/ft

SLUG OUT TEST

MONITOR WELL NUMBER:	πω-10
ELEVATION TOP OF CASING:	
ELEVATION WATER (IN):	ELEVATION WATER (JUT): 3.18
DEPTH OF WELL (TOC):	34.84 PIAMETER OF CASING: .167 FEET
SCREEN LENGTH AND INTERVAL:	10 FEET. 10.5 TO 30.5 FEET BELOW GRADE
BOREEN/FILTER F RE:	10 PARTIALL, MENETRATING/ 20/40 GRADE SILICA SAND
; AQUIFER TYPE AND THICKNESS:	CLAYER DILT AND SILTY SAND. 20 TO ? FEET BELOW GRADE
H(0) TRANSLATION:	1.45 = 400) THEORETICAL: 1.53
: INITIAL CONSISTENT VALUE:	7.75 TRANS. METH. (SLUG OUT) T(0): .05
FINAL TRANSDUCER VALUE:	9.2

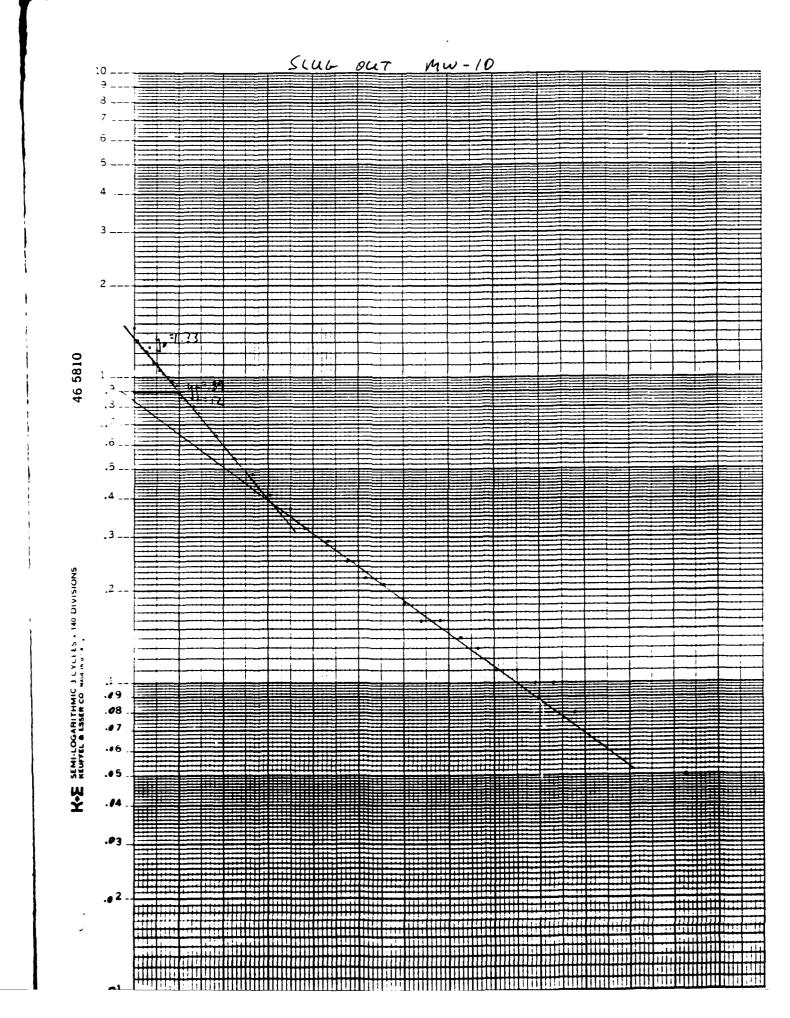
SLUG TEST OUT:

000 0 0 05 9.63 1.88 43 2966 001 .0033 .198 0467 8.55 .8 .65 .4483 002 .0067 .402 0433 8.77 1.02 .43 .2966 003 .01 .6 04 9.15 1.4 .05 .0345 004 .0133 .798 0367 9.09 1.34 .11 .0759 005 .0167 1.002 0333 7.86 .11 1.34 .9241 006 .02 1.2 03 9.63 1.88 43 2966 007 .0233 1.398 0267 9.09 1.34 .11 .0759 008 .0267 1.602 0233 8.95 1.2 .25 .1724 009 .03 1.8 02 7.72 03 1.48 1.0207 010 .0333 1.998 0167 8.72 .97 .48 .331 011 .05 3	H/H(O) THE(}.
001 .0033 .198 0467 8.55 .8 .65 .4483 002 .0067 .402 0433 8.77 1.02 .43 .2966 003 .01 .6 04 9.15 1.4 .05 .0345 004 .0133 .798 0367 9.09 1.34 .11 .0759 005 .0167 1.002 0333 7.86 .11 1.34 .9241 006 .02 1.2 03 9.63 1.88 43 2966 007 .0233 1.398 0267 9.09 1.34 .11 .0759 008 .0267 1.602 0233 8.95 1.2 .25 .1724 009 .03 1.8 02 7.72 03 1.48 1.0207 011 .055 .0333 1.998 0167 8.72 .97 .48 .331	=====: :==
001 .0033 .198 0467 8.55 .8 .65 .4483 002 .0067 .402 0433 8.77 1.02 .43 .2966 003 .01 .6 04 9.15 1.4 .05 .0345 004 .0133 .798 0367 9.09 1.34 .11 .0759 005 .0167 1.002 0333 7.86 .11 1.34 .9241 006 .02 1.2 03 9.63 1.88 43 2966 007 .0233 1.398 0267 9.09 1.34 .11 .0759 008 .0267 1.602 0233 8.95 1.2 .25 .1724 009 .03 1.8 02 7.72 03 1.48 1.0207 011 .0333 1.998 0167 8.72 .97 .48 .331	201
002 .0067 .402 0433 8.77 1.02 .43 .2966 003 .01 .6 04 9.15 1.4 .05 .0345 004 .0133 .798 0367 9.09 1.34 .11 .0759 005 .0167 1.002 0333 7.86 .11 1.34 .9241 006 .02 1.2 03 9.63 1.88 43 2966 007 .0233 1.398 0267 9.09 1.34 .11 .0759 008 .0267 1.602 0233 8.95 1.2 .25 .1724 009 .03 1.8 02 7.72 03 1.48 1.0207 010 .0333 1.998 0167 8.72 .97 .48 .331	.42
003 .01 .6 04 9.15 1.4 .05 .0345 004 .0133 .798 0367 9.09 1.34 .11 .0759 005 .0167 1.002 0333 7.86 .11 1.34 .9241 006 .02 1.2 03 9.63 1.88 43 2966 007 .0233 1.398 0267 9.09 1.34 .11 .0759 008 .0267 1.602 0233 8.95 1.2 .25 .1724 009 .03 1.8 02 7.72 03 1.48 1.0207 011 .0333 1.998 0167 8.72 .97 .48 .331	.281
004 .0133 .798 0367 9.09 1.34 .11 .0759 005 .0167 1.002 0333 7.86 .11 1.34 .9241 006 .02 1.2 03 9.63 1.88 43 2966 007 .0233 1.398 0267 9.09 1.34 .11 .0759 008 .0267 1.602 0233 8.95 1.2 .25 .1724 009 .03 1.8 02 7.72 03 1.48 1.0207 010 .0333 1.998 0167 8.72 .97 .48 .331	.0327
005 .0167 1.002 0333 7.86 .11 1.34 .9241 006 .02 1.2 03 9.63 1.88 43 2966 007 .0233 1.398 0267 9.09 1.34 .11 .0759 008 .0267 1.602 0233 8.95 1.2 .25 .1724 009 .03 1.8 02 7.72 03 1.48 1.0207 010 .0333 1.998 0167 8.72 .97 .48 .331	.07.
006 .02 1.2 03 9.63 1.88 43 2966 007 .0233 1.398 0267 9.09 1.34 .11 .0759 008 .0267 1.602 0233 8.95 1.2 .25 .1724 009 .03 1.8 02 7.72 03 1.48 1.0207 010 .0333 1.998 0167 8.72 .97 .48 .331	.875d
007 .0233 1.398 0267 9.09 1.34 .11 .0759 008 .0267 1.602 0233 8.95 1.2 .25 .1724 009 .03 1.8 02 7.72 03 1.48 1.0207 010 .0333 1.998 0167 8.72 .97 .48 .331	281
008	.07. 🖯
010 .0333 1.9980167 8.7203 1.48 1.0207	.161
010 .0333 1.9980167 8.72 .97 .48 .331	.9673
	.31(7
7.75	.94
012 .0667 4.002 .0167 7.88 .13 1.32 9103	.8627
013 .0833 4.998 .0333 7.93 .18 1.27 .8759	.8301
0.14 0.1 6 0.05 7.98 0.23 0.22 0.8414	.797
015 .1167 7.002 .0667 7.94 .19 1.26 869	.8235
016 .1333 7.998 .0833 8.09 .34 1.11 .7655	.7255
017 .15 9 .1 8.10 .35 1.1 .7586	.71
015 .1667 10.002 .1167 8.15 .4 1.05 .7241	.386
0.19	.6732
020 .2 12 .15 8.20 .45 1 .6897	.658 :
021 .2167 13.002 .1667 8.23 .48 .97 .669 022 .2333 13.998 1833 8.26 51	.63
023 25 15 1500 8.20 .51 .94 .6483	.6144
0.01 .00 .0138	.5817
025 2807 16.002 .2167 8.34 .59 .86 .5931	.562
025 .2033 16.998 .2333 8.36 .61 .84 .5793	.549
020 .3 18 .25 8.39 .64 .81 .5586	.5294
027 .3167 19.002 .2667 8.40 .65 .8 .5517	.522
026 .3333 19.998 .2833 8.44 .69 .76 .5241	.496
030 5 .000 .000 .01 .04 .4414	.4183
031 5032 34 000 .50 .51 .54 .3/24	. 352
032 6667 40 000 0107 331	.313
033 75 1.04 .41 .2828	.268
034 9332 40 000 1.00 1.00 .57 .2052	.2417
035 0167 55 000 000 1.13 .32 .2207	.209
036 1 000 000 0.31 1.10 .29 .2	.1895
037 1 0822 04 000 1 0000	.1634,
0.30 1 1.007 70 0.30 1.20 .22 .131/	.143
020 105 77 1140	. 137s ^t
040 1 3333 70 000 1.241	.1176
041 1 4167 95 000 1.200	.104
042 1 5 00 1103	.1040
043 1 583 04 00 1.50	.0915
044 1 6667 100 000 1 000	.08
044 1.8667 100.002 1.6167 9.09 1.34 .11 .0759	.071

SLUG TEST OUT:

SAMPLE NUMBER	TIME (MINUTES)	TIME (SECONDS)	T(0) TRANS.	XD RRADING	A/B DATUM TRANS.	H TRANS.	H/H(0) TRANS.	H/H(0) THEOR.
045	1.75	105	1.7	9.09	1.34	.11	.0759	.0719
046	1.833	109.98	1.783	9.10	1.35	.1	.069	.0654
047	1.9167	115.002	1.8667	9.10	1.35	.1	.069	.0654
048	2	120	1.95	9.12	1.37	.08	.0552	.0523
049	2.5	150	2.45	9.15	1.4	.05	.0345	.0323
050	3	180	2.95	9.17	1.42	.03	.0207	.0196
051	3.5	210	3.45	9.17	1.42	.03	.0207	.0196
052	4	240	3.95	9.18	1.43	.02	.0138	.0131
053	4.5	270	4.45	9.18	1.43	.02	.0138	.0131
054	5	300	4.95	9.20	1.45	6.6613e-16	0	0
055	5.5	330	5.45	9.20	1.45	6.6613e-16	0	Ö
056	6	360	5.95	9.20	1.45	6.6613e-16	0	0
057	6.5	390	6.45	9.20	1.45	6.6613e-16	0	0
058	7	420	6.95	9.20	1.45	6.6613e-16	Ŏ	Ö
059	7.5	450	7.45	9.20	1.45	6.6613e-16	0	ő
060	8	480	7.95	9.20	1.45	6.6613e-16	Ö	Ö
061	8.5	510	8.45	9.20	1.45	6.6613e-16	0	0
062	9	540	8.95	9.20	1.45	6.6613e-16	0	Ö
063	9.5	570	9.45	9.20	1.45	6.6613e-16	Ö	Ö
064	10	600	9.95	9.20	1.45	0.00136-10	0	Ö
065	12	720	11.95	3.20	0	ŏ	Ö	Ö
066	14	840	13.95		ŏ	ŏ	Ö	ŏ
067	16	960	15.95		ŏ	ŏ	ŏ	Ö
068	18	1080	17.95		Ö	ő	Ô	ő
069	20	1200	19.95		ŏ	ŏ	Ö	Ö
070	22	1320	21.95		Ö	ŏ	ŏ	Ö
071	24	1440	23.95		ŏ	ő	ŏ	ő
072	26	1560	25.95		ő	ő	ŏ	Ö
073	28	1680	27.95		ő	ŏ	Ŏ	Ö
074	30	1800	29.95		ő	ŏ	Ŏ	Ö
075	32	1920	31.95		Ö	ŏ	Ö	ŏ
076	34	2040	33.95		ŏ	ŏ	Ö	Ŏ
077	36	2160	35.95		ŏ	ŏ	ŏ	Ö
078	38	2280	37.95		ŏ	ŏ	ŏ	ŏ
079	40	2400	39.95		ŏ	ŏ	Ŏ	Ŏ
080	42	2520	41.95		ŏ	ŏ	Ö	Ŏ
081	44	2640	43.95		ŏ	Ŏ	Ŏ	ŏ
082	46	2760	45.95		ŏ	ŏ	Ŏ	Ö
083	48	2880	47.95		0	ŏ	ŏ	0
084	50	3000	49.95		0	Ö	Ö	Ö
085	52		51.95		0	0	Ö	0
086	54		53.95		0	ŏ	Ö	Ŏ
087	56		5 5.9 5		0	ŏ	0	Ŏ
088	58		57.95		0	Ŏ	0	Ö
089	60		57.95 59.95		0	Ö	0	Ö
			J J. J U		U	v	0	U

1



SEUG- SUT well no. na-co

hasing Clameter = 2 in. = .is/ ft. Casing regius (re) = .003 (t. denote of screen (L) = 10.0 %. Height or water from base on screen (it) = 12.40 %%. Hadius of borenois (ray) = -344 \odot . Thickness of Aguirer (2) = -10.8 %%. = i.9 $y_0 = 1.03$ $y_1 = 0.87$ t = -2 sec.:ntk=/ru/ = : ----- - ----B HOPW = Fw

: In(10.43/.344) : (10.0/.344) ;

= 2.74

K = HYDRAULIC CONDUCTIVITY

re2 ln(Kerry, t 1.000) 1 file, 41 2(10.0) 12 K = 5.10 x 10⁻⁵ ft./sec. K = 1.68 ft./da. K ≈ 7.45 ± 10⁻⁴ cm./sec.

T = TRANSMISSIVITY

T = (K) (D) + 7.48 apazetT = (2.68) (13.5) (7.48)

T = 270.63 apd/ft

APPENDIX C GEOPHYSICAL SURVEY REPORT

GEOPHYSICAL SURVEY REPORT
OF
ELLINGTON FIELD LANDFILL PROJECT

SUBMITTED TO

NUS CORPORATION 16360 PARK TEN PLACE, SUITE 300 HOUSTON, TEXAS 77084

BY
H. NEAL REEVES, GEOPHYSICAL CONSULTANT

NOVEMBER 27, 1989

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INTRODUCTION

This report is submitted to NUS CORPORATION(Client) of Houston, Texas, by H. Neal Reeves(Consultant) as a record of events, conclusions, and recommendations offered by Consultant to Client resulting from the geophysical survey conducted at a landfill site on the northwestern perimeter of Ellington Field south of Houston. Texas, between the dates of November 8-13, 1989.

STATEMENT OF WORK

Geophysical techniques were chosen to assist Client in obtaining a refined site assessment/site characterization of near surface conditions prior to embarking on the next phase of their work program. Which could include such items as the installation of monitoring wells, determining groundwater gradient, obtaining soil and water samples for analysis, and to obtain a more precise location of an underground storage tank generally located in the southwest quadrant of the site. Results obtained from the geophysical phase will be used by Client to avoid drilling hazards and to assist in insuring that all zones, disturbed or otherwise, are adequately characterized.

Specifically, Consultant was charged with the responsibility of acquiring, processing, and interpreting a combined Magnetometer/Gradiometer Survey as well as to process and interpret an Electromagnetic Survey conducted by Client representative, Mr. David Upthegrove, during the same period referenced above. Results of both surveys, which are complementary techniques, will be integrated with each other and with site historical data in order for very precise and specific conclusions and recommendations to be presented to Client by Consultant.

SITE CONDITIONS AND ADVANCE PREPARATION

The site can be generally described as a rectangle having an approximate 1250 ft(E/W) X 900 ft(N/S) dimension. The area is bounded for the most part on all sides by an 8 foot tall chain link fence and has a storage facility behind an inside fence located roughly in the E 1/2 of the SW Quadrant. A blacktop road parallels the fenced boundaries on all but the south side of the site. Access is excellent, elevation relief is negligible, and the area has been kept free of thick vegetation which might impede progress of the survey. Although the site had been used as a landfill periodically

over a period of years, backfilling, leveling, and the growth of grass and small trees had removed all but the scattered evidence of its former use. For example, pieces of concrete with rebars sticking out of the ground could to observed in a few locations across the site. There is, however, little current expression of the depth and aerial extent of any materials currently buried at the site.

Prior to Consultant becoming directly involved, Client contracted with the survey company of Washburn & Company to lay out a 100 ft X 100 ft control survey grid across the area This grid was marked by wooden stakes at each 100 X 100 ft corner. Line and Position convention adopted had the initial (X,Y) position (000.0,000.0) located at the northeast corner of the site. Line numbers increased to the west and Position numbers increased to the south. N''S representatives, including Mr. David Upthegrove, further refined the survey grid to a 25 ft X 25 ft interval by chaining between control survey stakes and placing pin flags at 25 ft intervals. This advance survey was in the process of being completed at the time of my arrival in the field on November 8, 1989.

As a result of preliminary discussions with Client, Consultant was requested to secure geophysical instrumentation from reputable vendors and check out the instruments prior to taking delivery on them from the vendor. Consultant arranged for this and did so on his own time.

The net result was that due to the efforts and forethought of all involved parties, the survey proceeded with all due haste and was completed essentially without delay.

GENERAL INTRODUCTION TO GEOPHYSICAL SYSTEMS UTILIZED

The geophysical systems deemed appropriate by Client and Consultant were, with ample precedent, suited to achieving the survey objectives referenced above. A brief non-rigorous discussion of both will now be presented to establish the relationship between site conditions, survey objectives, and the geophysical tools and techniques utilized.

Magnetometer/Gradiometer-The presence of buried ferrous materials which have in effect become magnets due to exposure to the earth's magnetic field(induced magnetization) over a period of time will commonly cause the total field reading as measured by a magnetometer to be anomalous by as much as several hundred or even several thousands of gammas; depending on size, volume, orientation, depth of burial,

etc.. of the buried object. A magnetometer survey in essence measures and maps variations in the total field caused by the presence of magnetic materials in the earth.

The gradiometer is effectively no more than two total field magnetometers mounted on the same staff and whose sensors are separated vertically by a known distance. By measuring the total field at the same location at two different heights, one is able to better detect the presence of where smaller(higher frequency)metallic concentrations begin and end and the rate at which this occurs in gammas/meter. This principal is analagous to the relationship between velocity and acceleration wherein both gradient and acceleration measure the rate of change of the fundamental unit in operation. One might intuitively see that a deeply buried broad (low frequency) geologic feature would not lend itself to the gradiometer approach. It is peculiarly applicable to environmental, engineering, archaeological, and other shallow investigations.

Electromagnetics-Electromagnetic instruments such as the one used in this survey are designed to measure variations in the conductivity of the subsurface volume sampled by the signal being transmitted and recorded. Conductivity variations within the earth are caused by factors including changes in porosity, permeability, moisture content, salinity, acidity, and presence of colloids/leachate in solution. This application is particularly useful in going from native(undisturbed)soil conditions outside a landfill area to the landfill itself; although internal as well as boundary changes are quite often hydrogeologically significant. Additionally, the Electromagnetic(EM) method as utilized in this survey will detect ferromagnetic materials with good resolution to a generally adequate depth in the mode used for conductivity cortrast mapping.

From the above discussion it should be obvious, when considering survey objectives, that the two systems employed do complement each other, overlap in some features, and are, when properly applied, applicable to surveys such as the one under discussion.

ACQUISITION PHASE DISCUSSION

Magnetometer/Gradiometer Survey

The instrument used was an EDA OMNI-IV PLUS Magnetometer/

Gradiometer which measures and records in protected memory the total magnetic field(top sensor) in gammas and the magnetic gradient of the total field(top sensor reading less bottom sensor reading divided by the distance between the two) in gammas per meter.

At the start of each recording day, the recording system would be powered up, put through a series of internal self-checking tests, programmed for initial lines to be surveyed, and put into the magnetometer/gradiometer recording mode for the days operations.

Additional to recording the values at each (Line, Position) location, a base station reading was taken at the start of each survey day which revealed an average regional total field value of 49,920 gammas for the survey area. This observed value tied very well with published value expected at the geographic coordinates and magnetic latitude of the survey site. Also, a magnetic datum value of 50,000 gammas was programmed into the system memory for the entire survey. Magnetic values for the total field recorded are thus net of datum. Such a practice is standard in order to avoid working with large numbers in the processing and interpretive stage.

At the end of each day the microprocessor controlled recording section of the instrument was linked to a microcomputer via RS-232 interface and the data were downloaded onto a floppy disk. Data were printed out and studied as a further refinement to the same values observed being recorded during the course of the day. Additional to this, system batteries were put on charge overnight at the end of each day.

A study of the data acquired during the previous day allowed the planning of additional detail data point locations in areas exhibiting rapid lateral magnetic response changes.

The instrument performance was trouble free. No magnetic storms were experienced during the course of the survey. Statistical information provided later in this report will give greater information as to total points acquired, production rate, etc.

Electromagnetic Survey

The instrument used was a Geonics Limited EM-31 DL Electromagnetic Recording System which is used in a continuous profiling manner to record the quadrature-phase component of the induced magnetic field; which is linearly related to the ground conductivity in native soils(undisturbed zones) and

will detect and be influenced by the presence of buried metallic objects in fill areas(disturbed zones). The quantity measured is in millimhos per meter, which is the reciprocal of resistivity. Depth of detection of conductivity through native soils in the vertical coil configuration utilized is nominally down to 6 meters in depth. Detection depth of buried metallic objects is nominally in the range of 2-3 meters.

At the start of each recording day the instrument was checked for battery level and for zero reading at the least sensitive setting to insure the system was in calibriation. These checks were repeated during the course of the day on a periodic basis. NUS representative, Mr. David Upthegrove, operated the EM-31 throughout the survey.

The survey progressed routinely in a north-to-south direction with frequent right angle orientations recorded to determine if lateral changes were occuring. Readings were recorded manually in a log book. Readings were taken at every 25 ft interval in all cases and more frequently where subsurface influences were causing the readings to change rapidly.

Operating mode allowed the continuous recording of anomalous zones during one pass as compared to the Magnetometer survey which required obtaining needed detail on subsequent days.

The system performed in a trouble-free manner throughout the survey. As referenced above, production statistics will be provided in greater detail later in this report.

DATA PROCESSING DISCUSSION

In geophysical surveys, as in most scientific endeavors, there is a direct connection between acquisition, processing, and interpretation. The process is an iterative one which requires editing values that are anomalous not because of subsurface conditions but by cultural interferences such as powerlines, metal fences, automobiles, buried utilities, etc. In this regard a short discussion of cultural influences will precede any discussion of data processing and interpretation.

Cultural influences

During the course of the survey it was observed that any magnetometer readings closer to metal fences than 25 ft resulted in anomalously high readings. In the case of the Electromagnetic system, anomalously high readings were recorded inside 35 ft for coil orientation perpendicular to

the fence and 25 feet for coil orientation parallel to the fence. In both cases the recorded values within this negative cultural influence zone were edited out during the data processing stage in order for subsurface conditions to be characterized without including extraneous influences. The same is true of well marked underground utilities encountered on the east side of the storage facility located in the southwest quadrant of the survey area.

Data Processing Procedures

Input data consisted primarily of data sets for the following:

Set 1-Electromagnetic recording(Z) for each surveyed Line and Position Number(X,Y).

Set 2-Total Field Magnetometer recording(Z) for each surveyed Line and Position Number(X,Y).

Set 3-Magnetic Gradient of Total Field Magnetometer recording(Z) for each surveyed Line and Position Number(X,Y).

Data processing was performed on a microcomputer utilizing a software package which takes data sets containing (X,Y,Z) information, creates a grid file, and outputs the data in either two(2) or three(3) dimensions. Two dimensional data are displayed as topographic contour maps, or simply as map values posted to the appropriate (X,Y) location, or in two dimensional (X,Z) crossection form. Three dimensional data were displayed with surface relief projected orthogonally and options utilized to rotate the 3-D displays at specified angles of rotation around the Z-Axis and tilt.

For all three data sets mentioned above, Consultant generated a topographic map(2-D) and four orthogonal projections which displayed the data in 3-D image at 45 degree angles to each corner of the survey grid. Additional to this, numerous other displays were computer generated which were of assistance in interpreting and reporting results of the survey. In all there were 35 displays generated during the data processing/interpretation phases of this project. Each one of the displays generated are made a part of this report and will be discussed individually, where appropriate, in the interpretation section of this report.

As mentioned earlier, interpretation is an iterative process which requires inspection of selected map values which may be

anomalous not because of subsurface conditions but rather as a result of cultural interference. Many of the final maps included in this report are a result of at least two processing/interpretive iterations. This process will be understood as not unusual to those familiar with interpreting data sets of virtually any type.

DISCUSSION OF INTERPRETATION

Establishing Patterns in an Integrated Interpretation

During the course of this survey and subsequent data processing phase, a determination was made interactively as to which data points were of value in the interpretation of the Total Field, Gradient, and Electromagnetic Data Sets. As mentioned previously, data points were edited out only if the values were anomalous due to known cultural interference sources. Hidden cultural sources may still exist but Consultant made no assumptions in this matter in order to maintain the integrity of the data.

As a matter of record, the following data points were retained included in the final interpretation:

- *Electromagnetic(EM)......1537 Points *Total Field Magnetic......1998 Points*
- *Gradient of Total Field......1998 Points*

*Magnetic Data Includes Additional Detailing Points

Following the completion of the acquisition phase, Consultant was provided the use of site historical data including:

- *Aerial Photograph of Site Dated 1965
- *Aerial Photograph of Site Dated 1969
- *Aerial Photograph of Site Dated 1975
- *Drawing Entitled "Former Base Landfill
 Test Pit/Boring Location Ellington
 ANG"

Consultant utilized all available information acquired during

the course of this survey up to the interpretation phase to establish certain patterns which may be significant to the interpretation of the data.

During the course of discussing the interpretation of the data the term "anomaly" will be used on a recurring basis. In the interest of being understood, Consultant will now offer a general definition and a discussion of this recurring term.

Anomaly-This term will geneally mean any measurement which does not conform to the normal or expected. In the case of the Total Magnetic Field values being discussed, any value or set of values which varies materially from the regional magnetic field, has a positive/negative swing in observed values across the zone, and can be contoured with closure will be considered anomalous.

In the case of the Gradient to the Magnetic Field, any value or set of values that vary much beyond the low tens in value, exhibit a positive/negative swing in observed values across the zone, and can be contoured with closure will be considered anomalous.

In the case of the Electromagnetic Conductivity reading, any value that varies upward or downward from the expected reading in undisturbed(native soils) zones, considering soil types, moisture content, etc. will be considered anomalous. In zones where the quadrature phase signal is being influenced by the presence of ferromagnetic materials buried in the near surface, which results in anomalously high readings, closure around this zone, and good correlation to the general patterns obtained by the magnetometer survey, such an EM conductivity situation will be considered anomalous.

During the course of the processing and preliminary interpretation, it was observed that anomalous conditions observed on the Total Field Map were consistently observed, as expected in a landfill situation, on the Gradient map. It was also observed that in zones exhibiting anomalously high Total and Gradient values, the Electromagnetic survey exhibited high values of conductivity more often than not. Historical information provided to Consultant and referenced above provides additional insight into the interpretation of the geophysical data; not an unexpected development.

In any event, Consultant will now develop a data set which will hopefully reveal patterns helpful to the understanding of the geophysical data and site characterization.

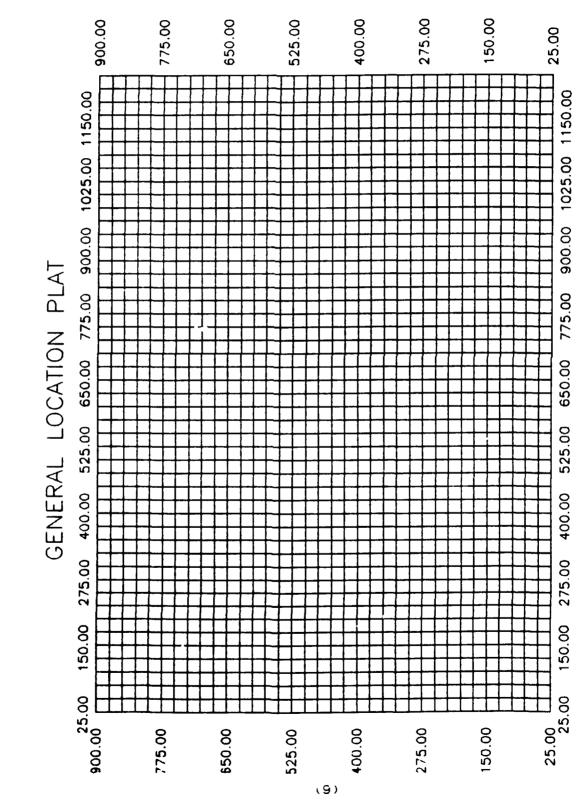


TABLE OF ANOMALOUS ZONES

ZONE CENTER		TOTAL FI RANGE	ELD		UCTIVITY ANGE
# 1	(P-100	P-150	P-175)	P-100	P-125
(125,150)	-388	430	-333	72	48
# 2	(P-800	P-825	P-850)	P-800	P-825
(150,825)	-257	154	-101	89	78
# 3	(P-225	P-275	P-375)	P-225	P-250
(175,275)	-627	787	-397	50	48
# 4	(P-325	P-350	P-425)	P-325	P-360
(225,350)	-1287	836	-26	62	0
# 5	(P-475	P-500	P-525)	P-475	P-500
(275,500)	-282	177	73	49	48
# 6	(P-180	P-200	P-260)	P-175	P-195
(300,200)	-2158	1683	-35	62	12
# 7	(P-400	P-425	P-475)	P-400	P-410
(425,425)	-1441	909	32	48	18
# 8	(P-250	P-275	P-300)	P-250	P-275
(475,275)	-426	731	-418	88	96
# 9	(P-330	P-390	P-500)	P-370	P-400
(500,390)	-1269	1774	-25	290	115
# 10	(P-700	P-750	P-775)	P-725	P-750
(500,750)	-1532	331		80	68
# 11 (525,100)	(P-50	P-100	P-175)	P-65	P-75
	-898	-358	-252	120	85

# 12	(P-275	P-300	P-325)	P-275	P-300
(575,300)	-1252	547	-440	110	92
# 13	(P-350	P-375	P-450)	P-350	P-375
(5 75 ,375)	-589	1073	-120	120	200
# 14	(P-75	P-125	P-175)	P-100	P-125
(625,125)	-753	636	-277	100	84
# 15	(P-275	P-325	P-350)	P-275	P-300
(625,275)	-710	548	-275	95	82
* 16 (675,250)	(P-200	P-250	P-275)	P-225	P-250
	-368	828	-343	110	110
# 17	(P-300	P-350	P-400)	P-305	P-325
(675,350)	-536	597	-6	100	92
# 18	(P-50	P-75	P-125)	P-60	P-75
(725,75)	-643	314	-285	120	70
# 19	(P-175	P-200	P-210)	P-175	P-200
(750,200)	-443	102	-18	120	125
# 20	(P-320	P-350	P-390)	P-325	P+350
(750.350)	-281	1414	33	115	87
# 21	(P-325	P-350	P-425)	P-325	P-350
(775,350)	-525	806	78	120	105
# 22	(P-370	P-400	P-420)	P-375	P-400
(800,400)	-251	1387	227	105	100
# 23	(P-375	P-400	P-500)	P-375	P-400
(825.500)	-551	1166	-1105	115	105
# 24	(P-250	P-300	P-310)	P-275	P-300
(850,300)	-985	295	-388	100	88
* 25	(P-125	P-175	P-200)	P-125	P-150
(900,175)	-574	99	-229	85	46
# 26	(P-360	P-390	P-420)	P-375	P-390
(900.390)	-1604	1846	13	115	60

TABLE OF ANOMALOUS ZONES (CONTINUED)

ZONE	TOTAL FIELD		CONDUCTIVITY		
CENTER	Range		RANGE		
# 27	(P-525	P-550	P-625)	P-525	P-550
(900,550)	-735	627	-346	80	40
# 28	(P-475	P-500	P-575)	P-475	P-500
(1000,500)	-607	608	-140	74	90
# 29	(P-525	P-550	P-600)	P-525	P-550
(925,550)	-657	492	-137	92	110
# 30	(P-225	P-250	P-300)	P-225	P-250
(1050,250)	-600	405	-434	90	82
# 31	(P-580	P-610	P-640)	P-575	P-600
(1075.610)	-2271	1834	-46	42	20
# 32	(P-800	P-830	P-850)	P-800	P-805
(1075,830)	-1069	472	-110	27	140
# 33	(P-150	P-175	P-225)	P-150	P-175
(1125,175)	-927	518	-30	80	67
# 34	(P-275	P-300	P-350)	P-275	P-300
(1125,300)	-811	668	-250	84	90
# 35	(P-425	P-450	P-500)	P-435	P-450
(1150,450)	-623	1125	-29	46	105
# 36	(P-550	P-575	P-625)	P-550	P-575
(1175,600)	-310	410	-332	62	58

The definition of "anomalous" should be kept in mind when looking at the zones listed above.

Factoring In Site Historical Data

Aerial photographs and plat map referenced earlier were used by Consultant to prepare a map across the site which gives at least a partial picture of the land usage which contributed to the anomalous conditions observed on the geophysical data(See Fig. 1). General locations of trenches have been helpful in confirming the reasonableness of some of the geophysical results. Additional help was derived from the plat referenced earlier in having a record which gives a ballpark location of the underground storage tank which requires locating more precisely as well as old site facilities, such as the location of incenerator, buildings, tracks, etc. which are no longer in evidence.

One should always be careful in forming strong conclusions based on incomplete information. The composite historical picture shown in Figure 1 does not show, for instance, the evidence in the 1965 aerial photograph of older closed out fill areas in the northwestern quadrant of the site. There are undoubtedly other gaps in available historical information but the data provided fits the overall picture very well.

One additional factor will be thrown in the hopper before returning to the interpretation and beginning to state some conclusions which may be drawn from the geophysical data bank. While it will be observed that there is a strong correlation between the response of the magnetometer and the electromagnetic system in disturbed zones where ferrous metals are at or near the surface, the EM system will have a differing response to varying soil types and soil conditions in undisturbed zones. A few common ones typical to this area and present on this particular site include:

SOIL TYPE

EM RESPONSE RANGE

Clay	50-100 Millimhos/Meter
Topsoil	10
Unsaturated Sand	0-1
Moist Sand	5-20
Saturated Sand	50

These responses will vary depending primarily on the nature of particulates in solution and their susceptibility to the conductivity of electrical and electromagnetic components.

Discussion of Anomalous Zones

Magnetic response signatures recorded across the area were classic dipole wherein the response going from south to north would go slightly negative as the buried object was approached, swing dramatically to the positive, and then dramatically to a negative(minimum) value before becoming

regional again. Objects buried within landfills generally can be modeled as horizontal cylinders, spheres, dikes, or the like of high frequency(short wavelength) duration. Geomagnetic inclination at the survey site is approximately 60 degrees, which means the force field coming from the buried object is located at a 60 degree angle from horizontal and as measured from the zero crossing northward; which would place the buried object just to the south of the minimum(largest negative number and typically the largest absolute value number in the signature resulting from the induced magnetic effects of the earth's magnetic field on the object being detected).

Electromagnetic response signatures which are under the influence of the induced magnetic field of buried ferromagnetic materials will record their highest reading at or near a point immediately above the object; certainly within a 10 foot radius of the object.

In both cases, readings off to the side of the object and in cases where insufficient spatial sampling is used, the field from the buried object may be ambiguous or be missed entirely. This caution applies to both data sets. These considerations should be kept in mind when interpreting results from these type surveys.

The anomalous zones tabulated above will now be discussed in greater detail individually. Tabular values for Total Field Magnetics are for Positions where the signature onset occurs, where its maximum positive value occurs, and where its maximum negative value occurs. Tabular values for the Electromagnetic Survey are maximum and minimum values recorded in the zone of influence of the buried object with Positions being noted above the reading in each case.

Zone #1-This zone is interpreted to contain a small amount of ferrous materials which requires closer sampling to locate with pinpoint precision. Both data sets agree that a close approximation of the location is between Position 100-110.

Zone #2-This zone can be characterized as containing a small amount of ferrous materials located between Positions 800-810. Good agreement is achieved between both methods. Closer sampling could further refine.

Zone \$3-This zone exhibits good closure and indicates a ferrous concentration between Positions 225-235. There is good agreement between both methods.

Zone #4-This is a very well defined anomaly on both data sets which indictes the presence of ferrous materials between Positions 325-335.

Zone #S-A weak but coherent anomaly detected on both systems. Could be resolved better with finer sampling. Indicated location of ferrous materials is between Positions 475-485.

Zone #6-A very strong response contrast on both systems with indicated location of buried ferrous materials between Positions 180-190.

Zone \$7-A very strong response contrast on both systems with indicated location of buried ferrous materials between Positions 400-405.

Zone #8-A moderate response on both systems which indicates that the area sampled is part of a northeast trending nose off a larger anomaly to the southwest. Indicated location of buried materials is between Positions 260-265.

Zone #9-A very strong anomaly that is well defined on both systems. Detail obtained on both systems indicates concentrations of ferrous materials between Positions 350-370.

Zone \$10-This is an isolated anomaly centered at P-700. This anomaly was detected slightly by the EM system but stands out significantly on the Magnetometer reading. The signature is unusual in that there is very little positive swing but significant negative reading. The most likely explanation is that inadequate spatial sampling did not pick up the positive component on the magnetometer survey and that the EM sampling was inadequate as well. In any event the indicated location is between Positions 700-710.

Zone #11-A narrow anomaly which is detected by both systems but detail obtained on the EM survey places the location of ferrous materials at Position 65.

Zone #12-A well defined anomaly on both systems located between Positions 275-285.

Zone #13-A very strong anomaly detected by both systems but which would benefit from finer spatial sampling as the maximum magnetic minimum and probably the strongest EM reading is skipped. Probable location is between Positions 365-375.

Zone #14-A small anomalous feature detected reliably by both systems. Location is between Positions 85-95.

Zone #15-A mildly disturbed zone detected by both systems with probable location between Positions 275-285.

Zone \$16-A mildly developed anomaly detected by both systems. Symmetric signature on both systems indicate the position not to be located immediately over a severely disturbed zone. Location is between Positions 240-250.

Zone #17-A well developed anomaly which is detected by both systems with detail acquired with the EM system locating the ferrous materials at Position 305; a location which is consistent with the Magnetics.

Zone \$18-A well developed anomaly detected by both systems and located off the flank of a larger anomaly. Location is between Positions 50-60.

Zone #19-A mildly disturbed zone detected by both systems. The zone between 175-200 could benefit from greater detailed gridding. Ferrous materials are located between Positions 175-185.

Zone #20-A well defined zone that is located more precisely by the EM system due to greater detailing. Anomaly is located between Positions 325-335.

Zone #21- A well developed anomaly detected by both systems. Located on the southeast flank of a trend running northwest-southeast. Anomaly location is between Positions 330-340.

Zone \$22-A well developed anomaly detected by both systems and following the same trend as Zone #21. Anomaly location is between Positions 375-385.

Zone #23-A well developed anomaly which could benefit from more magnetic detail between Position 375-400. Detail on EM survey places location of this ferrous concentration between Positions 380-390.

Zone #24-A mildly anomalous zone detected by both systems and located between Positions 260-270.

Zone #25-A well defined anomaly on both systems and located between Positions 130-140.

Zone #26-A very strong anomaly detected by both systems and located between Positions 370-380.

Zone #27-A well defined anomaly detected by both systems but probably would be stronger with finer spatial sampling. Location of this anomaly is between Positions 530-540.

Zone \$28-A mild anomaly which is detected by both systems but which is not well defined probably due to inadequate spatial sampling. Location of this deposit is between Positions 490-500.

Zone #29-An ill defined anomaly due to inadequate sampling which is located between 540-550. Another cause for ambiguity is that it is located on the northeast flank of a major disturbance growing off to the southwest.

Zone #30-A mild anomaly detected by both systems and located between Positions 230-240.

Zone #31-A very strong anomaly detected by both systems and located between positions 580-590.

Zone #32-A well defined anomaly on both systems with detailed measurements on the EM survey placing the location between Positions 805-815.

Zone #33-A mild anomaly detected by both systems and located between Positions 160-170.

Zone \$34-A mild anomaly detected by both systems. Increased spatial sampling required to refine but indications are that location is between Positions 290-300.

Zone #35-A well defined anomaly by both systems which would benefit from greater spatial detail but which, due to some detailed information on th EM survey indicates a location between Positions 440-450.

Zone #36-A poorly defined anomaly which is on the flank on a more pronounced expression but which could benefit from finer spatial sampling. Indicated location of buried target is between Positions 560-570.

The above detailed anomalous zones are in some cases isolated from the major pit areas but for the most part are to be considered as part of a depositional trend of ferromagnetic materials across the landfill area. The trends are obvious from plotting the zones discussed and from a review of the orthogonal projections of the three quantities measured. There is good agreement between results obtained by the Total Field Magnetics, Gradient of the Total Field, and the

Electromagnetic method. The data presented above in zone form is deemed suitable for the selection of a representative number of locations to collect soil samples, which is one of the stated objectives of the survey.

There is one area of interest outside the area most disturbed which is deemed worthy of mention when considering locations to collect soil and water samples as well as for possible location of monitoring wells. From a review of the aerial photographs it appears that there is a zone in the southeast quadrant where there were at one time tanks or perhaps natural ponding. The location of this zone appears to be be on a trend between Lines 100-400 and between Positions 700-800. One such site is near Zone #2 discussed above.

Electromagnetic Conductivity Response in Undisturbed Zones

As can be seen in the discussion of the various Zones above, much of the area has been disturbed and as a result the EM readings are influenced by the presence of ferrous materials which have induced magnetic properties. A cursory glance of the topographic and orthogonal projections, particularly the Gradient of the Total Field projections, will graphically present those high amplitude disturbed zones which dominate the northeast, northwest, and southwest quadrants and, to a lesser extent the southeast quadrant. Nevertheless, Consultant attempted to determine if any significant patterns could be observed in the relatively undisturbed zones. As a part of this investigation, topographic maps of the Electromagnetic Data were generated which limited the signal being contoured over a set of panels. These displays are made a part of this report and are identified as Figures 14-18. These Figures, when coupled with orthographic displays of all data sets, which complement and agree with each other. were used to investigate those relatively undisturbed areas to see if any useful geological and hydrogeological information could be inferred.

The only areas that are even relatively free of disturbed zones are to be found in areas generally to include:

- * Southeast Quadrant of Site.
- * East 1/2 of Southwest Quadrant,
- * Central Portion of South 1/2 of Northeast Quadrant.

There are others of course such as just up against the fences in the Northeast corner and along portions of the western fence. However, for the purposes of this discussion the three areas referenced above will be analyzed.

Only one zone was observed in the area of investigation which had concentrated areas where Electromagnetic readings between 0-20 mmohs/meter and that was in and around Line 450, Position 400(See Fig. 14). This reading range would be typical of moist to saturated sand.

Opening the window to include readings between 0-50 mmhos/m, revealed that a triangular wedge with corners at (L-125, P-150) southwestward to (L-575,P-600) eastward to (L-200, P-575) and back to the starting point to the northeast had significant power in the 20-50 mmohs/m range. This range would infer a reasonable concentration of saturated sand or very sandy clay to be present(See Fig. 15).

Opening the window further revealed that the values in the 50--70 mmohs/m are increasing to the south and southeast(See Fig. 16).

The window from 70+ mmohs/meter upward reveals that there is a gentle trend with some areas of closure in the southeast quadrant and eastern 1/2 of the southwest quadrant where this higher reading begins to express itself. This reading would be typical of soils which are predominantly clays(See Fig. 17).

The window including 90+ mmohs/m reveals that no coherent contours are present in the relatively undisturbed areas under consideration(See Fig. 18).

Thus one could conclude that this area consists of saturated sands and sandy clays to the north grading to the south and southwest to primarily clays.

The area to the south where clays dominate do not exhibit any significant closure which might indicate a significant change in the hydrogeological environment which could in turn indicate an increase in conductive materials in the groundwater.

This analysis does not speak to organics which are, except where in very heavy concentration, difficult to detect. In any event, the readers are invited to form their own conclusion on matters discussed in this section.

Underground Storage Tank(UST) Location

Historical information provided at the end of the field phase plus discussions with NUS representative David Upthegrove indicates that the approximate location of this tank to be on the west side of the north-south road running along the west side of the landfill area. Specifically, the tank is reported to be west of the old cul-de-sac which circled the incenerator which has long since been torn down. This would place the tank at an approximate location of L-1125, P-600. The area is in a very disturbed zone, both culturally and subsurface wise. Culturally from the fence just to the west of the road and subsurface wise due to the amount of remnants from past facilities. Without some historical information it would be easy to get lost in this exercise of trying to find one particular bolt in a bucket of bolts. For instance, the Total Field Signature derived at L-1075, P-600 is a classic response of what one might expect to see when crossing an underground storage tank(See Fig. 28).

In order to investigate the most probable site, several detailed displays were generated at the site. Specifically, topographic and orthogonal projections were generated for the Total Field, Gradient of Total Field, and Electromagnetic survey data(See Figures 29-36).

Total Field detailed topographic display revealed a maximum area centered at (L-1175,P-585) with minimum components to the east; with the strongest minimum being to the east at approximately (L-1125,P-600).

Gradient of Total Field detailed topographic display revealed a gradient positive peak at (L-1200,P-575) and a gradient negative(mininum) trough at (L-1175,P-600).

Electromagnetic detailed topographic display revealed a high closed area at (L-1200,P600) and a northwest-southeast saddle with a maximum reading of 75 mmohs/m centered at approximately (L-1150,P-600). A close analysis of this data led to the personal conclusion that the closure at L-1200, P-600 is due to cultural interference from the nearby cyclone fence.

Overall, readings from the two systems are not nearly as high as one might expect from crossing an underground storage tank. Assuming the tank is in the proximity suggested by historical data, one can only conclude that adequate spatial sampling was not used in either survey to obtain the high amplitude signature characteristic of this type feature. Again, Figure 28 would be typical. A study of this figure will reveal that in the course of 30 feet the signature went from maximum positive to maximum negative value.

Based on what we have and not what we might like to have, the Total Field and Gradient of the Total Field would indicate a

tank location of (L-1135,P-585). The approximate location based on Electromagnetic data is not at all clear to me. It may be that the depth of burial or insufficient sampling or the presence of sand backfilling around and over the tank or some combination of the above creates this inconclusive evidence.

For a location on the west side of the road. Consultant would have to recommend the above location as a good place to probe---Line 1135, Position 585.

Initial Monitoring Well Locations

Based on discussions with Client representative, Consultant is under the impression that an initial well program to obtain water samples for analysis and to determine gradient will consist of a four well program, with one well being placed on each side of the site.

Potential candidate locations for the east side of the site would likely include (L-50,P-50) and/or (L-50,P-600), assuming the criteria is to drill near but not into disturbed zones.

For a location on the south end of the site there are numerous undisturbed locations to choose from. Recalling the reference earlier of historical evidence suggesting that at one time there appears to have been ponding or a manmade tank complex across the area bounded by Lines 100-400 and Positions 700-800. Perhaps at least one site along this trend is to be recommended.

On the north side of the site, undisturbed zones are confined to the eastern and western extremities for the most part, with possible locations at (L-825,P-50) or, if a more central location is chosen on the east side. I would recommend the northeast corner as another possibility; as for example $(L-75,\ P-25)$ or perhaps the northern most site on the east side referenced earlier.

Locations on the west side will have to be tight against the fence at any location but two candidates would include (L-1175,P-750) or (L-1175,P-850).

CONCLUDING REMARKS

Issues addressed during the course of this report have included the following:

- * Detailing the site to identify all anomalous zones for planning a soil sampling program.
- * Characterizing the geologic and hydrogeologic conditions across undisturbed zones.
- * Locating undisturbed sites on each side of the landfill area to consider for the initial monitoring well program.
- * Deriving a more precise estimate of the location of underground storage tank.

Consultant feels that the quality of the data acquired and the consistency of results within each technique and between techniques, considering the complexity of the area, has resulted in a quality product which extracted the maximum available information which should allow Client to enter the next phases of the work program with a higher level of understanding of site conditions and the confidence which this brings to the decision making process.

ACKNOWLEDGEMENTS

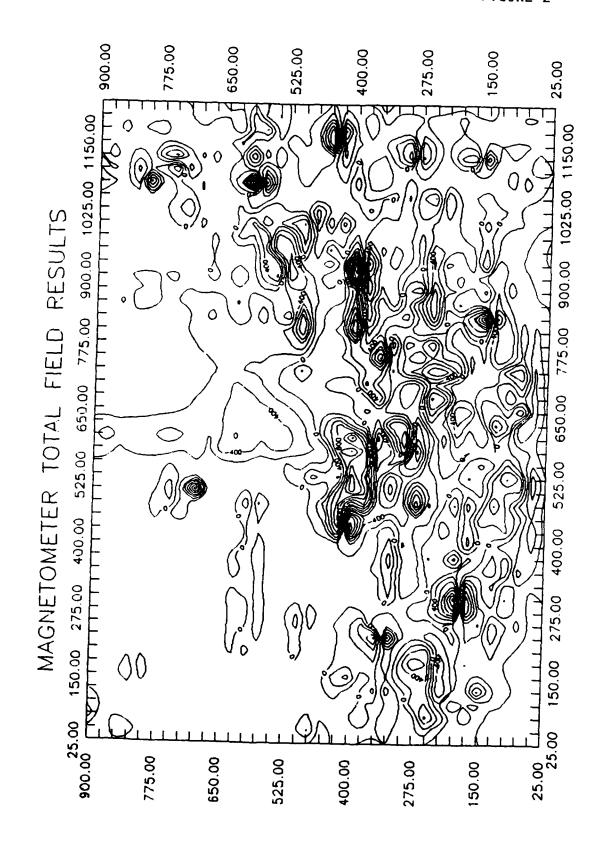
I would like to express appreciation to NUS CORPORATION for the opportunity to have been chosen to participate with them in this very interesting and challenging survey. A personal word of thanks goes to Mr. David Upthegrove for his enthusiastic support and professionalism.

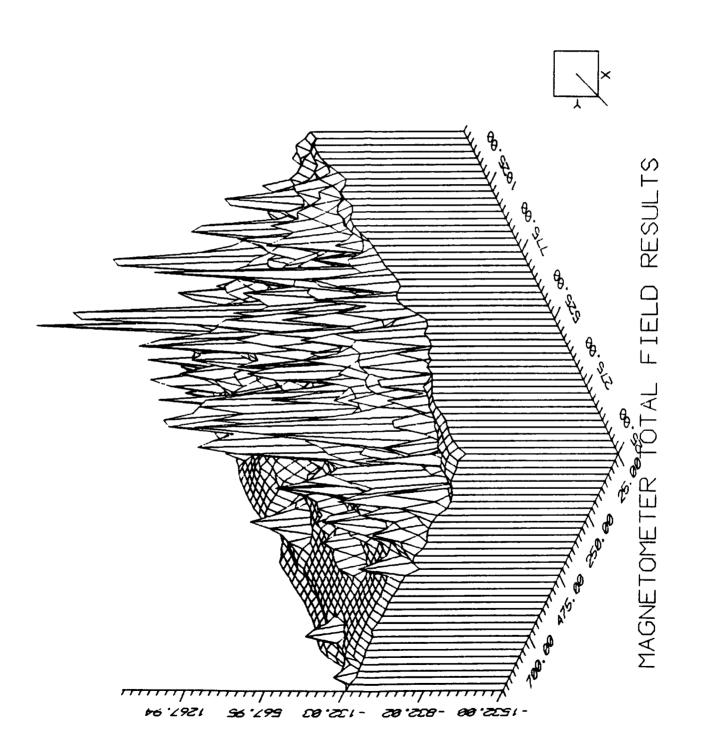
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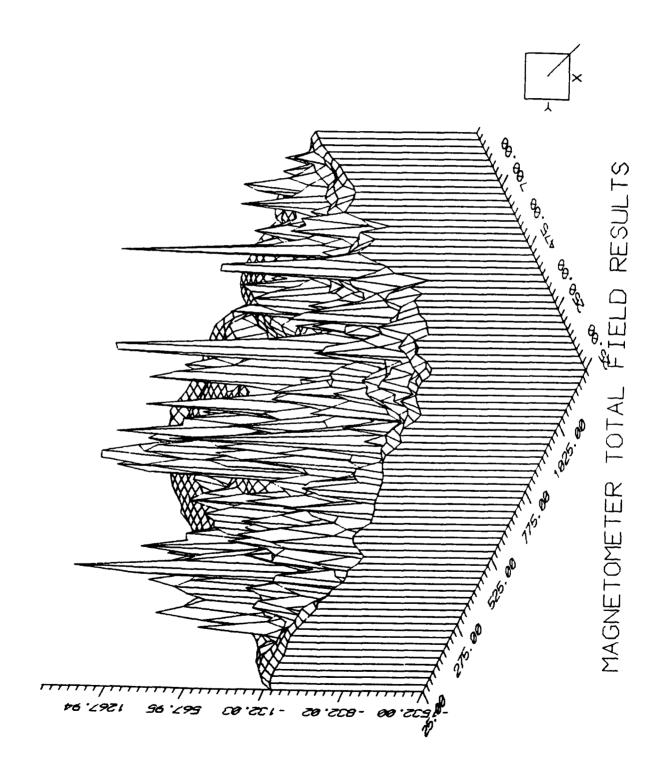
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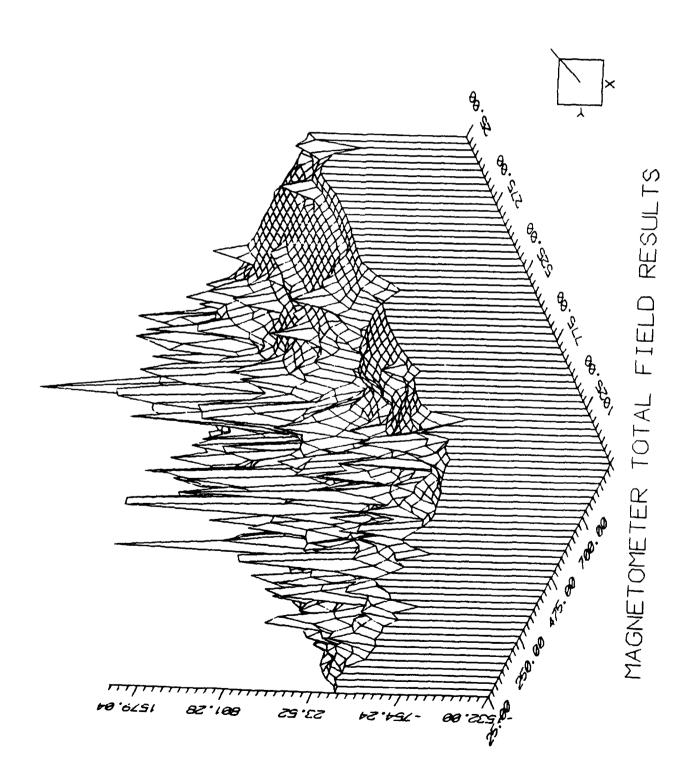
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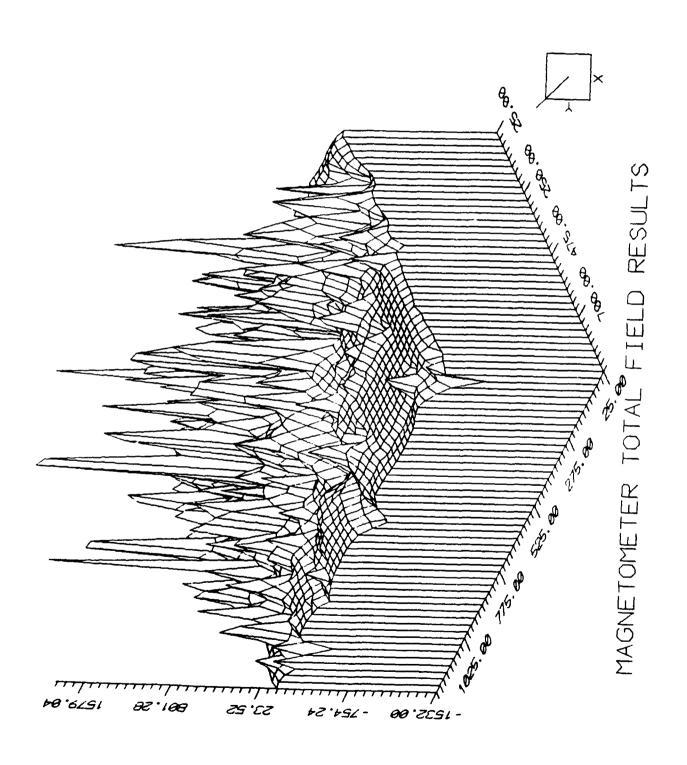
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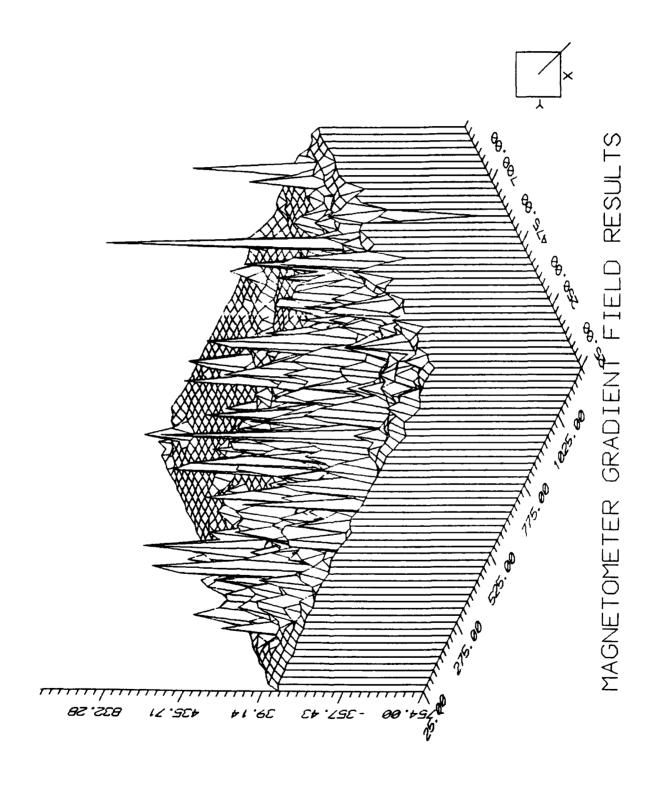


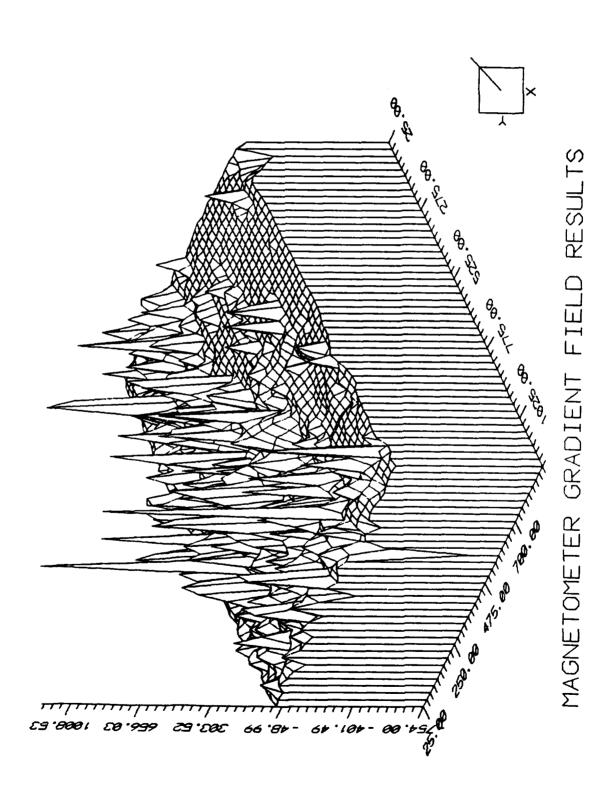


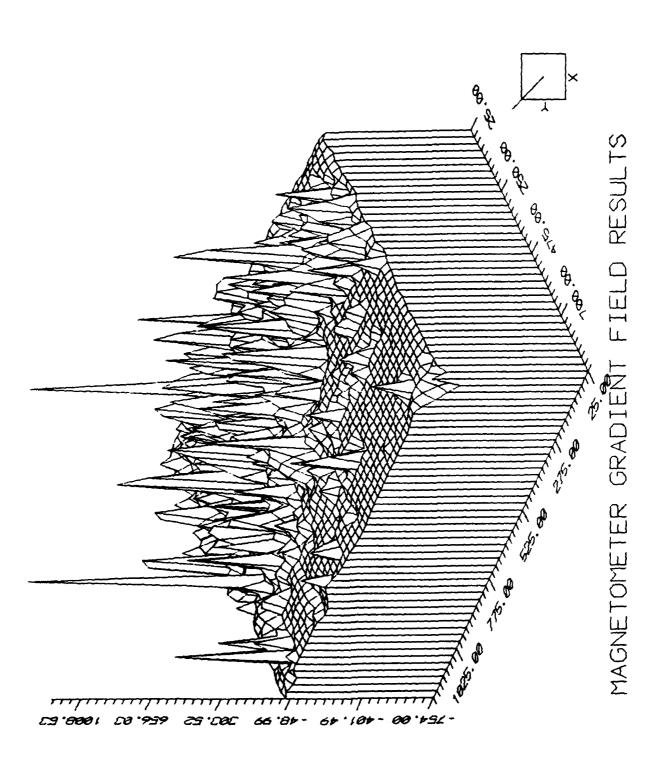


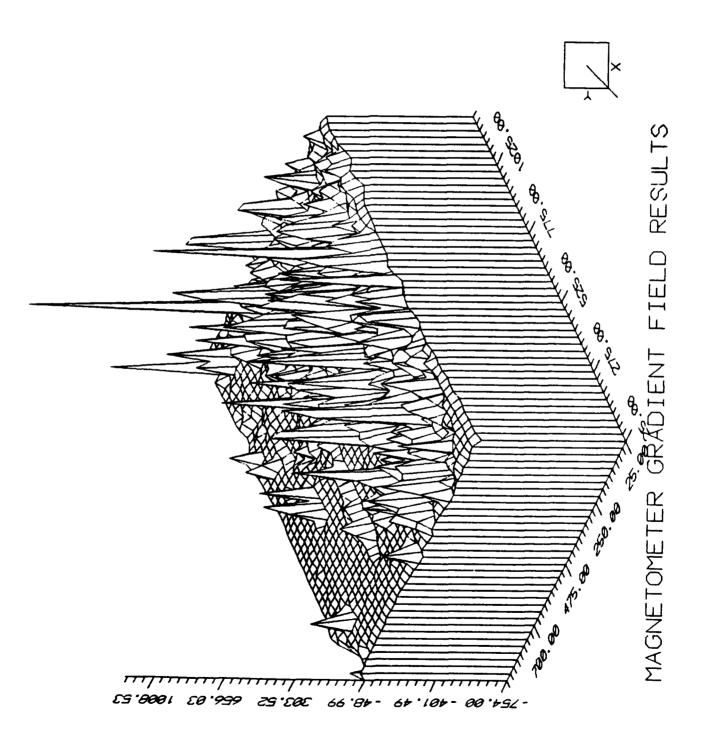


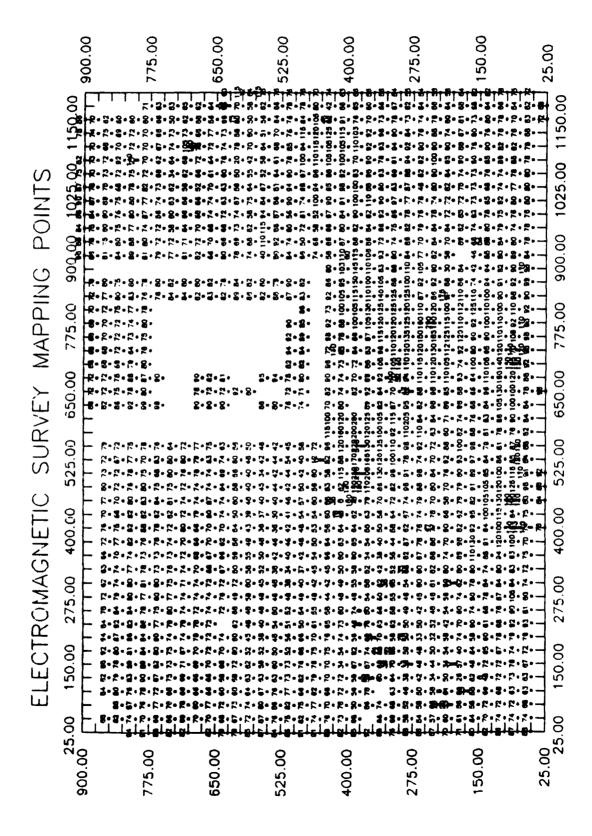


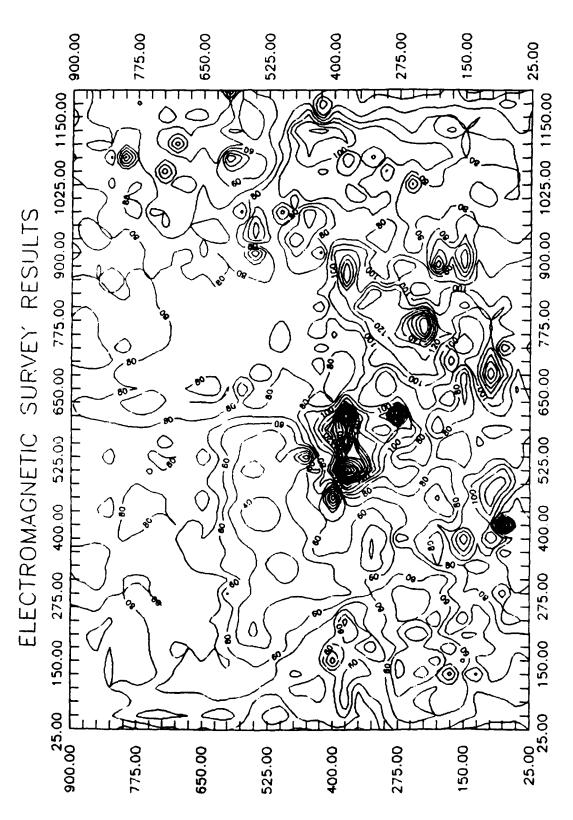


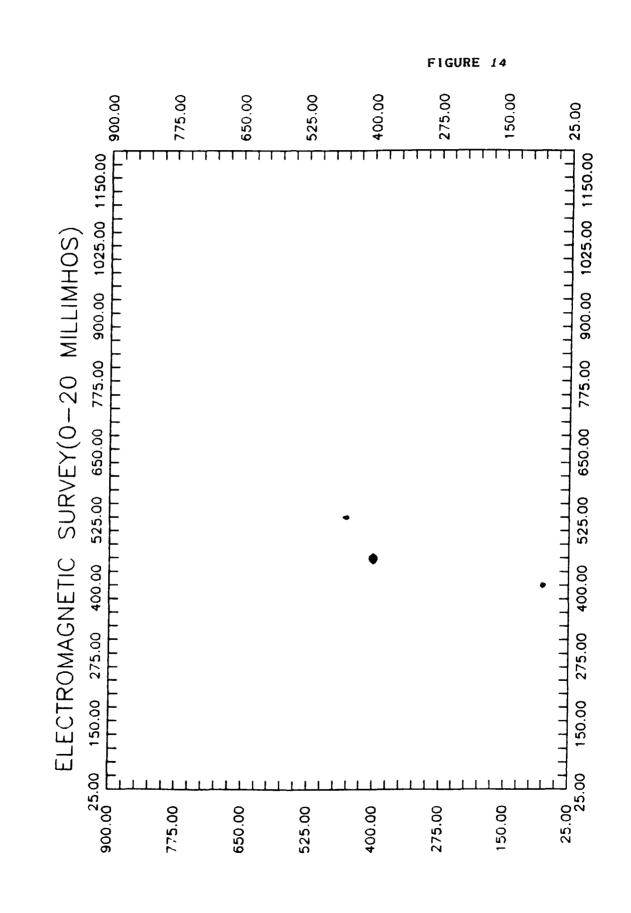


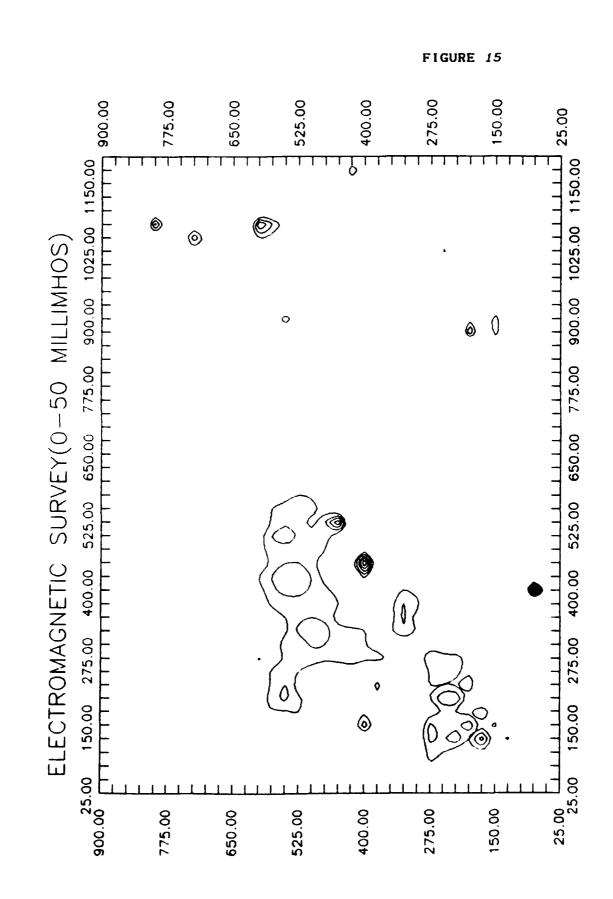


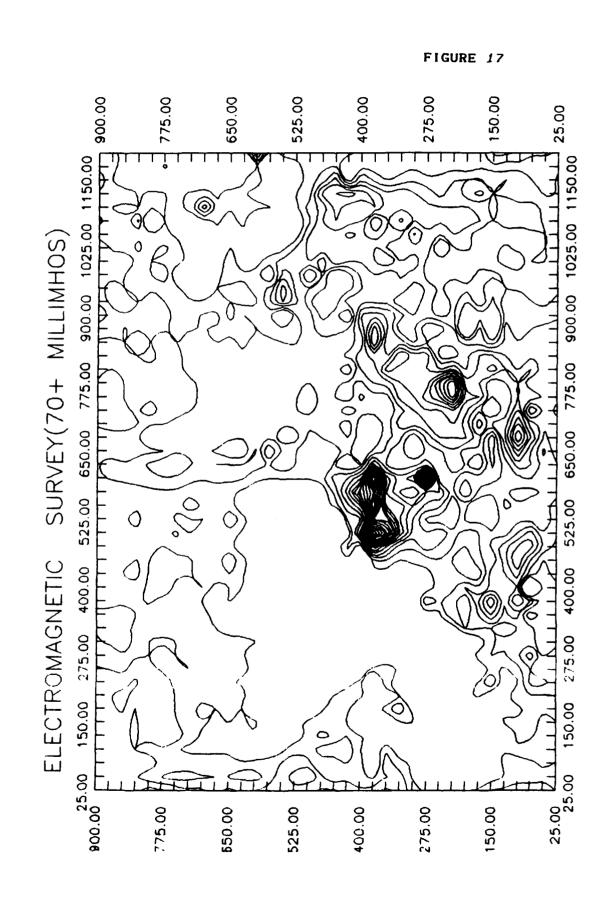


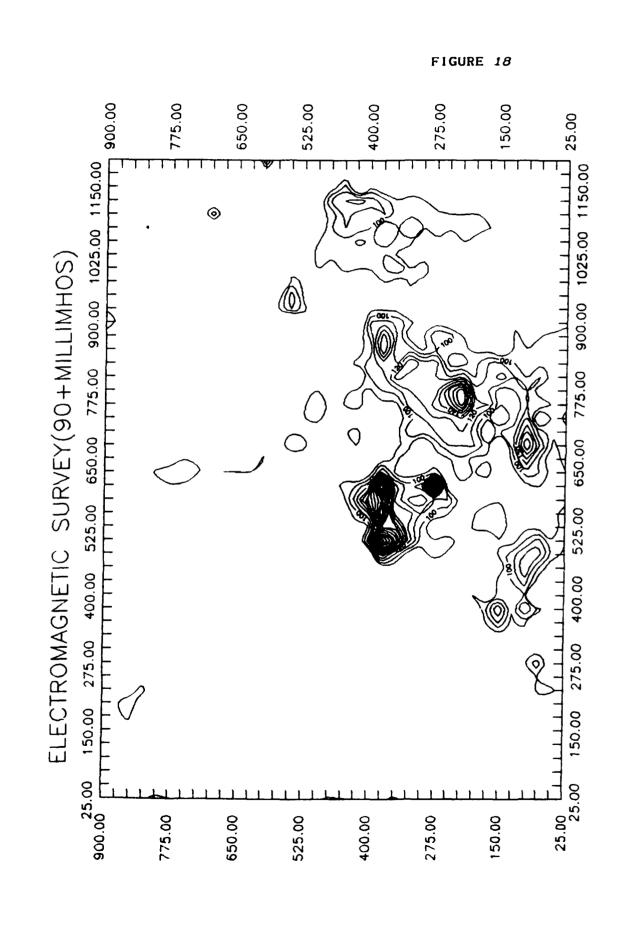


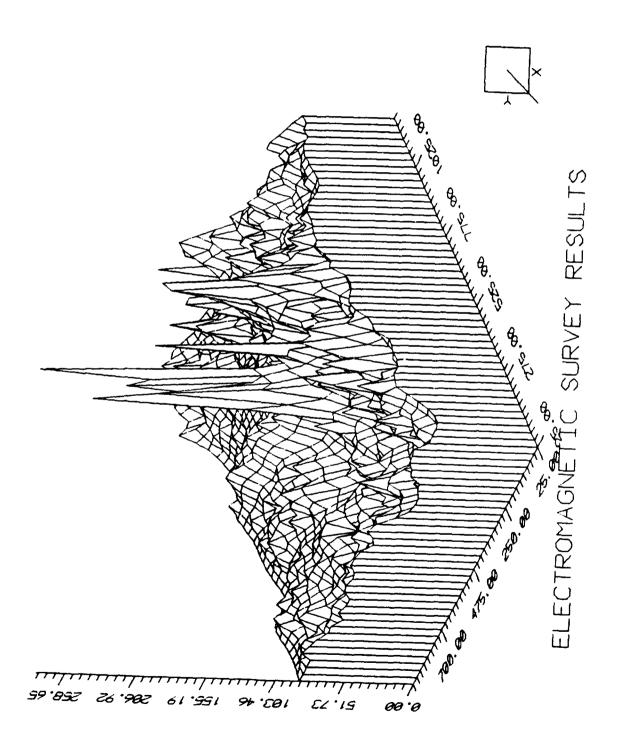


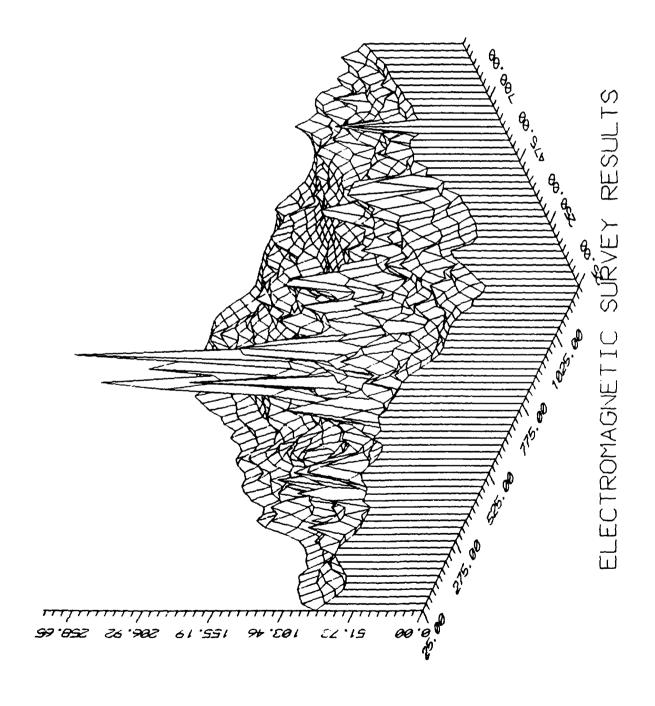


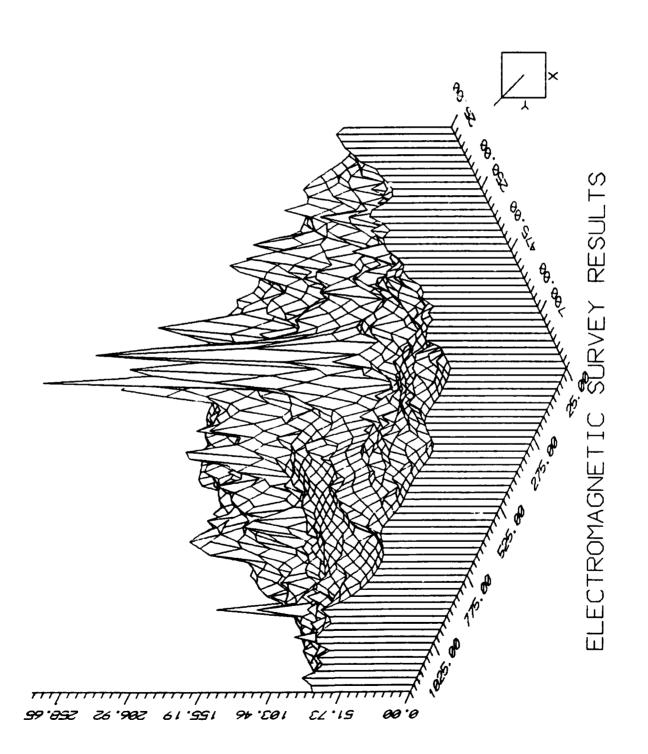


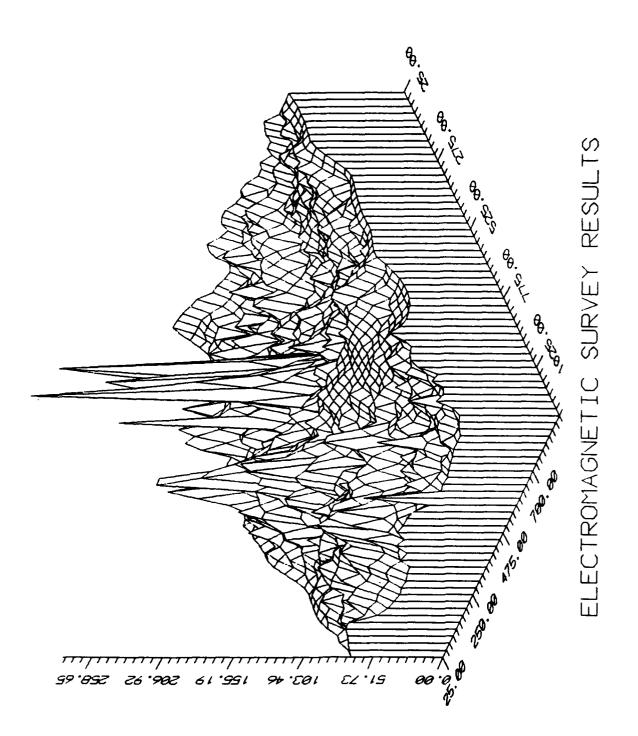


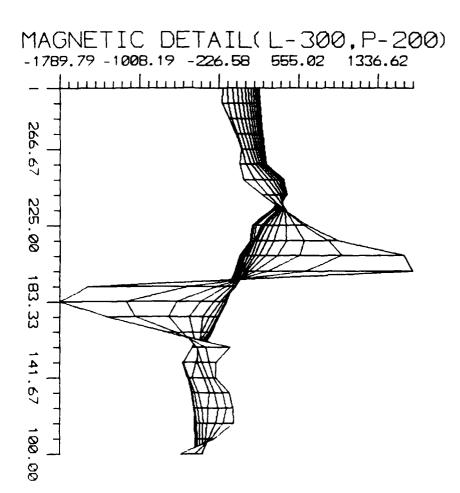


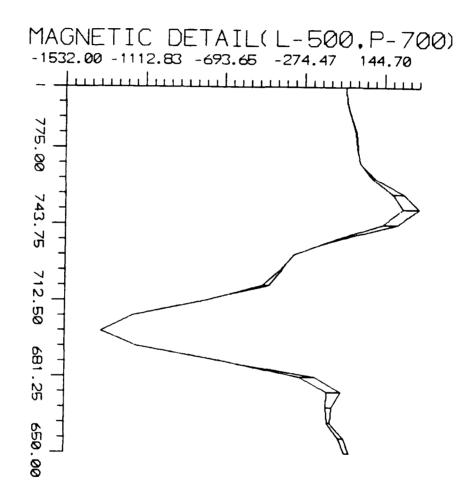


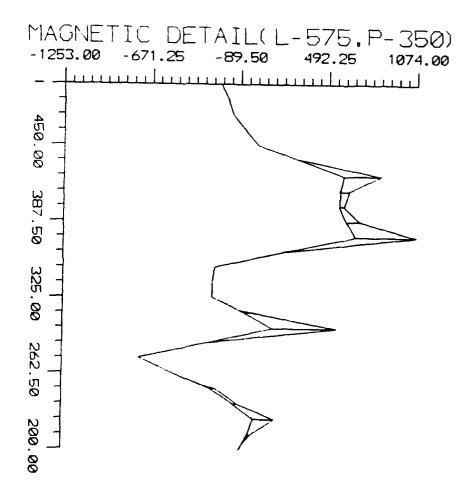


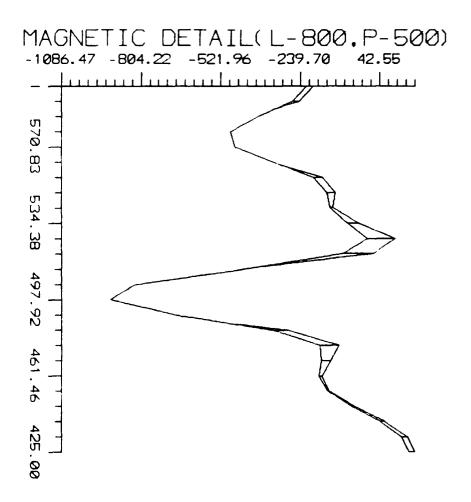


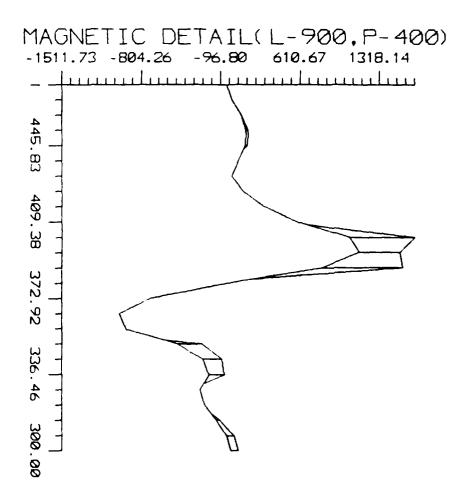




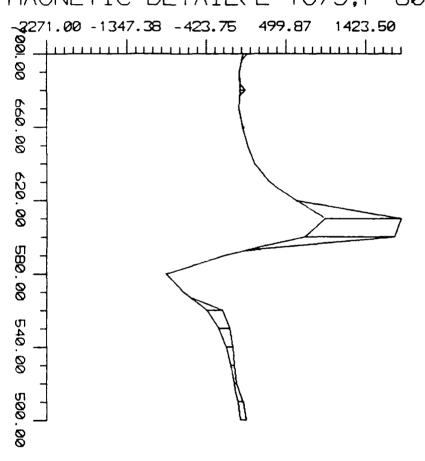


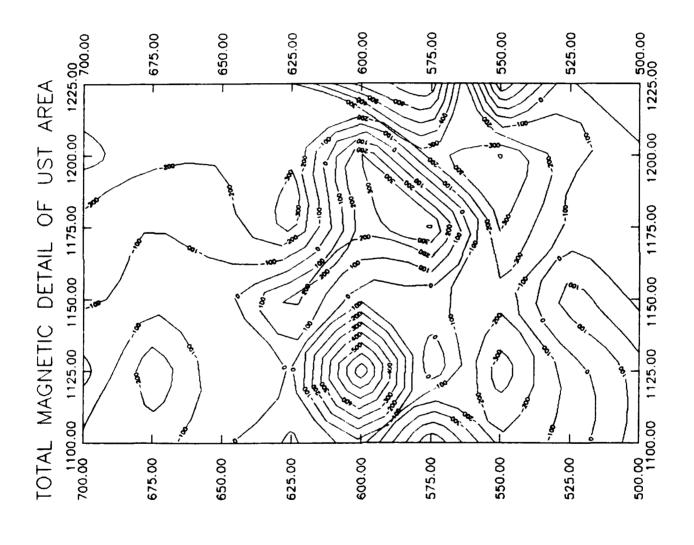


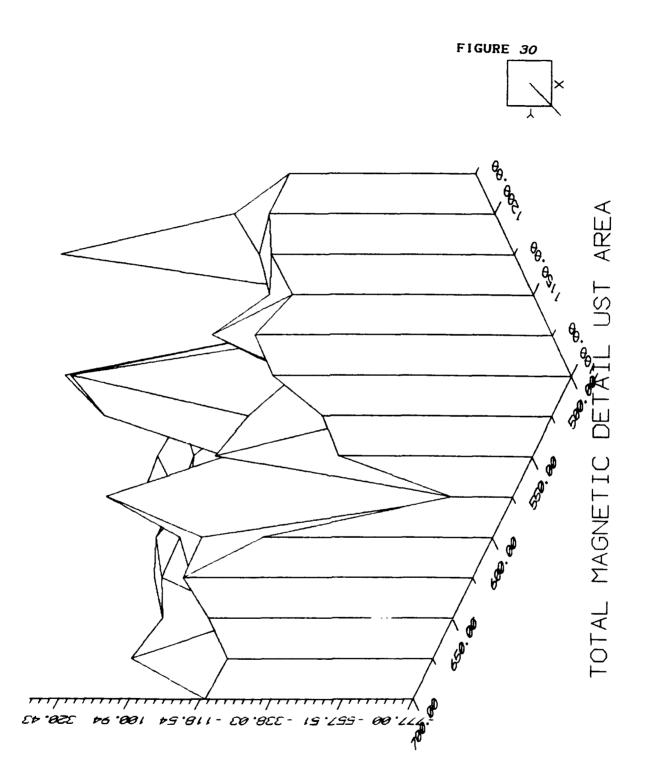


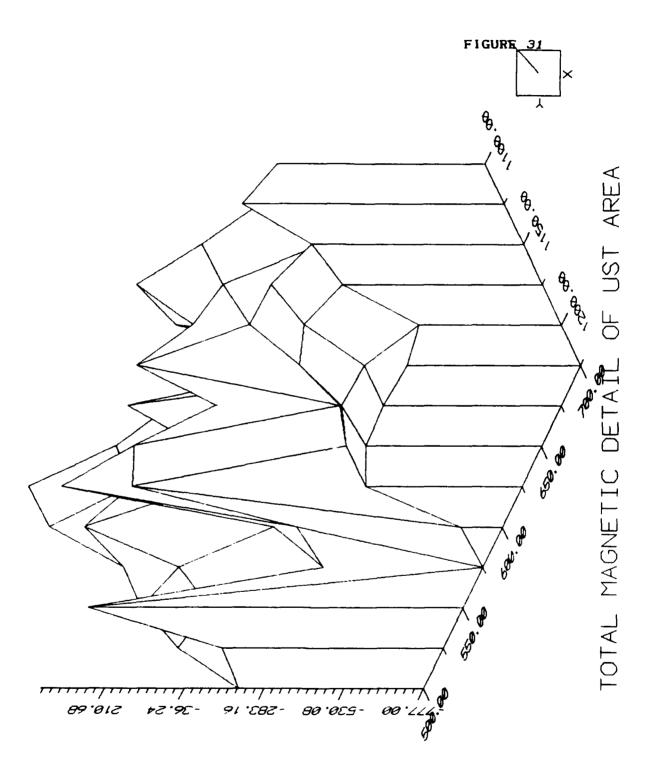


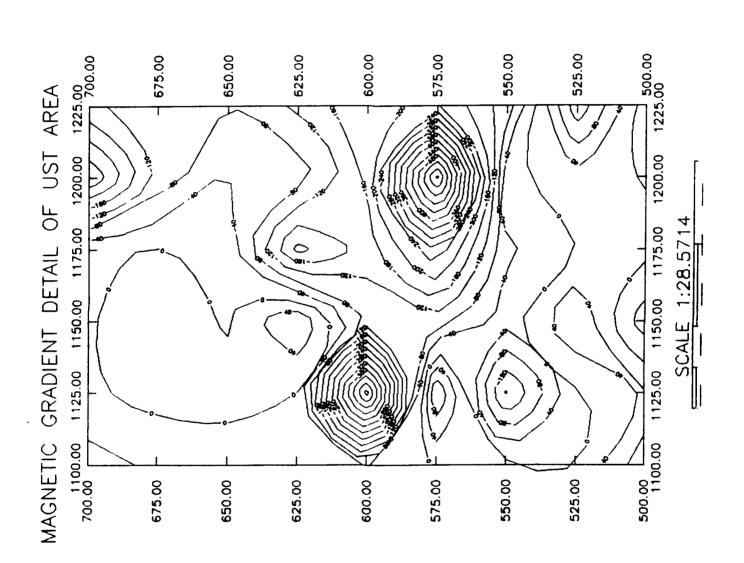
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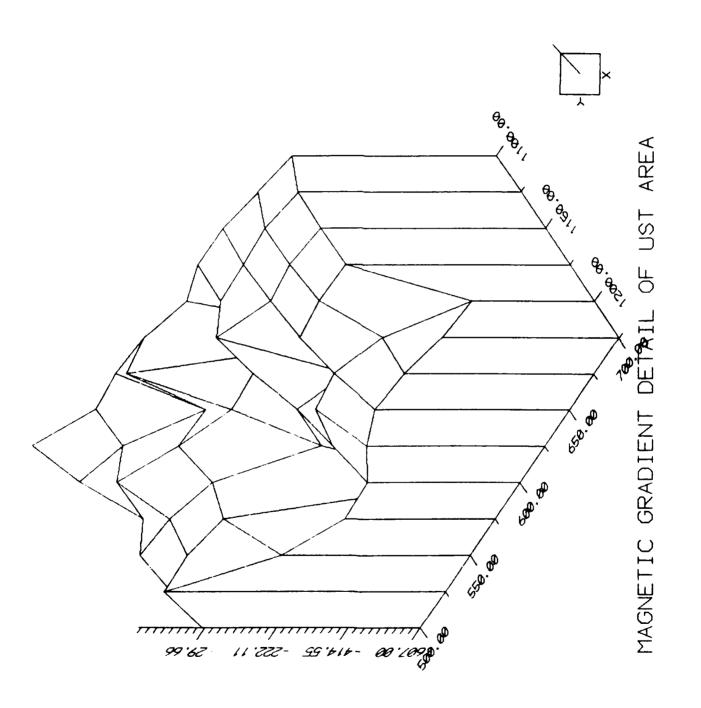
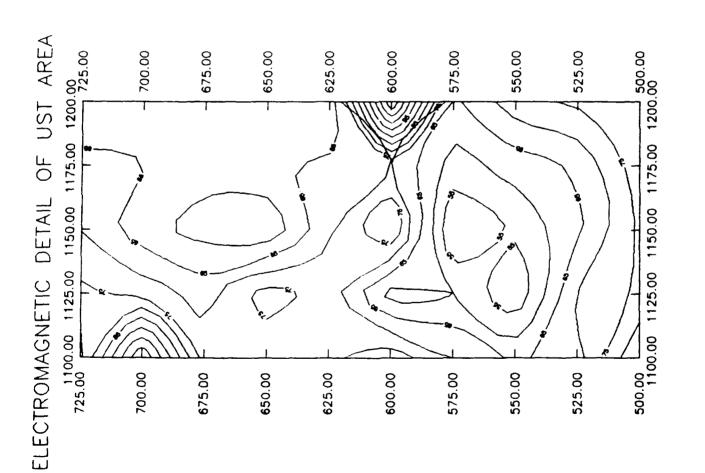
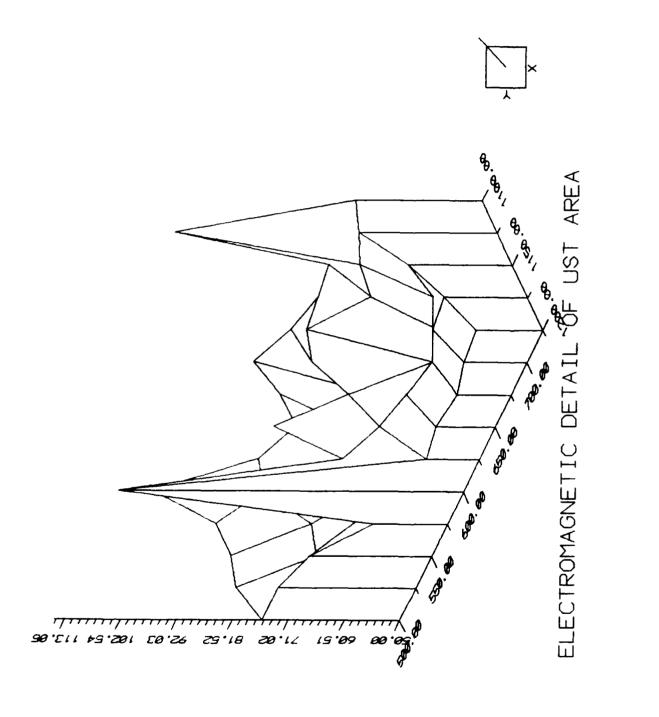
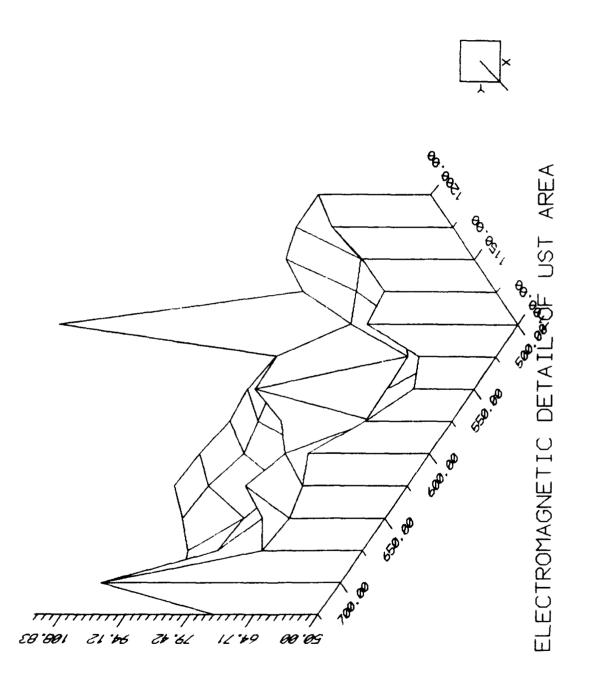
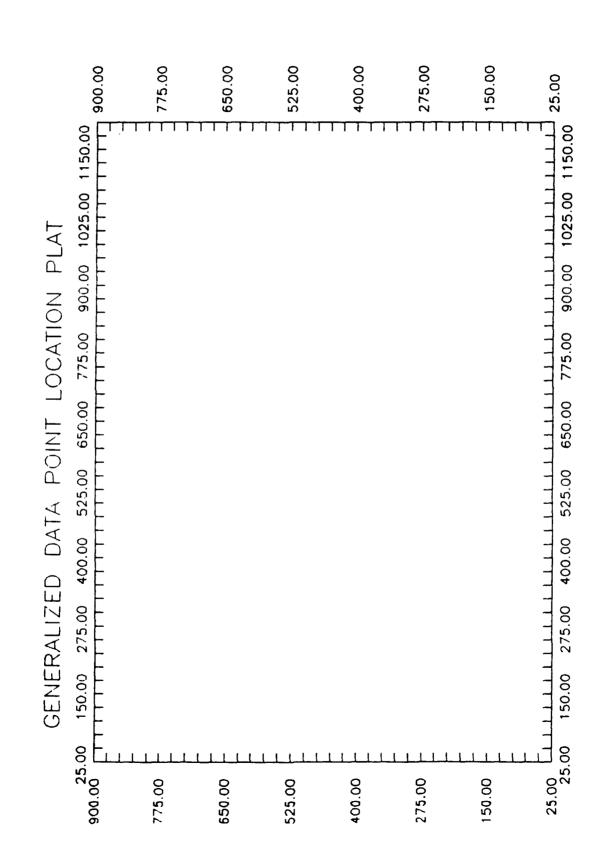


FIGURE 34









APPENDIX D ANALYTICAL DATA BASE

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01-SK84A-A	. 9-, 4	12/21/89 12/13/89 12/13/89 12/13/89 12/13/89 12/13/89 12/13/89
01-SF03B-A	12'-14'	UG/KG 12/13/89
91-SF83A-A	8 . 18	UG/KG 12/13/89
91 SP974 A	16 18	UG/KG 12/14/89
81 - SH81R- A	.82 .98	UG/KG 12/13/89
81 SH81A A	16 18	UG/KG 12/13/89
81 FD82-A	18 22 DUP 958 A	UG/KG 12/21/89
SAMFLE NUMBER: NOTES: LOCATION:	DEFTH: DFSCRIPTION:	UNITS; DATE SAMPLED;

NO FARAMETERS FOR THIS CATEGORY

COMPOUND

FF CAS NO

VOLATILES

NOTES:

J AFFROXIMATE VALUE
[] APFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

ELLINGTON AFB - SITE BI SURSURFACE SOIL

I OCATION:	01-FD82-A	BI SBBIA-A	81-SH81R-A	81 SHBZA-A	81-SRB3A-A	81-SB838-A
DESCRIPTION:	18 : 22 : DUF 858 A	16 : 18	. 92 92	16 18	8 · 10 ·	12:-14:
DATE SAMPLED:	UG/KG 12/21/89	UG/KG 12/13/89	UG/KG 12/13/89	UG/KG 12/14/89	UG/KG 12/13/89	UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG

01-SF84A-A

UG/KG 12/12/89

. 9-. 6

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COMPOUND

BASE/NEUTRALS ### CAS NO NO FARAMETERS FOR THIS CATEGORY

NOTES:

J AFFROXIMATE VALUE
(J AFFROXIMATE VALUE
ND NOT DETECTED
HA NOT ANALYZED

3-2

ELLINGTON AFR - STTE 01 SURSUKFACE SOTL

SAMFLE NUMBER; NDTES; LOCATION;	81-FD82-A	01-5F01A.A	81-SR818-A	01 SE02A A	01 - SF03A-A	01-SF03R-A	81-SF64A-A
DEFIH; DESCRIFTION; UNITS:	18 22 DUF 858 A	81 .91	. 82 - 93	16 18	. 8	12. 14.	.9,6
DATE SAMPLED:	UG/KG 12/21/89	UG/KG 12/13/89	UG/KG 12/13/89	UG/KG 12/14/89	UG/KG 12/13/89	UG/KG 12/13/89	UG/KG
SER ACIDS RES			;		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
FF CAS NO COMFOUND							
65A 108-95-2 FHENDL	155						

NOTES: J AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

ELLINGTON AFR - SITE 01 SUBSUKFACE SOIL

SAMFLE NUMBER: Nates: Location;	81- FD82-A	01-SF01A-A	81-SK01R-A	81 - SH82A-A	01-SH03A-A	01-5R03F-A	01-SF04A-A
DEPTH: DESCRIFTION:	18: 22: DUP 058 A	. 81 . 91	.8292	.81 .91	8 . 18	1214.	, 9-, 4
DATE SAMPLED:	UG/KG 12/21/89	UG/KG 12/13/89	UG/KG 12/13/89	UG/KG 12/14/89	UG/KG 12/13/89	UG/KG 12/13/89	UG/KG 12/12/89
*** FESTICIDES ***			1 1 3 5 5 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		; ; ; ; ; ; ; ; ;		
FP CAS NO COMFOUND							
188F 76-44-8 HEFTACHLOR	133					č	

21

NOTES :

AFFROXIMATE VALUE
AFFROXIMATE VALUE
NOT DETECTED
NOT ANALYZED - 29 ≸

FILINGFON AFR STEE 01 SUISURFACE SOIL

SAMFIE MIMBER: NOTES: LOCATION:	01 FD87 A	01 SE01A-A	01-SB01k-A	81-SPUDA: A	01 : SF03A : A	01∵SR03H-A	01-SR84A.A
DEFTH:	18: 22 DUF 858 A	. 81 . 91	. 82 . 92	. 81 . 91	. 81 8	12. 14.	, 9- , 4
UNIS: DATE SAMPLED:	M67KG 12721789	MG/KG 12/13/89	MG/KG 12/13/87	~	MG/KG	MG/KG	MG/KG
	•			ì		15/13/87	12/12/89
FFF INDEPENDENT ###							
FP CAS NO COMPOUND							
1 ALUMINUM	1840	800	8701				
AKSENIC	1.9	0.0	1908	649	5780	3538	8656
	7.4	97.9	[22,3]	[11.1]	•	[1.8]	9.00
PERYLL TUR		[6.82]		[C.11]	4.4	136	186
CALCIUM	258	28686	28888		19.55]	[0.32]	[0.90]
CHEDRICH	2.4	10.13			17.48		
189 00551	1.9	[4.9]					a
11 IRON	880	6.8	[11.7]		[5.6]	[2.1]	[2.6]
12 LEAD	4.6	9 G G G	2928	1439	3866	4918	138
. 13 MAGNESIUM		7.0	6.7		3.6	8.5	15.8
14 MANGANESE	41.2	2000	[18:8]		1150	1250	1478
15 MERCURY	· · · · ·		990	57.3	12.4	452	540
16 NICKEL	•	12.14	[6.13]	[0.19]	[0.18]	[8.19]	8.28
17 FOTASSIUM		2001	(5.5)	[9.6]	[5.5]	[5.5]	16.2
VANADIUM	Ç.	1466	(A17)	[45.6]	320	[407]	[487]
24 ZINC	4	1000	[B.:	[3.5]	[3.9]	[7.5]	28.9
		30.74			12.13		15.67

AFFROXIMATE VALUE AFFROXIMATE VALUE NOT DETECTED NOT ANALYZED 528₹ NOTES:

ELLINGTON AFR - SITE UL SURSURFACE SOIL

SAMFLE NUMBER: NUTES:		01-FD82-A	81-SH81A-A	91 - SF81R-A	01 SHBZA.A	01 - SHB3A-A	01~SR03R-A	01-SF84A-A
LOCATION: DEFIH:		18' 22'	16 '- 18 '	.82 .92	.81 .91	8 ' - 10 '	12:-14:	.96
UNITS: UNITS: DATE SAMPLED:		MG/KG 12/21/89	MG/KG 12/13/89	MG/KG 12/13/89	MG/KG 12/14/89	MG/KG 12/13/89	MG/KG 12/13/89	MG/KG MG/KG MG/KG 12/13/89 12/13/89
### GEOCHEMICAL PARAMETERS ###	PARAMETERS ###							
PP CAS NO	COMPOUND							
	FETROLEUM HYDROCARBONS	9	9	Q N	G N	2	Ş	Q

ELLINGTON AFP - STTE 01 SURSURFACE SOIL

81-SF85F-A	. 22 81	UG/KG 12/21/89
81-SR85A-A	.21 .81	UG/KG UG/KG UG/KG 12/12/89 12/21/89 12/21/89
01 SF84F A	12. 14	UG/KG 12/12/89
SAMFLE NUMBER: NOTES:	CCCS LON: DESCRIPTION:	UNITS: DATE SAMPLED:

NO PARAMETERS FOR THIS CATEGORY

COMPOUND

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VOLATILES ### CAS NO NOTES:

3 AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

ELLINGTON AFF - STIE BI SHESURFACE SOIL

CATION:		H_H;GJC TO	H. NCBNC: TB
•			
DEF1H:	12:14		. ((
DESCRIPTION:		7	11 01
N115:	38/911	116.740	0// 0/1
SATE SAMPLED:	12/12/89	12/21/89	12/21/89

*** PASE/NEUTRALS ***

COMFOUND PF CAS NO NO FARAMETERS FOR THIS CATEGORY

3 AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED NOTES:

ELLINGTON AFR STIF ALSUESURFACE SOLL

-

ADTES:	A NEGATION	81 SH85A A	01-SP05R-A
DCA110N:			
DEFTH:	10 m	: :	
ESCRIFTION:	•		: ; ::
NITS:	58/511	116.786	28/31
JATE SAMFLED:	12/12/89	12/21/89	12/21/89

COMFOUND	
	;
CAS NO	:
S	1
ű	1
ų.	<u>.</u>
4	:

*** ACIDS ***

65A 188 95 2 FHENDI

NOTES:

J APPROXIMATE VALUE
[] APPROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

ELL INGTON AFP - SITE HI SUBSURFACE SOLL

MOTES; OCATION:	И1 SFRИ	81 SR85A A	01 - Sk05k- A
DESCRIFTION:	12. 14	18 12.	18. 55.
UNITS: DATE SAMFLED:	UG/KG 12/12/89	UG/KG 12/21/89	UG/KG 12/21/89

*** FESTICIDES ***

COMFOUND FF CAS NO

HEFTACHI OR 188F 76-44-8

HOTES:

J AFFROXIMATE VALUE

[] AFFROXIMATE VALUE

ND NOT DETECTED

NA HOT ANALYZED

FILLINGTON AFR SITE BI SURSURFACE SOIL

01-5405E-A	. 22 . 81	12/12/89 12/21/89 12/21/89
01 SHOSA A	.21 .81	MG/KG 12/21/89
81. SH84F A	12. 14	MG/KG 12/12/89
SAMFLE NUMBER: NOTES: LOGATION:	DEFTH: DESCRIFTION:	UNITS: DATE SAMPLED:

1		
2		

	948	8.9		,	2.0 1699	2.8	16.3	0.21 2.9	156
	8378	35.1	831 7 8	9 9	6368	4.2	38.6	11.1	874 6.5
	3868 [8,34]	[23.5]			3488	3.4 [852]	4.73	[5.6]	[251] [5.3]
COMFOUND	ALUMINIM ARSENIC	BARIUM Beryllium	CALCIUM CHROMIUM	COBALT COPPER	IRON	MAGNESIUM	MANGANESE MERCURY	NICKEL	FULMSSIUM VANADIUM ZINC
CAS NO									
4	- m	4 no 1	- 6 0 (1.0	= =	125	12	1.6	333

NOTES ;

³ AFFOXIMATE VALUE
(3 AFFOXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

FILINGTON AFE STIE OF SURSUEFACE SOIL

DESCRIPTION: 12 14 10 12 18 72 18 72 18 10 17 18 19 12 18 18 18 18 18 18 18 18 18 18 18 18 18	SAMETER: NOTES: LOCATION:	RI SFUAR A	01 SE050 A	В 1 - SH05H- A
M57KG M57KG 127R2789 12721789	EFTH: FESCRIFTION:	12 14	. 21 - 01	
	UNITS: DATE SAMPLED:	M5/KG 12/12/89	MG/KG 12/21/89	MG/KG 12/21/89

		S
		QN
COMFOUND	4	FETROLEUM HYDROCARRONS
FF CAS NO		
ů.	:	

GEOCHEMICAL PARAMETERS

ş

GROUND-WATER SAMPLES POL STORAGE AREA

FLL INGTON AFR .. STIE 02 GRUUNDWATER

SAMFLE HUMBI NOTES: LOCATION:	ER:		82 MW87 A	92-MW88 A	82-MW89-A	B: Muin A
DEFTH: DESCRIFITON: UNITS: DATE SAMFLED:			9672718 NG71	U6/L 01/22/90	UG/L 01 /24/90	867E 1/97
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	* * * * * * * * * * * * * * * * * * * *	1	1	
*	*** VOLATILES ***	***				
9.5	CAS NO	COMFOUND				
380	188 41-4 95-47-6	ETHYL PENZENE TOTAL XYLENES				6.3
>7	188-98-7 188-98-7	STYRENE CHLOKURENZENE				19 cm

NOTES: J AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

ELLINGTON AFR - STIL BE GROUNDWATER

82 MM18 A	UG/L 01/22/98
A: 984M-58	UG/L 01 /24/98
A-884M 78	UG/L 01/22/98
A THURT A	U671 0 172279 0
SAMFLE NUMBER: NDTES: LOCATION:	DEFTH: DESCRIFTION; UNITS: DATE SAMFLED:

BASE/NEUTRALS

COMFOUND FP CAS NO NO FARAMETERS FOR THIS CATEGORY

AFFROXIMATE VALUE
AFFROXIMATE VALUE
NOT DETECTED
NOT ANALYZED ~ □ 9 % MOTES :

ELLING ON AFR . SITE 02 GROUNDWATER

- DCA1150.	U / 00 10	W. MWBB A	92: MW89 A	0 0 0 0
				2
DEPTHs				
DESCRIFTION:				
UNITS				
DATE SAMFLED:	1/90	1/9/1	7/90	7/9/1
	01/55/40	81/22/18	81/24/98	81/22/98

NO FARAMETERS FOR THIS CATEGORY

COMFOUND

FF CAS NO

BRE ACTOS BEE

NOTES:

AFFROXIMATE VALUE AFFROXIMATE VALUE NOT DETECTED 5 I S S

ELLINGTON AFR - STIE 02 GROUNDWATER

SAME N NEW PROPERTY OF THE PRO		1		:
MOTES	NA YOUNG	0-89ML 79	MO- 1889 - A	6. MW1.0 A
LOCATION:	į	<u>.</u>	<u> </u>	Ž
DEFIX:				
DESCRIPTION:				
UNITS	1/90	1/90	17911	11671
DATE SAMFLED:	86/22/18	86/22/18	01/24/90	01/22/10

*** PESTICIDES ***

COMPOUND F.P CAS NO NO FARAMETERS FOR THIS CATEGORY

NOTES:

3 AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA HOT ANALYZED

ELLINGTON AFR STIE 02 GROUNDWATER

SAMFLE NUMBER: NOTES: LOCATION. DEFTH:	67 AWR 10 AN	6.884 AV	02-MW09-A NA	82 MW18-A
DESCRIPTION; UNITS: DATE SAMFLED;	UG/L 81/22/98	UG/L 81/22/98	UG/L Ø1/24/90	9671271 8

*** INDREANICS ###

٤ :

COMFOUND CAS NO

NI FARAMETERS FOR THIS CATEGORY

MOTES:

J AFFOXIMATE VALUE
[] AFFOXIMATE VALUE
ND NOT DETECTED
NA NUT ANALYZED

ELLINGTON AFR SITE 02 GROUNDWATER

DATE SAMPLED: ### GEOCHEMICAL PARAMETERS ### FP CAS NO COMFOUND

SUBSURFACE SOIL SAMPLES POL STORAGE AREA

ELLINGTON AFB - SITE 02 SUBSURFACE SOIL

82-SB88A-A	.2-,0	UG/KG 81/13/98
A-3/842-18	16'-18'	UG/KG 01/12/90
82-S887k-A	8 - 10 .	UG/KG 01/12/90
02-SH07A-A		US/KG 81/12/98
82FD84-A	8 -18 DUP 18A A	UG/KG Ø1/16/98
82-FD83-A	16'-28' DUF 88C-A	UG/KG 01/13/90
02-FD01-A	18 · 22 · DUF 11C · A	UG/KG 12/18/89
SAMFLE MUMBER: NOTES: LOCATION:	DESCRIFTION:	DATE SAMPLED:

*** VOLATILES ***

COMPOUND	ACETONE	2 - BUTANONE	4-METHYL-2-FENTANINE	BENZENE	ETHYLBENZENE	TOTAL XYLENES	STYRENE	CHLOROPENZENE	METHYLENE CHLORIDE	1.2-DICHLOROPROPANE
CAS NO	67-64-1	78-93-3	168~16-1	71-43-2	199-41-4	92-41-6	188-42-5	168-96-7	75-89-2	78-87-5
4				\$	380			2	4	320

NOTES :

AFFOXIMATE VALUE
AFFOXIMATE VALUE
NOT DETECTED
NA)T ANALYZED

ELI INGTON AFR - STIE 02 SURSURFACE SOIL

02-5808A-A NA		UG/KG 01/13/90
82-SK87C-A	16 '- 18 '	UG/KG 01/12/90
82-5887K-A NA	8 - 18	UG/KG 01/12/90
82 SF87A A		UG/KG 0 1/12/9 0
02.FD84.A	8 - 10 ' DUF 10A-A	UG/KG 01/16/90
02 · FD03 · A	16 28 DUF 88C-A	UG/KG 01/13/90
82-FD81-A NA	18 - 22 - DUP 11C A	UG/KG 12/18/89
SAMFLE NUMBER: NUTES: LOCATION:	DEFTH: Description:	UNITS: Date Sampled:

BASE/NEUTRALS

COMPOUND CAS NO 55P 91-28-3 91-57-6 ٤ |

NAPHTHALENE 2-METHYLNAPHTHALENE

11**8**3

J AFPROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED NOTES :

ELLINGTON AFB - SITE 02 SURSURFACE SOIL

SAMFLE NUMBER: NOTES: LOCATION:	02-F DØ1-A NA	82-FD83-A	02-FD04-A	82-SHB7A: A NA	82-SR87E-A NA	02-SR07C-A	82~SR88A-A NA
EPTH: FED IN TONI	181-221	1620	8 · 16 ·		818.	16'-18'	.20
SSCRITION: VITS: ATE SAMPLED:	DOF 115.4 UG/KG 12/18/89	UG/KG 01/13/90	UG/KG 06//KG 01/16/90	UG/KG 01/12/90	UG/KG 01/12/90	UG/KG 01/12/90	UG/KG 81/13/98

*** ACIDS **

COMPOUND CAS NO ů.

NO PARAMETERS FOR THIS CATEGORY

NOTES :

AFFROXIMATE VALUE APPROXIMATE VALUE NOT DETECTED NOT ANALYZED ₅ 🗆 🕏 🕏

ELLINGTON AFB - SITE 02 SURSURFACE SOIL

MOTES: LOCATION:	82-F DØ1 - A NA	82: FD83-A NA	82-FD84-A NA	BE SFB7A A	82-58878-A NA	82-S8875-A NA	82-SE88A-A NA
DESCRIPTION:	18 - 22 · DUP 11C A	16 20 DUF 98C-A	8 - 18 - DUF 190-6	. Z = , B	8 * - 10	.8191	, , , , , , , , , , , , , , , , , , ,
DATE SAMPLED:	UG/KG 12/18/89	UG/KG 01/13/90	UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG UG/KG 01/13/98 81/13/98 81/13/98 81/13/98	UG/KG 01/12/90	UG/KG 01/12/90	UG/KG 01/12/90	UG/KG

*** PESTICIDES ***

COMPOUND CAS NO PP CAS NO NO FARAMETERS FOR THIS CATEGORY

NOTES:

J AFFROXIMATE VALUE

() AFFROXIMATE VALUE

ND NOT DETECTED

NA NOT ANALYZED

ELLINGTON AFR - SITE 02 SURSURFACE SOIL

02-SE07C-A 02-SE0BA-A NA NA	16'-18' 8'-2'	MG/KG MG/KG MG/KG MG/KG MG/KG MG/KG MG/KG B1/12/90 81/12/90 81/12/90 81/12/90
82-SF87FA Na	8 -18	MG/KG 01/12/90
82 - SH07A - A NA		MG/KG 01/12/90
82.FD84-A NA	8 - 18 '	MG/KG 81/16/99
82 - F D83 - A NA	16'-20' Dupl.1CATE	MG/KG MG/KG 12/18/89 01/13/90
82-FD81-A NA	18'-22' DUF 11C-A	MG/KG 12/18/89
SAMPLE NUMBER: NOTES: LOCATION:	DEPTH: DESCRIPTION:	UNITS: DATE SAMFLED:

*** INDRGANICS ***

PP CAS NO COMPOUND

NO PARAMETERS FOR THIS CATEGORY

MOTES: 3 AFFROXIMATE VALUE

[] APFROXIMATE VALUE

ND NOT DETECTED

NA NOT ANALYZED

ELLINGTON AFR - SITE 02 SURSURFACE SOIL

SAMFLE NUMBER: NOTES: LOCATION: DEFTH:	82-FD81-A	02. FD83-A	82-FD84-A	02.5407A-A	02-SF078-A	82-5487C-A	82-SK88A-A
	18: 22: DUP 11C-A	16: 20: DUF 08C-A	8 - 10 DUF 10A A		8 ' 1.0 '	16'-18'	.20
AATE SAMPLED:	MG/KG 12/18/89	MG/KG 01/13/90	MG/KG 81/16/98	MG/KG 01/12/90	MG/KG 81/12/98	MG/KG 81/12/98	MG/KG 01/13/90
*** GEOCHENICAL PARAMETERS ***					7 1 1 1 1 1 1 1 1 1 1		: 4 1 2 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
PF CAS NO COHFOUND							
FETROLEUM HYDROCARKONS	Q.	<u>a</u>	66	gn	Q N	G Z	9

ELLINGTON AFR - SITE 02 SURSURFACE SOT

82-SH18H-A	2823.	UG/KG	B1 (0) (18		
82-SR18A-A	.818	UG/KG 81/16/98			663
82-SF89C-A	2123.	UG/KG 81/15/98	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
A-4684S 28	.116	UG/KG 01/15/98	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
82-5489A-A	4.4	UG/KG Ø1/15/98	1		
92-SH88C-A	1620.	UG/KG Ø1/13/98	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
82-51881-A	8 7 1.08 7	UG/KG 81/13/98			
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	*	COMPOUND	ACETONE 2-BUTANONE 4-NETHYL-2-FENTANONE RENZENE ETHYL.BENZENE 10TAL XYLENES STYRENE CHLORORENZENE METHYLENE CHLORIDE 1.2-DICHLOROFROPANE
SAMFLE NUMBER: NOTES:	DEFIH; DESCRIFTION; HMTC.	DATE SAMPLED:	### VOLATILES ###	PP CAS NO	67-64-1 78-93-3 108-10-1 4V 71-43-2 38V 100-41-4 95-47-6 100-42-5 7V 108-99-7 44V 75-89-2 32V 78-87-5

J AFFROXIMATE VALUE

[] AFFROXIMATE VALUE

ND NOT DETECTED

NA NOT ANALYZED

5-7

NOTES :

ELLINGTON AFB - SITE 02 SURSURFACE SOIL

82-SR18A-A 82-SR18B-A	. 22 . 882	
	.818	UG/KG 81/16/98
02-SH09C-A	2153.	UG/KG 01/15/90
82-5489H-A NA	9 111	UG/KG @1/15/98
82-5489A-A NA	. 6 2	UG/KG 81/15/98
82~SHBBC~A	1620.	UG/KG 01/13/90
82 - SKØ8F - A NA	8.18	UG/KG 01/13/90
SAMFLE NUMBER: NOTES; LOGATION:	DESCRIPTION: UNITS.	DATE SAMPLED:

1503

NAPHTHALENE 2-METHYLNAPHTHALENE

55B 91-28-3 91-57-6

COMPOUND

FP CAS NO

BASE/NEUTRALS

NOTES: J AFFROXIMATE VALUE

[] APPROXIMATE VALUE

ND NOT DETECTED

NA NOT ANALYZED

ELLINGTON AFR - SITE 07 SURSURFACE SOIL

SAMFLE MUMBER: NDTES:	82 SEBBE A	02∵SE08C-A	02-5409A-A Na	02-SE09E-A	82-SK89C-A	82-SE18A-A	62-58188-A NA
DEFTH: DESCRIPTION:	8 - 10	16 128	. 6 2	9.111	21 1: 23 1	8 · 18 ·	2825.
UNITS: DATE SAMFLED:	UG/KG 81/13/98	UG/KG 01/13/90	UG/KG Ø1/15/90	UG/KG 01/15/90	UG/KG 01/15/90	UG/KG 81/16/98	UG/KG 01/16/90

*** ACIDS ***

COMFOUND CAS NO 4 NO FARAMETERS FOR THIS CATEGORY

NOTES:

J AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

ELLINGTON AFR - SITE BZ SURSURFACE SUIL

SAMFI E NUMBER; NDTES; LOCATION;	02-SR08R A	02-SH88C-A NA	82-5489A-A NA	82-54894-A NA		82-5818A-A NA
DESCRIPTION:	81 - 18	16 20	V . Z	9 11	21. 23.	. 8 1.8.
UNITS: Date Sampled;	UG/KG 81/13/98	UG/KG 81/13/98	UG/KG 81/15/98	UG/KG 01/15/90	UG/KG 01/15/90	UG/KG 81/16/98

82-SR188-A NA

. 22 - . 82

UG/KG 01/16/90

PESTICIDES

COMPOUND FF CAS NO

NO FARAMETERS FOR THIS CATEGORY

J AFFROXIMATE VALUE

[] AFFROXIMATE VALUE

ND NOT DETECTED

NA NOT ANALYZED NOTES .

ELLINGTON AFB - SITE 02 SUBSURFACE SOIL

NOTES: LOCATION:	82 · SF88F A	82 - SR88C - A NA	82-SE89A-A NA	02 SH09R A	82-5889C-A NA	82-SE18A-A NA
FTH: SCRIFTION:	8 - 18	. 82 . 91	. 	9 - 11 -	. 53 . 13	. 81 18
UNITS: Date Sampled:	MG/KG 01/13/90	MG/KG 81/13/98	MG/KG 01/15/90	MG/KG 01/15/90	MG/KG 01/15/90	MG/KG 01/16/98

82-58188-A Na

.22-,02

MG/KG 01/16/90

INDRGANICS

COMPOUND PP CAS NO NO FARAMETERS FOR THIS CATEGORY

NOTES:

3 AFFROXIMATE VALUE
[] APPROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

ELLINGTON AFR - SITE B2 SURSURFACE SOIL

SAMFLE NUMBER: NOTES:		02 SR888 A	02-SHØ8C-A	82-SR89A A	82.SE89E A	82-SF89C-A	82-SF.8A.A	82-SH18K-A
LOCATION: DEPTH: DESCRIPTION:		8 - 18	16 29	. •	9 11	21. 23.	. 8. 1.9.	.55.
UNITS: DATE SAMPLED:		MG/KG 01/13/90	MG/KG 01/13/90	MG/KG 81/15/98	MG/KG 01/15/90	MG/KG 01/15/90	MG/KG 01/16/90	MG/KG 01/16/90
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	* * * * * * * * * * * * * * * * * * * *	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	; ; ; ; ; ; ; ; ;	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
### GEOCHEMICAL	### GEOCHEMICAL PARAMETERS ###							
F.P. CAS NO	COMFOUND							
	FETROLEUM HYDROCARBONS	QN	Q X	9	Q.	QN	66	Q

ELLINGTON AFR - SITE 02 SURSURFACE SOIL

SAMFLE NUMBER: NOTES: LOCATION:	82.5B11A A	02-58118-A	02-SH11C-A	82-SK17A-A	02-5R12R-A	02-5R12C-A	02-SR13A-A
DESCRIPTION: INITS:	· + 60	4.6.	18 · 22 ·		.8.9	.22-, 02	.289
DATE SAMPLED;	UG/KG 12/18/89	UG/KG 12/18/89	U6/KG 12/18/89	UG/KG 12/18/89	UG/KG 12/18/89	UG/KG 12/18/89	UG/KG
### VOLATILES ###			4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			

168

1863 2163 2463

ACETONE
2-BUTANONE
4-METHYL-2-FENTANONE
BENZENE
ETHYLENZENE
TOTAL XYLENES
STYRENE
CHLORORENZENE
METHYLENE CHLORIDE
1,2-DICHLOROFRONE 67.64-1 78-93-3 188-18-1 71-43-2 188-41-4 95-47-6 188-96-7 75-69-2 78-87-5

380

COMFOUND

CAS NO

& |

NOTES:

J AFFROXIMATE VALUE

E) APPROXIMATE VALUE

ND NOT DETECTED

NA NOT ANALYZED

5-13

74 44¢ 32¢

ELLINGTON AFR - SITE 02 SUBSURFACE SOIL

SAMFLE NUMBER: NOTES: LOCATION:	82-SELIA A NA	92 SR11B-A	82-SR11C A NA	02 SF12A: A	02 SH12H-A	02-SR12C-A NA
DEFINE DESCRIPTION:	. (3	46	181-221		.89	. 22 - 82
DATE SAMPLED:	UG/KG 12/18/89	UG/KG 12/18/89	UG/KG 12/18/89	UG/KG	UG/KG	UG/KG
	F : 1 E : 7 E E E E E E E E E	68/81/21 49/91/71			14/18/89	12/18/89

82-SB134-A NA

.2-.0

UG/KG 12/19/89

BASE/NEUTRALS

NAFHTHALENE 2-METHYLNAFHTHALENE COMFOUND CAS NO 91-28-3 34 55B

AFFROXIMATE VALUE AFFROXIMATE VALUE NOT DETFCTED NOT ANALYZED NOTES:

ELLINGTON AFR - SITE 02 SURSURFACE SUIL

SAMPLE NUMBER: NOTES:	82-SE11A-A NA	82-SB11B-A	82 SE11C A	82-SH12A-A	82-SH12R-A NA	82-SR12C-A NA	62-5B13A-A Na
DEFTH:	C4 (5)	4 6	18 : 22		8.9	18 - 11.	
DESCRIPTION: UNITS: DATE SAMPLED:	116/KG 12/19/89	UG/KG 12/18/89	UG/KG 12/18/89	UG/KG 12/18/89	UG/KG 12/18/89	UG/KG 12/18/89	UG/KG 12/19/89
	1 1 1 1			t :			1 1 1 1 1 1 1 1

*** ACIDS ***

COMPOUND CAS NO 4

NO FARAMETERS FOR THIS CATEGORY

₅ □ **9 9** NOTES:

AFFROXIMATE VALUE
APFROXIMATE VALUE
NOT DETECTED
NOT ANALYZED

ELLINGTON AFR - SITE 87 SURSURFACE SOIL

SAMFLE NUMBER: NOTES: LOCATION:	82 SELLA A NA	02-SH11F-A NA	02-58116-A NA	02 SELTA	A 02-58128-A	82-SF17C-A NA
DEFITH:	6	4.6	18: 22:	· ·	. 8 9	. 22 . 00
UNITS	11G / KG	UG/KG	UG/KG	UG/KG	UG/KG	
DATE SAMPLED:	12/18/89	12/18/89	12/18/89	12/18/89	12/18/89	12/18/89

82-5813A-A NA

UG/KG 12/19/89

.2~.0

*** PESTICIDES ***

COMPOUND CAS NO ٤ | NO FARAMETERS FOR THIS CATEGORY

NOTES:

AFFROXIMATE VALUE AFFROXIMATE VALUE NOT DETECTED NOT ANALYZED ~ 28 %

ELLINGTON AFB - SITE 02 SUBSURFACE SOIL

NOTES: LOCATION:	82-SH11A-A NA	82-SR118-A NA	02~5811C-A NA	82 - SR12A-A NA	82-5R12R-A NA	82-SF12C-A NA	82-SB13A-A NA
H: RIFTION:	. 3 6	. 9 6	181 - 22 -	₹6	.8-,9	1815.	.2-,8
DATE SAMPLED:	MG/KG 12/18/89	MG/KG 12/18/89	12/18/89 12/18/89 12/18/89 12/18/89 12/18/89 12/18/89 12/18/89 12/19/89	MG/KG 12/18/89	MG/KG 12/18/89	MG/KG 12/18/89	MG/KG 12/19/89

INDRGANICS

COMPOUND FP CAS NO NO FARAMETERS FOR THIS CATEGORY

J AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED NOTES:

ELLINGTON AFB - SITE 02 SUBSURFACE SOIL

SANFLE NUMBER: NOTES:		02-SE11A.A	02-SR11R-A	92-SR11C-A	82-SH12A·A	82-SB12R-A	02-SR12C-A	02-SR13A-A
DEFTH: DESCRIPTION:		. 2 6	.96	1822.	. ₹ . 8	.89	2825.	. 2 8
; 	; ; ;	MG/KG 12/18/89			MG/KG 12/18/89	MG/KG 12/18/89	MG/KG 12/18/89	MG/KG 12/19/89
*** GEOCHEMICAL PARAMETERS ***	ETERS ###		1 h h h h h h h h h h h h h h h h h h h	1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
PP CAS NO CO	COMPOUND							
PETRO	PETROLEUM HYDROCARKONS	QN	문	Q	Ş	ᅙ	Q.N	132

ELLINGTON AFB - SITE 02 SUBSURFACE SOIL

SAMPLE NUMBE NOTES:	: ::		82-SE138-A	02-SK13C-A	82-SR14A-A	02:SB14R-A	82-5814C-A
LOCATION: DEPTH: DESCRIPTION:	_		. 9 6	. 22 . 82	. 2 8	. 8 9	1850.
UNITS:			UG/KG 12/19/89	UG/KG 12/19/89	UG/KG 12/19/89	UG/KG 12/19/89	UG/KG 12/19/89
*	*** VOLATILES ***				; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
44	CAS NO	COMPOUND					
	67-64-1	ACETONE 2-BUTANONE			25 6 3 413		
74	168-18-1 71-43-2	4-METHYL-2-FENTANONE RENZENE		4.1			
380	188-41-4	ETHYLRENZENE	158883	33			
	92-42-8	TOTAL XYLENES		121			
	168-42-5	STYRENE		5.1			
٧٢		CHLOROBENZENE		1.1			
44V 32V		METHYLENE CHLORIDE 1.2-DICHLOROFROPANE	6188.1	1.3			

AFFROXIMATE VALUE
AFFROXIMATE VALUE
NOT DETECTED
NOT ANALYZED NOTES :

ELLINGTON AFR - SITE 02 SURSURFACE SOIL

SAMFLE NUMBER: NOTES:	B2 SHISH A	02 SR13C+A NA	02 SK13C-A 02-SK14A-A NA	82 SHI4H A	82 SE14C-A NA
DETTH: DESCRIPTION:	4 . 6	. 22 . 82		.8 . 9	.02 .81
DATE SAMPLED:	UG/KG 12/19/89	UG/KG 12/19/89	UG/KG UG/KG UG/KG 12/19/89 12/19/89 12/19/89	UG/KG 12/19/89	UG/KG 12/19/89

288.1 648

NAPHTHALENE 2-METHYLNAPHTHALENE

558 91·20-3 91-57·6

COMPOUND

2 |

BASE/NEUTRALS ### CAS NO AFFROXIMATE VALUE AFPROXIMATE VALUE NOT DETECTED NOT ANALYZED ~ □ **9** § NOTES :

ELLINGTON AFR - SITE 02 SUBSURFACE SOIL

SAMFLE NUMBER: NOTES: LOCATION:	02 SH138-A	82-5813C-A NA	02-SR13C-A 02-SR1A	82 - SR148 - A NA	02-5814C-A NA
DEFTH: DESCRIPTION:	46	.22 .80		. 8 . 9	18 28
UNITS: DATE SAMPLED:	UG/KG 12/19/89	UG/KG 12/19/89	UG/KG 12/19/89	UG/KG 12/19/89	UG/KG 12/19/89

COMPOUND CAS NO 44

*** ACIDS ***

NO PARAMETERS FOR THIS CATEGORY

NOTES:

AFFROXIMATE VALUE AFFROXIMATE VALUE NOT DETECTED NOT ANALYZED -, 🗆 🗣 💈

ELLINGTON AFR - SITE 02 SURSURFACE SOIL

SAMFLE NUMBER; NDTES; LOCATION; DEFTH; DEFTH; DNTS; DNTES;			
AMFLE NUMBER; DOTES; DOCATION; EPTH: ESCRIFTION; NITS;			

82-SF14C-A NA

82-5814H-A NA

82-5814A-A NA

82-581.3C-A NA

82. SH13H A

UG/KG 12/19/89

UG/KG 12/19/89

UG/KG 12/19/89

UG/KG 12/19/89

UG/KG 12/19/89

18.50

. 8 - . .

12.0

22 .02

9 . 4

PESTICIDES

COMPOUND PP CAS NO ND PARAMETERS FOR THIS CATEGORY

NOTES :

J APPROXIMATE VALUE
[] APPROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

ELLINGTON AFR - SITE 02 SURSURFACE SOIL

SAMPLE NUMBER:	NOTES	LOCATION:	DEPTH	DESCRIPTION:	UNITS	DATE SAMPLED:	

82-SR14C-A NA

02 - SH148-A NA

82..5814A-A NA

82-SH13C-A NA

82-SF13F-A NA

MG/KG 12/19/89

MG/KG 12/19/89

MG/KG 12/19/89

MG/KG 12/19/89

MG/KG 12/19/89

18 . 28

8.9

2 - 8

28 - 22 -

9 . 6

INDRGANICS

COMPOUND PP CAS NO NO FARAMETERS FOR THIS CATEGORY

NOTES:

J AFFROXIMATE VALUE

[] APFROXIMATE VALUE

ND NOT DETECTED

NA NOT ANALYZED

ELLINGTON AFR - SITE 82 SURSURFACE SUTL

SAMPLE NUMBER: NOTES: LOCATION:	82-SH13F A	07-SH13C-A	02-SE14A-A	82-SH14R-A	A-3814C-A
DEFTH; DESCRIFTION; UNITS:	. 9	. 22 . 82		8 . 4	. 96 81
DATE SAMPLED:	MG/KG 12/19/89	MG/KG 12/19/89	MG/KG 12/19/89	MG/KG 12/19/89	MG/KG 12/19/89
### GEOCHEMICAL FARAMETERS ###		* * * * * * * * * * * * * * * * * * *	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		

9 FETROLEUM HYDROCARBONS COMPOUND CAS NO £ :

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9

ş

윺

BLANK SAMPLES FORMER BASE LANDFILL

ELLINGTON AFB - SITE BI FLANKS

SAMFLE NUMBER: NOTES: LOGATION: DEPTH: DESCRIPTION: UNITS:	E K :		01-F801 A HFLC FIELD PLANK UG/L 12/14/89	01-FP02-A MUNICIFAL FIELD BLANK UG/L 12/14/89	01-FB03-A HFLC FIELD RLANK UG/L 12/21/89	01-FF04-A MUNICIFAL FIELD BLANK UG/L	01-FB10-A HFLC FIELD BLANK UGAL	01-FB11-A LF HYDRANT FIELD BLANK UG/L	81-RB81-A RINSATE UG/L
3	SER VOLATILES ERE	**	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				96/77/10	61/24/98	12/12/89
4	CAS NO	COMFOUND							
4 (67-64-1 78-93-3 591-78-6 71-43-2	ACETONE 2-BUTANONE 2-HEXANONE RENZENE		& &			,	116	76 27
255 440 470 480 510	67-66-3 75-89-2 75-25-2 75-27-4 124-48-1 75-15-8	CHLOROFORM METHYLENE CHLORIDE BRONDFORM BRONDICHLOROMETHANE CHLORODIBRONOMETHANE CARBON DISULFIDE		60 th 60		3.16	9 1 6	33 21 21 41	

NOTES: J APPROXIMATE VALUE

[] APPROXIMATE VALUE

ND NOT DETECTED

NA NOT ANALYZED

ELLINGTON AFR - SITE 01 BLANKS

01-RB01-A		RINSATE UG/L 12/12/89
01-FB11-A	LF HYDRANI	FIELD BLANK UG/L 01/24/90
01-FR18-A	HFLC	FIELD BLANK UG/L 01/24/90
81-F484 A	MUNICIFAL	FIELD FLANK UG/L 12/21/89
01-FE03-A	วาสห	FIELD BLANK FIELD BLANK FIELD FLANK FIELD BLANK RINSATE UG/L UG/L UG/L UG/L UG/L UG/L UG/L UG/L
81 -F R02-A	MUNICIFAL	F 1EL D RL ANK UG/L 12/14/89
01 FR01 - A	HF1 C	F1ELD FILANK UG/L 12/14/89
SAMFLE NUMBER: NOTES:	LUCA JUN:	UNITS: UNITS: DATE SAMPLED:

RASE/NEUTRALS

COMFOUND CAS NO ١

BIS(2-ETHYLHEXYL)PHTHALATE PYRENE 66B 117-81-7 84B 129-68-8

66

AFFROXIMATE VALUE AFFROXIMATE VALUE NOT DETECTED NOT ANALYZED -, □9 ≸ NOTES:

ELLINGTON FE SITE BY BLANKS

*** ACIDS ***

PF CAS NO COMFOUND

64A 87-86-5 FENTACHLOROFHENDL

230

NOTES: 3 AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

FLLINGTON AFF SITE BY BLANKS

NOTES:	61 F FB1 A	81 1 FB2 A	81-F FB.3 A	81 1 HAG A	01-FR18-A
4	J 1.JH	MUNICIFAL	HPI C	MUNIC IF A	□ 1.5±
DESCRIFTION: UNITS:	FIELD ELANK	I IFI D RI ANK	FIELD PLANK	FIELD BLOWK	F TELD BLANK
DATE SAMFLED:	12/14/89	U6/L 12/14/89	UG/L 12/21/89	UG/1	UG/L

01-RE01-A

KINSATE UG/L 12/17/89

*** PESTICIDES ***

COMPOUND DELTA BHC GAMMA BHC HEPTACHLOR 185F 58-89-9 185F 58-89-9 188F 76-44-8 FF CAS NO

H0185:

3 AFFROXIMATE VALUE
[1] AFPROXIMATE VALUE
ND HOT DETECTED
HA HOT ANALYZED

ELLINGTON AFR STTE BT REANKS

J AFFROXIMATE VALUE
[] APFROXIMATE VALUE
ND NOT DETFCTED
NA NOT ANALYZED NOTES:

ELL INSTON AFR - STIE BL FLANKS

	F HYDRANI		81/24/98		e e
01-1418	HF1C	FIELD BLANK MG/L	1		Ş
91 - I H94 A	MUNICIEAL	FIELD FLANK MG/L			4D
01 -F 1883 A	HFLC	FIELD RLANK MG/L 12/21/89			QN
91 F 182 A	MINICIFAL	F I E I D RI ANK MG/L 12/14/89	+ † † 1 1 1 2 2 3 3		2
01 FF01 A	HFIC	FIFLD FLANK MG/L 12/14/89			Q
			FARAMETERS ###	COMFOUND	FETROLEUM HYDROCAKBONS
SAMFLE NUMBER: NOTES:	LOCATION: DEFTH:	DESKIPTION; UNITS; DATE SAMPLED;	*** GEOCHEMICAL FARAMETERS ***	PP CAS NO	

ELLINGTON AFB - SITE BY PLANKS

01-T889-A	TRIP BLANK UG/L 01/25/98			23 th
81-TE84-A	TRIF BLANK UG/L 12/21/89			9
01-TR03-A	TR.IF BLANK UG/L 12/14/89			12 6 6-
81-T#81-A	TRIF BLANK UG/L 12/13/89	1 1 1 1 1 1 1 1 1 1 1		n 6
01-8813-A	KINSATE UG/L 01/25/90			6 11 6
01-FF93-A	KINSATE UG/L 12/14/89			
		**	COMPOUND	ACETONE 2- RUTANONE 2- HEXANONE 2-HEXANONE BENEENE CHLOROFORM METHYLENE CHLORIDE BROHODICHLOROMETHANE CHLORODIBROHOMETHANE CARRON DISULFIDE
SAMFLE NUMBER: NOTES: LOCATION:	DESCRIFTION; UNITS; DATE SAMPLED;	### VOLATILES ###	FF CAS NO	67-64-1 78-93-3 591-78-6 4V 71-43-2 23V 67-66-3 44V 75-89-2 47V 75-25-2 48V 75-27-4 51V 124-48-1 75-15-8

AFPROXIMATE VALUE
AFFROXIMATE VALUE
NOT DETECTED
NOT ANALYZED 5099 NOTES:

FLI INSTON AFE STIF 01 FLANKS

184-A 81-TR89-A	K TKIF ELANK TRIP ELANK TRIP BLANK UG/L UG/L UG/L UG/L 12/14/89 12/21/89 81/25/98
. A 81-TF84-A	ANK 18.1F UG/L 9 12/21
01 1F83 A	K TKIF BLANK UG/L 12/14/89
9 81-TR81-A NA	TKIF FILAN UG/L 12/13/89
4 01-KB13-A	:
81 - RE85 - A	KINSATE UG/L 12/14/89
SAMFLE NUMBER; NOTES; LOCATION; DEFTH;	DESCRIPTION: UNITS: DATE SAMPLED:

BASE/NEUTRALS

ĕ

COMFOUND CAS NO

668 117-81-7 FIS(2: ETHYLHEXYL)FHTHALATE 848 129-88-8 FYRENE

NOTES:

AFFROXIMATE VALUE
AFFROXIMATE VALUE
NOT DETECTED
NOT ANALYZED - □ **9** §

ELL INGTON AFR - SITE 81 PLANKS

SAMFLE NUMBER: NOTES: LOCATION:	01 RK01 A	01 RF13-A	81-TB81 · A NA	01: 1F03: 0	01 TB04 A	81-1889-A NA
	KINSAIE	KINSAIE	TRIF RLANK	TRIF BLANK	TRIF PLANK	TRIF HLANK
	1/9/1	NG/L	UG/L	1/ 9 n	7/9n	UG/L
	12/14/89	01/25/90	12/13/89	12/14/89	12/21/89	01/25/60

*** ACIDS ***

COMFOUND FF CAS NO

FENTACHLOROFHENOL 64A 87-86-5

J AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED NOTES:

ELLINGTON AFR - SITE BL BLANKS

61: TR89 A NA	TRIF BLANK UG/L 01/25/90	
81 - TH84 - A NA	TKIF BLANK UG/L 12/21/89	
81-1FH3 A	16.1F REANK UG/L 12/14/89	
81 TF61-A NA	TKIF BLANK UG/L 12/13/89	
81 RHI3 A	KINSATE UG/L 01/25/90	
01 - КН03∴ д	KINSATE UG/L 12/14/89	
	}	
SAMFLE NUMBER: NUTES: LOCATION: DEFTH:	DESCRIPTION: UNITS: DATE SAMPLED:	*** PESTICIDES ***

COMPOUND

PP CAS NO

DELTA BHC GAMMA BHC HEFTACHLOR

184F 319-86-8 185P 58-89-9 188P 76-44-8

0.072 0.14 0.18

NOTES:

J AFFROXIMATE VALUE

[] AFFROXIMATE VALUE

ND NOT DETECTED

NA HOT ANALYZED

ELLINGTON AFR - SITE BI FLANKS

!

81-RB83 A 81-RB13 A 61-TR81-A 81-TB89-A 81-TB89-A NA NA NA NA NA NA	RINGATE RINSATE TRIF ELANK TRIF ELANK TRIF ELANK TRIF ELANK UG/L UG/L UG/L UG/L UG/L UG/L UG/L UG/L
SAMFLE MUMBER: NOTES: LOCATION:	

INDRGANICS

COMFOUND

PP CAS NO

	[85.9] [1.1]	[0.14]	[2.4]
ALUMINUM AKSENIC BARIUM REKYLIUM	CALCIUM CHRONIUM COBALT TROM	LEAD MAGNESTUM MANGANESE MEKCURY	FOTASSIUM SILVER SODIUM VANADIUM ZINC
⊶ 13 ዊ 16 1	\ B & II	2255	7 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5

[8.4] [52.8] [8.88]

[6.9] 848

[1770]

J AFFROXIMATE VALUE

[] AFFROXIMATE VALUE

ND NOT DETECTED

NA NOT ANALYZED NOTES :

ELLINGTON AFP STIE BE HEANKS

81 · TR89 · A NA	TRIF BLANK MG/L 81/25/98
81 - 1F84 - A NA	IRIF BLANK MG/L 12/21/89
81 TEBS A	TRIF RI ANK MG/L 17/14/87
81 TEB1-A NA	TRIF RI ANK MG/L 12/13/89
61 - RE13 A	KINSATE MG/L 01/25/98
91 - KBB3 A	KINSATE MG/L 17/14/89
SAMFLE NUMBER: Notes: Lucation:	DEPTH: DESCRIFTION: UNITS: DATE SAMPLED:

GEOCHEMICAL PARAMETERS

PF CAS NO COMFOUND

PETROLEUM HYDROCARBONS ND

2

BLANK SAMPLES POL STORAGE AREA

FILTHOTON AFR - SITE OF RIANKS

67-64-1 78-93-3 591-78-6 71-43-7 108-88-3	ACETONE 2. BUTANONE BELIZENE 101.15 NE	£ £			61	12/19/89	01/12/98 01/12/98
	ETHYLEENZENE TOTAL XYLENES CHLORORENZENE CHLORORENZENE CHLOROPORM METHYLENE CHLOROPORM METHYLENE EKDMODTCHLUKOMETHANE CHLORODIBKOMOMETHANE CHLORODISULFIDE OVINYL ACFTATE	<u>c</u>	18 18 18 18 18 18	6 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	16 35 36 17 18 18		

NOTES: J AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

FILLINGTON AFR - STEE BY FLANES

82-RR87-A		KINSATE UG/L A1/12/20	94/71/19
82-KB85-A		RINSATE UG/L 12/19/89	
82 · F #89 · A	F01 SF1601	FIELD BLANK UG/L 81/24/98	
A - 888 - 58	MUNICIFAL	FIELD 14 ANK UG/L 81/16/98	
82 F887-A	HFLC	FIELD FLANK UG/L 81/16/98	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
B? FHB6 A	MUNICIPAL	F 1EL D RLANK UG/L 01/13/90	
92-F895 A	HFET	FIELD BLANK US/L 01/13/90	
SAMPLE NUMBER: NOTES: LOCATION:	DEFTH; DESCRIFTING	UNITS: DATE SAMPLED:	

RASE/NEUTRALS

COMFOUND CAS NO <u>.</u>

BIS(2-ETHYLHEXYL)FHTHALATE NAFHTHALENE 668 117-81-7 558 91-20-3

8

AFFROXIMATE VALUE AFFROXIMATE VALUE NOT DETECTED NOT ANALYZED NOTES:

- C **9** §

FELTHGEON AFR - STIE BY BLANKS

*** ACIDS ***

COMFOUND FF CAS NO

NO PARAMETERS FOR THIS CATEGORY

MOTES:

AFFROXIMATE VALUE AFFROXIMATE VALUE HOT DETECTED HOT ANALTZEP r = = =

ELL INSTRIN AFR STIF RE PLANKS

82 - R 187 - A NA	KINSATE UG/L 01/12/90
82-RE85-A NA	RINSATE UG/L 12/19/89
02-F1489-A NA FOL SP1601	FIELD FLANK FIELD FLANK RINSATE UG/L UG/L 01/16/90 01/24/90 12/19/89
82 FRBB A NA MUNICIFAL	FIELD FLANK UG/L 01/16/90
02 FR07-A NA HF1 C	FIELD FLANK UG/L 01/16/90
82 FH86-A NA MUNICIFAL	FIELD RLAWK FIELD FLANK FIELD FLANK UG/L UG/L UG/L B1/13/98 81/16/98
82 F 1485 A NA 1871 C	FIELD BLANK UG/L 01/13/90
SAMFLE NUMRER: NOTES: LOCATION: DEFTH:	NITS:

COMPOUND

CAS NO

2

*** PESTICIDES ***

NO FARAMETERS FOR THIS CATEGORY

NOTES :

3 AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

FIT INGTON AFB - STIE BY BLANKS

62 - RE67 - A NA	
82-KF85-A	
82 F F89 A NA FOL SF 1601	F IELD BLANK UG/L 81/24/98
	F TELD FLANK UG/L 81/16/98
82 1 887 A Nn HFT C	F 1E1 D F4 AHK UG/L 01/16/90
	FIELD BLANK UG/L 81/13/98
82 1 1950 A NA HETC	FIELD FLANK UG/L 01/13/90
FR:	DESCRIFTION; UNITS; DATE SAMFLED;
SAMFLE NUMBER; MOTES; LOCATION; DEFTH;	DESCRIFTION: UNITS; DATE SAMFLED;

NO PARAMETERS FOR THIS CATEGORY

COMPOUND

FF CAS NO

INDEGANICS

J AFFROXIMALE VALUE

[J AFFROXIMALE VALUE

ND NOT DETECTED

NA NOT ANALYZED NOTES:

ELLINGTON AFR - SITE BY BLANKS

SAMPLE NUMBER:		N 2843.28	87-FR86 A	92 FR87-A	92 FR88 A	82-F189-A	62-KR85-A	82-RB87-A
LOCATION; DEFIH:		HFLC	MINICIFAL	HFLC	MUNICIFAL	F01 SF1601		
DESCRIFITON: UNITS: DATE SAMFLED:		FIELD BLONK UG/L 01/13/90	F 1ELD FLANK MG/L 01/13/90	FIELD BLANK MG/L 01/16/90		FIELD BLANK UG/L 01/24/90	RINSATE MG/L 12/19/89	RINSATE MG/L 01/12/90
*** GEOCHEMICAL FAKAMETEKS ***	FARAMETERS ***							, , , , , , , , , , , , , , , , , , ,
FF CAS NO	PP CAS NO COMFOUND							
_	PETROLEUM HYDROCARBONS	Î	Ş	Q	Ş	Ê	23	S

FILINGTON AFP - STEE 02 BLANKS

07-1R08-A	TRIP PLANK UGZL	01/24/98					10	۰	•	n				27	18				5
82-1187. A	TRIF PLANK UG/1	61/22/98			23	9	c	• 0	D			c	, i	3 9 t	81				
87. TR86. A	TRIF FLANK UG/L	01/16/90											ĭ	7.					
82 1885 A	TRIF BE ANK UG/L	86/21/19											86						
87 TR83 A	TRIF FLANK UG/L	10/11/11											80						
A RHII A	RINSATE UG/L 01/22/98						60							14				95	
A 9849-59	R INSATE UG/L 01/15/98	: : : : : : : :																	
		・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・	COMPOUND	ACE TONE	Z-FUTANDNE Z-HEYANDRE	BENZENE	TOI UENE	ETHYL PENZENE	TOTAL XYLENES	CHLOROBENZENE	1.1 -DICHLORDETHENE	CHL ORDFORM	METHYLENE CHARLETTE	PROMOFORM	PROMODICAL DROME THANK	CHI ORDD I REDMOME THANK	CARRON DISULFIDE	VINYL ACETAIE	
HER:	N: EB;	*** VOLATILES ***	F CAS NO	67 64 1	591-78-6	71-43-2			95-47-6							124-48-1	75-15-8	188 85-4	
SAMFLE NUMMER: NOTES: LOCATION: DEFTH:	DESCRIFTION: UNITS: DATE SAMFLED:	**	<u>.</u>			40	A98	280	i	2	290	230	440	470	480	510			

NDIES: 3 AFFROXIMAIE VALUE
LI AFFROXIMAIE VALUE
ND NOT DETECTED
NA NOT ANALYFE

FLI INBTON OF B SITE BY BLANKS

SAMFLE NUMBER:	B2 - RHB9 - A	82 RF11 -A	82 TR85-A	82 TR85-A	82-1886-A	82-1887-A	82-T#88-A
NOTES:			₹	٩I	S	₹	Ş
LOCATION:							
DEF'TH:							
DESCRIFTION:	KINSAIF	FINSAIE	TRIP RLANK	TRIF PLANK	TRIF FLANK	TRIF FLANK	TRIP BLANK
UNITS:	UG/L	N6/L	7/9n	በይላ	N6/L	UG/L	UG/L
DATE SAMFLED:	01/15/90	91/22/18	12/19/89	01/12/90	01/16/90	01/22/40	91/24/98
医克莱耳氏征 医克耳二氏原虫 医电影中枢 医二氯二甲二甲二甲二甲二甲二甲二甲甲甲二甲甲甲二甲甲甲二甲甲甲二甲甲甲二甲甲甲二					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		

BASE /NEUTRALS

FF CAS NO COMFOUND

668 117-81-7 RIS(2-ETHYLHEXYL)FHTHALATE 55R 91-28-3 NAFHTHALENE

(4

J AFFROXIMATE VALUE
(3 AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYEP MOTES:

FLL INGTON AFR . STIE 82 PLANKS

62-1868-A NA	TRIF FLANK TRIF FLANK TRIF FLANK TRIP BLANK UG/L UG/L UG/L UG/L UG/L UG/L UG/L 01/12/99 91/22/99 91/24/99
82-TR87-A NA	TRIF PLANK UG/L 81/22/98
82 - 1 F86 - A NA	TRIF RLANK UG/L 81/16/98
82-1485 A NA	TRIF HI ANK UG/L 01/12/90
82 - T883-A NA	TRIF RLANK UG/L 12/19/89
82 RR11-A	KINSATE TRIF PLANK UG/L UG/L 91/22/98 12/19/89
92-FH09 A	EINSATE UG/L 01/15/90
SAMPLE NUMBER: NOTES: LOCATION: DFFTH:	DESCRIFTION: UNITS; DATE SAMFLED;

ACIDS

COMPOUND CAS NO ÷

NO PARAMETERS FOR THIS CATEGORY

NOTES :

AFFROXIMATE VALUE APFROXIMATE VALUE NOT DETECTED NOT ANALYZED - 288

SAMELE NUMBER:	02-KH09 A	82-RH11-A	82-1483-A	82-TF05 A	92. TB86-A	82-1187-A	82TB98-A
NOTES:	Ç	\$	Ş	V.	2	Ş	Ş
LOCATION:							
DEFTH:							
DESCRIFTION:	RINSAIF	RINSAIE	TRIF H. ANK	IRIF PLANK	TRIF PLANK	TRIF BLANK	TRIF BLANK
UNITS:	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	U6/L
DATE SAMFLFD:	01/15/90	81/22/98	12/19/89	01/12/90	01/16/90	01/22/98	01/24/90
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	11 11 11 11 11 11 11 11 11 11 11 11 11	

*** FESTICIDES ***

COMPOUND CAS NO ŭ

NO PARAMETERS FOR THIS CATEGORY

NOTES:

J AFFROXIMATE VALUE
[] AFFROXIMATE VALUE
ND NOT DETECTED
NA NOT ANALYZED

FULINGTON AFR SITE 82 BLANKS

82-11688-A NA	TRIF BLANK UG/L 01/24/90
82-TR87-A NA	TRIF BLAHK UG/L 81/22/98
82-TF86 A NA	TRIF RLANK UG/L 81/16/98
82 1895-6 HA	1RIF RLANK UG/L 81/12/98
82 - 1883 - A NA	TRIF PLANK UG/L 12/19/89
82 RR11-A FIA	KINSATE UG/L 01/22/98
92 KH99 A	KINSATE UG/L 01/15/98
SAMFLE NUMBER: Notes: Lucation: Depth:	DESCRIFIION: UNITS: DATE SAMFLED:

INDRGANICS

COMFOUND FP CAS NO

NO FARAMETERS FOR THIS CATEGORY

- 295 NOTES :

AFFECXIMATE VALUE
AFFECXIMATE VALUE
NOT DETECTED
HOT ANALYZED

ELLINGTON AFF SITE BE BLANKS

82: TR88-A NA	RINSATE TRIF RLANK TRIF RLANK TRIF RLANK TRIF RLANK MG/L MG/L MG/L MG/L MG/L MG/L MG/L MG/L
82-T887- A NA	TRIF BLANK MG/L 01/22/90
82 TR86-A Na	TRIF RLANK MG/L 81/16/98
82 TB85 A	IR IF FLAUK MG/L 01/12/98
82 TR83-A	FRTF PLANK MG/L 12/19/89
87 - KP11 - A	RINSATE MG/L 01/22/90
82. RF09 A	RINSATE MG/L 01/15/98
CAMELE NUMBER; MOTES; (OCATION; DEFIH;	DESCRIFTION: UNITS: DATE SAMFLED;

GEOCHEMICAL FARAMETERS

PF CAS ND COMFOUND

FETROLEUM HYDROCARBONS HA

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APPENDIX E DATA VALIDATION REPORTS



C-49-0-3-174

TO:

LINDA STEAKLEY

DATE: APRIL 18, 1990

FROM:

DEB SCHEIB

CC: FILE

SUBJECT: ORGANIC DATA VALIDATION - VOA/BNA/P&P

ELLINGTON AIR FORCE BASE CASE NO. EAFB1, SDG EAFB1

SAMPLES:

SOIL

01-FB01-A	01-SB03B-A	02-SB11B-A
01-FB02-A	01-SB04A-A	02-SB11C-A
01-RB01-A	01-SB04B-A	02-SB12A-A
01-RB03-A	01-TB01-A	02-SB12B-A
01-SB01A-A	01-TB03-A	02-SB12C-A
01-SB01B-A	02-FD01-A	01-SB02-A
01-SB03A-A	02-SB11A-A	

NUS Laboratories analyzed 14 soil samples (including one field duplicate pair) and 6 aqueous quality control samples for Target Compound List (TCL) volatiles. In addition, thirteen samples were analyzed for semivolatile compounds and eleven were analyzed for pesticide /PCBs. Included with this sample set are two field blanks, two rinsate blanks and two trip blanks.

The data were reviewed with reference to the EPA "Functional Guidelines for Organic Data Validation", and the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data". These analyses were performed under HAZWRAP Level C QA/QC requirements and were evaluated based on the following criteria:

- Holding times
- GC/MS tuning and mass calibration
- Laboratory and field blank analyses
- Initial and continuing calibration
- Surrogate spike recovery
- Matrix spike/matrix spike duplicate (MS/MSD) results
- Field duplicate precision
- Internal standards performance
- Detection limits

Surrogate spike The data package was complete as submitted. recovery and internal standards performance met contract required criteria. Results which did not meet quality control criteria are

discussed below.

Volatile Fraction

The aromatic compound seven-day holding time allowance was exceeded by 4-5 days for samples 02-FD01-A, 02-SB11B-A, 02-SB12A-A, 02-SB12B-A and 02-SB12C-A. Detection Limits (DLs) for aromatic compounds in these samples are qualified as estimated, "UJ".

Sample 02-SB12A-A was reanalyzed beyond volatile compound holding time allowances. Only the reanalysis data was submitted as part of the data package. All results for this sample are considered to be estimated. Positive results are qualified "J"; DLs are qualified "UJ".

Instrument 4500B failed to meet GC/MS tuning and mass calibration criteria on 12/15/89. Only field quality control samples were analyzed on that date; no reanalyses were performed. No qualifications were made as field quality control samples are not qualified for any non-compliance. The sample data as reported is considered to be useable for purposes of evaluating the extent of blank contamination.

The following contaminants were detected in trip, field, rinsate and laboratory method blank analyses in the maximum concentrations indicated:

contaminant	maximum concentration (ug/)	(q)
benzene	8	٠.
bromodichloromethane	15	
bromoform	30	
bromomethane	2	
chloromethane	1	
chloroform	39	
dibromochloromethane	36	
1,1-dichloroethene	1	
total-1,2-dichloroethene	2	
trans-1,3-dichloropropane	1	
2-hexanone	27	
1,1,2,2-tetrachloroethane	1	
1,1,1-trichloroethane	1	
1,1,2-trichloroethane	3	
vinyl acetate	1	
common contaminant		
acetone	85	
2-butanone	76	
methylene chloride	19	
toluene	3	

Action levels of ten times the maximum amount of common lab contaminant and five times the maximum amount of other contaminants were used to evaluate the data. Sample size and moisture content adjustments were considered prior to application of the action levels. No qualifications were made for bromodichloromethane, dichlorobromomethane, bromoform, 2-hexanone, chloromethane, bromomethane, 1,1-dichloroethene and total-1,2-dichloroethene as no positive results were reported for these compounds. Sample contaminant concentrations below the Contract Required Quantitation Limit (CRQL) have been deleted. Sample contaminant concentrations above the CRQL but within the action level are qualified "U", as undetected.

The Percent Relative Standard Deviation (%RSD) for the initial calibration of 2-butanone exceeded 50%. No qualifications were made, however, as only field quality control samples were affected.

Initial calibrations for bromomethane, chloroethane and methylene chloride exceeded the exceeded ±30% RSD quality control limit. No qualifications were made for bromomethane as only field quality control samples were affected. No qualifications were made for chloroethane as no positive results were reported for this compound. All results for methylene chloride were previously qualified "U" on the basis of blank contamination; no further action was taken.

Some continuing calibration Percent Differences (%Ds) for acetone, cis-1,3-dichloropropene, trans-1,3-dichloropropene, carbon disulfide and 2-butanone exceeded 50%. No positive results were reported for these compounds in affected samples. DLs are qualified as estimated, "UJ".

Some continuing calibration %Ds for several compounds exceeded the ±25% quality control limit. No qualifications were made, however, as no positive results were reported for these compounds in affected samples.

The Relative Percent Differences (RPDs) for methylene chloride and acetone exceeded the 50% field duplicate quality criteria for soils. Results for these compounds in both samples have been previously qualified "U" based on blank contamination. No further actions were taken as this occurrence is felt to be attributable to varying levels of laboratory contamination and is not due to field duplicate imprecision.

Several unknown Tentatively Identified Compounds (TICs) were detected in blanks analyzed with this sample set. Sample results for these unknowns which are less than five times the maximum amount of TIC detected have been stricken (crossed-out) on the Form I-VOA TIC reports.

Semivolatile Fraction

Laboratory method blank analyses yielded a maximum amount of 35 ug/kg of the common laboratory contaminant di-n-butyl phthalate. A corresponding 350 ug/kg action level was used to evaluate the data. Sample size and moisture content adjustments were considered prior to application of the action level. Sample contaminant concentrations below the CRQL have been deleted. Sample contaminant concentrations above the CRQL but within the action level are qualified "U", as undetected.

The 30% RSD initial calibration criteria was exceeded for 4-chloroaniline, 3-nitroaniline, 2,4-dinitrophenol, 4-nitroaniline, bis(2-chloroethoxy)methane, 2-methylphthalene, 2,6-dinitrotoluene, 4-chlorophenyl-phenylether, fluorene, and pyrene. No qualifications were made as no positive results were reported for these compounds.

The continuing calibration Response Factor (RF) for 4-nitrophenol was below the 0.05 quality control limit. Only sample 01-SB01B-A was affected. The DL for 4-nitrophenol in this sample is qualified as unreliable, "R".

Some continuing calibration %Ds for di-n-butylphthalate and butylbenzylphthalate exceeded 50%. No qualifications were made as only field quality control samples were affected.

The \pm 25 %D quality control criteria was exceeded for the continuing calibrations of several compounds. No qualifications were made as no positive results were reported for these compounds in the affected samples.

Percent recoveries (%R) for 4-nitrophenol and 2,4-dinitrotoluene exceeded quality control limits for the Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis of sample 01-SB02-A. No qualifications were made as no positive results were reported for this sample.

Several TICs were detected in associated blank analyses. A summary of the maximum amounts of TIC contaminants found follows:

Contaminant (RT) Ma	x. Amount Found (ug/kg)
2,5-dimethyl-2-hexene	180
2,5-dimethyl-3-hexene	240
2,3,6-trimethyl heptane	830
aldol condensation product	37000
2,3-dimethyl heptane	1700
2,4-dimethyl heptane	190
2,5-dimethyl heptane	220
• •	(continued)

2,6-dimethyl heptane	780
3,4-dimethyl heptane	310
3,5-dimethyl heptane	2300
2,2,4-trimethyl pentane	130
2,3,4-trimethyl pentane	2100
4-(1-methylethyl)-heptane	660
5,5-dimethyl-2-furanone	540
dimethyl-2-pentene isomer	260
1-methylethyl acetic acid (ester)	1600
4-methylethyl acetic acid (ester)	140
2,6-dimethyl heptane	350
2-methyl octane	220
3-methyl octane	1300
2-butoxy ethanol	1300
2-ethyhexyl hexanedioic acid (ester)	65000

Several unknowns and alkanes were also detected. Sample results less than five times the maximum amounts of TIC contaminants shown above have been stricken (crossed-out) on the Form I-BNA TIC reports.

Pesticide/PCB Fraction

Sample 01-SB04B-A was extracted six days beyond holding time allowances. No positive results were reported. DLs for this sample are qualified as estimated, "UJ".

DAS: 0-EAFB1

DATA SUMMARY
TABLE A

DATA SUMMARY FORM: V O L A T I L E S

SHe Name: £1/12, \$1.5 1.5 1.5 1.5 (\$1.56 (\$1.64) SOIL SAMPLES

Case #: £1/63/2 Sampling Date(s): 1.7[12][25] 141/85

(ug/Kg)

To calculate sample quantitation limit: (CROL * Dilution Factor) / ((100 - %)

	Sample No. [17-FBD1-1 17-FBD2-1 17-RBD1-1 RBD - 11 1 STAN (1 CROSH (1 DESTIN SESTANDED)	M-FBMA	1-1-1-302-H	61-13641-4	F 1989 17	H. H. J. F. 17	PSIONS 1)	11800013	V DENSO 1)	WG5W
	Dilution Factor	1.00	7.7.6	1.00	111	0.71	1.6	0 17) /: -	10.7
	% Moisture	_				0)	_	(<u> </u>	7.0	1 =
	Location	1	1	١	1	11, 1-10,	178 J 35	31-15	101-16.1	11.11
	Date Sampled	13/14/89	13/14/180	13/10/181	しかしもして	13181161	20121721	13113180	13 15/66	7
	Date Analyzed	13/15/89	13/15/181	13/15/85	一名いこと	(3) 15 Let	13116	1011	100111101	¥ 100
2000	COMPOUND	FIELD BUNNK HPLC	FIELD BLANK	1) 1/15/4/K	Burrak Dio					3) / /
2	Chipromethere						-		-	
2	Bromomethane									
õ	Vinyl Chibride									
2	Chlorosthane									
S	Methydene Chioride					n 88	71 15	5	102 11	47
2	Acatone		54					П	73	
9	Certon Disuffde									
s	1,1 Dichloroethene									
5	1.1-Dichtproethene									
9	Total-1,2-Dichloroethene									
2	Chiprotorm					7 81	3 51			15
s	1.2-Dichloroethene									
2	2-Butenone			76						
•	1.1.1-Inchloroethene									
s	Carbon Tetrachloride									
20	Veryl Acetate									
5	Bromodichloromethane		15							
2	CRDL = Contract Required Detection Limit	Detection Li	mit				SEE NA	NARRATIVE FOR	FOR CODE DE	DEFINITION

Yenthad by Deb Scheib

revised 12/88

Tabulated by Pal Brush

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Sto Name: Ellington the trace buse

SOIL SAMPLES #: EHTEL Sampling Date(a): 12/12/18/1-13/141/18/1

3

To calculate sample quantitation timiti

77.77 12/12 01-13/603 A 101-5/60/4-11 101-5/2018 A 101-5/20-4/101-5/2018 101-5/201 (CROL * Ditution Factor) / ((100 - % motsture 12118891151 E J. 12/13/85 151-151 13189 12/15/189 10,13 1.00 121151189 216 " 2B' 12/13/89 00. 12115 189 12/189 16, 18, 00.1 12115189 12114 189 Rinsete 8 DI-F1301-A 101-F1302-A 101-81301-A 12115189 12/15/187 Rinsate 1.00 27 12/14/89 (2/15/85 (2/4/6 . DC 36 30 2812118 2114185 1.00 Sample No. Dilution Factor % Moleture Date Sampled Date Analyzed Location Trens-1,3-Dichloropropens 1,1,2,2.Tetrachiorosthane COMPOUND Ce-1,3-Dichloropropene **Dibromochipromethane** 1.2 Orchloropropene 4-Methyl-2-pentanone 1,12-Trichloroethene Tetrachloroethene Tachloroethene Chlorobenzene Total Xytenes Ethybenzene 2-Henenone Shrane CHO 2 2 40 •

CROL - Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITIC

Page 3 of 18

Ste Name: 21/1/19/1/10 (1/2) (1/2) Ste Name: Elling has (1/2) (1/2) Ste Soil Samples
Case 4: Elling has Date(s): Idia[89-12/14]89

To calculate sample quantitation limit:

			BLANKS				CROL	Debution Face	Delution Factor / mon	1
_	Sample No.	101-FACI & 101-E	101-6000						W - MIN / (m)	moisture)/
	Dilution Factor		4.7.7.4		CINST H (1.6661)	b-H1-3,77	121-518 18-14	1.15 DE1. 11	11 150 51-4 CHERON SOLVE	17000
	A 14-14-14		(7,7,7)	1.00	1.00	1. UU.C	0271	2/01/11		7.75.
		ţ	•	,	1	16	1/2/-		3/3 3/1	0.30
	Location 1	HPLE W44.2 (1), 1)	11/2011	F. 15.14	Right	1, 2, 1,	1,70	1	2/4	, ,
	uere sampled	13114181	1.51 11121	15115151		1012		2	131-141	7:5
	Date Analyzed	114156	-	7 7 7 7 7		1,51 - 1 - 1	1.3101121	12113187	13181	SICIE
Ş	1 Date Extracted	3 - 3		35151	11,11,11	113/10	171111	061411	11410	12101
1		12112181	12119181	13181181	13/8/12	ジージーシー	10/10/10/10	1977	1310161	
922	Phenol						7612.1	16191	13181	<u> </u>
338	blsg-Chloroethyflether									
330	2-Chlorophenol									
OCC	1,3-Dichtorobenzana									
OCC	1,4-Dichlorobenzene									
83	Benzyl Alcohol									
33	12 Dichhroben									
5										
3	C-Manual Control									
8	Die 2. Chlorolsopropyflether									
ğ	4-Methyphenol									
82	N-Nitroso-d-n-propytemine									
330	Hexachloroethane				<u> </u>		+			
330	Mirobenzene						1			
330	haphorone					†				
8	2-Nitrophenol									
330	2.4-Dimethytchenol									
1600						1				
330						1				
1	A CONTRACTOR OF THE PROPERTY O				_		_			
R S	2.4 Dichlorophenol									
S	12.4 Trichlorobenzene									
S	Machinetene									
330	4. Chloropadine			+	+	+				

CROL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION

revised 12/88

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She Name: \$\(\frac{17.15}{11.15}\)\(\frac{1.27}{12.16}\)\(\frac{1.

To calculate sample quantitation limit:

			BLANKS	ks		_	CHOL	•	Dilution Factor) / ((100 - % moisture)/10	moisture)/10
Sample No.		199-17 1-1781-17	V.8381-13	F151917	CI-BBL3 A	C1-52014 A	N. 5.175 17	16x5 17 8 5835-13 6 W. 1. 5. 1.1	1. 25.025-10	1625 17
Diffution Factor	_	1.000	- 7771-	1.666	1.6.6	1.1.10	7.1.1.1	0001	1.5.7	13.131
* Moisture	atrus				_	J.*	7.5	->	J.S.	7.
Location	Hon	HPCC Wase Murrice.	My 116.336	Binsak	Burak	, हा , या	50. 28	10170	161.181	, 7 ·, h.
palduse agent	P G	13/14/81	131618	12/12/8%	13114187	1317 1161	13113185	1315151	1315161	3141101
Date Analyzed	yzed	751611	5751511	111150	114176	351211	11	11916	05151	13 18 1
CROL Date Extracted	כנפס	12/18/9)	12119183	55/57/21	12/12/15/	13/10/16/	13/18/19/5	13/10/18	13/3/181	315117.1
330 Herachlorobutadiane										
L										
330 Herachlorocyclopentadiene										
330 2,4,6-Trichlorophenol										
330 2-Chloronaphthalene										
1600 2-Nitroentine										
330 Dimethylphihalate										
330 Acenephilitylene										
1600 3-Nitroentine										
330 Acenephthene										
1600 4-Nitrophanol							8			
330 Dibenzok: en										
330 2,4-Dintrototuene										
330 Diethytphthalate										
330 4-Chlorophand-phenylether	,									
330 Fluorene										
1600 4-Nitroeniëne										
1600 4.6 Dinkro-2-methylphenol										1

CROL = Confract Required Quantitation Limit

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SEE NARRATIVE FOR CODE DEFINITIONS

BNAS DATA SUMMARY FORM:

n

SOIL SAMPLES (ug/Kg) Date(s): 1.2/12/89-12/14/89 7

Case #: [1][3] Sampling

To calculate sample quantitation limit:

12/15/ (CROL * Dilution Factor) / ((100 - % motsture) 1131 د. ا でであると 1818181 1 41 -12 051611 7.73.7 11: 10:31-4 1 415187 (X) (S) (E) (E) 111130 71., 1 5/300 1312121 15151 36 196 1.1.1.1 オモン・スーニ (からいて) 151 1121 11, 150 . 31 ., 11 711 06/3/11 1000 11:11:10 1.5 551-1121 19/10/10/1 114160 2003 SINVID -一名という Dhare or 13111151 30,1101 17 (27) 1**4**; 13/18/18/ 221141 01-5-27-11 14151 Date Sampled Date Analyzed Date Extracted % Moisture Location Sample No. **Dilution Factor** 4-Bromophenyl-phenylether bis (2 - Ethythenyflphihelete N-Minosodiphenylamine Indeno(1,2,3-cd)pyrene Dibenz(e,h)anthracene 3,3-Dichlorobenzidine Benzo(b) fluoranthene Benzofk)fluoranthene Benzola h hoerdene Butyfbenzyfphithelete Benzo(a)anthracene Hemschlorobenzene **Pentachtorophenol** Din-octytphthelate Din burykphthelete **Benzolalpyrene** Phenenthrene Fluoranthene Anthracene Chrysene 330 330 300 300 300 8 8 8 8 8 8 8 8 8 88 88 8 8 8 330 2 S S

CROL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION

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PCBS AND DATA SUMMARY FORM: P E S T I C I D E S

Ste Name: Ellang to line Field

Case d: EAFGL Sampling Date(s):

SOIL SAMPLES (ug/Kg)

		Case #: ZHE (2/ Sampling	pling Date(s):	: <u>:</u>				10 c	To calculate sample quantitation	puentitation first:	
District District				- BLANES				CROL	. Difution Fac	* · 001)) / (ro	moleture)/100)
Michigan Publisher Publi		Semple No.	1	01-5902-4	D1-8801-A	01-8 66 5-4	P-V1.385-10	A 31085-10	01-50034-1		DI-58044-
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Date Analyse July 89 Jaly 1		rocation .	H21 W. 42	$\overline{}$	Karak	Bins. te	161-121		.018	141-181	37
Mate Mail 17cd 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 11,2170 12,1170		Date Sampled	18/11/89	<u> </u>	_	1214189	12113184	-	12113189	13113189	13/13/29
### BYC Lalua 12 14 15 14 15 15		Date Analyzed	11110190	1113190	1113190	1113190	1112190	1113190	1112190	1116/90	116180
Section 1916 Section 2017 Sect	đ	nete extracted	12/14/89	13/51/21			12/19/18/	68151151	12/19/89	12/19/89	12/19/89
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Common BHC Electron	-	deta-OHC									
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Matter Haptechian Foundament Foundam										3.1	
	•	Aldte									
	•	Heptechlor Epodde									
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	8	Aractar-1221									
	8	Avactor-1232									
	8	Aroctor-1242									
	8	Aroctor 1248									
-	3	Aodor-1254									
	35	Aroctor-1260									

CRQL = Contract Required Quantitation Limit

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DATA SUMMARY FORM: VOLATILES

Sue Name: Ellingthe The Fire Cares Soil SAMPLES
Coop 8: Elfell Sampling Date(s): 13/13/89-13/18/89

To calculate sample quantitation limit:

L											=	5	(CHOL * Disustan Factor) / ((100 - % maisture)	Fedor	2 (See	* .	molsture
	Diffusion East A Co. 17	XX1	TT ST	1. 1361 1	\neg	B. 5.	11-1160 XO 11-10-1-12 11-12-12-12	7 77	1150 80	1	4-2000-6 11 4 618-8	1	1167.50	4.7			
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2	Bramamathana				-	#		1		+	1	+					
92	Very Chloride		+			1		1		1		\dashv					
2	Chiprochave		+	_		1		$\frac{1}{1}$		+		1					
\$	Methylene Chicado	-0	E	19	9	#	(1)	+	. (1	,	-					
91	Acetane		1		+	1	400	4	8	=	38	3	4	3			
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\$	1,1 Dichloroethene		\vdash	_		1		+		+	1	+		5			
9	1.1-Dichtoroothana		\vdash			1		\dagger		\dagger	1	+					
\$	Total 1,2 Dichlorosthana							+		+		\dagger		1			
S	Chloroform	19	3	33	36	T	3	-	5	 :	,						
S	1,2-Dichloroethane		-	-	, -	1	1	\$	7	4	98	4		1			
2	2-Butanone		-			1		\dagger		\dagger]	+		+			
8	1.1.1-Trichloroethane		-					\dagger		+	9	3		1			
\$	Carbon Tefrachloride		_			1		\dagger		\dagger		+		1		1	
2	Ways Acetale		_			1		\dagger		+		\dagger		+			
\$	Bramodichioramethane		-			1		\dagger		+	1	+					
								_	_		_	_		_		_	

CRDL = Contract Required Detection Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION

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DATA SUMMARY FORM: VOLATILES

To calculate sample quantitation limit: (CROL * Disulon Factor) / ((100 - 9) Case #: 27/7.7 Sampling Date(s): 1.2/1.2/89-1.2/1.8/89

	Consult Mi	, ,							property / (100 · 1 modeling		dshue
	11-13 H 11-13 H 11-13	1:15.485-111	K-17	C1-7-2-8-14	11.103-60	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	A 0 . O . O . O	7			
	Diffution Factor	7.C.C.	ر	93 -		1 100	יייוולייים	9116/ 70	Ŧ		
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		ZZ,	; 	,	6.9	<u></u>	23	700		1	1
		191-191	1	1	181 331	18, 23.	10:10		-	+	1
	Date Sampled	12/12/89	13/13/84	63/11/61	<u> </u>	<u> </u>	2012.101	9	-	<u> </u> 	
	Date Analyzed	13/16/89	1121	13/1/2/80	_		7	191812		+	
8	COMPOUND	_	Ľ.	7/3/2		7	1	13 35 101 131 17	+	$\frac{1}{1}$	
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^	12-Dichteropropere									_	
•	Ca-1,3-Dichlarepropere										
3	Techtoroethene										1
•	Distinctionantiese										
•	1.12. Tabellanakan										ļ
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-	Denzene				1=					-	ł
•	Trans-1,3-Dichtoropropens				**	1		الع			
8	Gromotorm				3	73	19	S			
2	4-Methyl-2-pentanone					En	19				
=	2-Heumane										
s	Tetrachiorosthene									4	ł
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9	Chlorobenzene				31:			LN MI		-	
\$	Ethybentene				3		1	10.7		_	ļ
\$	Syrano				3			43			
5	Total Xylanas				3			10.7			
						_	_	-			!

CROL = Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITIO

DATA SUMMARY FORM: B N A S

She Name: Elling has the feete these Soil Samples Case #: Entity Sampling Date(s): 12/12/86-12/18/89

To calculate sample quantitation finit: (CROL * Dilution Factor) / ((100 · % moisture)/)

	Semole No.	1 Courts 13 01. 7801.	101.7801.4	A1. 700 8. A	42. Chair. d	162.50	5	A. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4.	000000	2		
	_		B 15.27 7		11.	4//4/2		2 210				
	% Moleture	6.4					-		77	-		
	Location	131-14					-		17-17			
	Date Sampled	551हा है।							121,9190	(10		
	Date Analyzed	113196							0.511511	ت		
CHO	Date Extracted	।अविका							1311211	8		
ğ	Herachtorobutediene										F	
82	4 Chlore-3-methy/phenol						-				L	
83	2-Methytraphthelene										_	
330	Herachlorocyclopentadiene		not	100	2007	not		not			_	
82	2,4,0-Trichtorophenoi		202/42	202624	200 hear	202602		Justine				
1600	2,4,5-Trichlorophenol		•									
8	2-Chtoronaphthainne											
500	2-Miroenline											
82	Dimethylphthelete											
83	Acenephibylene											
88	2,8-Dinkrototuene											
1600	3-Niroentine											
83	Acenephibene											
1600												
1600	4-Mtrophanol										-	
330	Dibenzou: 180											
336	2,4-Dinitrotohiene										_	
336	Diethytphthalete											
33	4-Chlorophenyf-phenyfether											
330	Fluorene						\dashv					
1600	4. Nitroeniline							_				
1600												
	ı											

CROL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION

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DATA SUMMARY FORM: B N A S

Case #: 1/9/5/2 Sampling Date(s): 1/3/12/8/1-1/3/18/4/1 (ug/Kg) SNo Nome: Ellington the Fisher in se

To calculate sample quantitation limit: (CROL * Distribution Factor) / ((100 · % moisture)/)

	Sample No.	-1021-10 0-91-XC-17	A-1801-A	01-7002-6	47-50014	1-11183-60	-		ļ	İ
	Dilusion Ender	1 2 2		2 102.70		2//200	W 20110			
								00) ·		
		F./4						74		
	Location	131-141						, 7) , 1,		
	Date Sampled	13/12/8/						50 112		1
	Date Analyzed	113190						001511		
CRO	Date Extracted	13/8/8/1						12/2/10/1		
330	Phenot				-	-			<u> </u>	Γ
330	bis/2-Chloroethy@ether									T
33	2-Chlorophenol									
33	1,3-Dichtorobenzene		7104	1)04	1)04	not	pot			
336	1,4-Dichlorobenzene		peryene	myese	Varyer's	myen	parjeue			
336	Benzyl Alcohol									Γ
33	1,2-Dichlorobenzene									Γ
330	2-Methylphenol									<u>.</u>
330	ble 2-Chlorolsopropyflether									
330	4-Methylphenol								_	
330	N-Nitroso-d-n-propydamine								_	
330	Heuschloroethene								_	
330	Mirobenzene									
330	Isopherone									
330	2-Ninophenol									
330	2.4 Dimethylphenol									
1600										
330	bis/2-Chioroethoux/methens									
33	2.4 Dichlorophenol									
330	12.4 Trichlorobenzene									
330	Naphthalana									
330										

CROL * Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION:

DATA SUMMARY FORM: B N A S

30				S CONTRACTOR	9		2	TO CARCINGTO MATTERS QUANTIFICATION STATE		
·							(CRO	(CROL * Dilution Factor) / ((100 - % moleture)	× · (01)) / (moleture
	Sample No.	11 (11.155-11)	V 1082 10	Q1 T842 -A	A.1007.50	02.58//C.A	02.58//A.A	18 8116 Car 1		
	Dilution Factor	1.11.1						7.77.1		
	% Moisture	33						15.0		
	Location	131-141						1.17 //2		
	Date Sampled	13113189						[8][8]		
	Date Analyzed	113191						11000		
DEC.	Date Extracted	Balbilei						52116121		
8	N-Mirosodiphenylamine			-	 -	-				
8	4-Bromophenyl-phenylether				-	-				
83	Henechlorobenzene				-					
8	Pentachtorophenol		not 1	not	nor	not	7707			
330	Phanenthrane		Susked	Znahad	AUNCHE	Janian.	Aurlene			
8	Anthrocene		•		,					
ä	Die burydphihadate									
읽	fluorenthene									
8	Pyreme									
g	Burytonzytohihalate									
Š	3,3-Oichforobenzidine									
S	Benzo(a)anthracene									
33	Chrysens									
88	Dis(2-Ethythenyt)phihalate									
33	Dt-n-octytchtheinte									
83	Benzo (b) Augmenthene									
82	Benzofkiftkoranthene								·	
8	Benzolalpyrene									
8	Indeno(1.2.3-cdpyrene									
8	Dibenz(a,h)anthracene									

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION

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Namo: Ellington air True faise

8: £4£61 Sampling Date(s):

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Ske

SOIL SAMPLES (ug/Kg)

(CROL * Disulton Factor) / ((100 - % moleture)/100) To celculate sample quantitation finit: N.81185.20 4.41185.20 JOSHA 710 200/42 act A-31185.20 ANTO Tal 15. FOO! A JACKEL not Ol. 7863 · A 202624 Dat 01-53-04-A 01-TBW-A 20262 not 1.000 23. 12.-14. 12.18? 1113/90 68/BE/E1 Sample No. Dilution Factor Date Sampled Date Analyzed Date Extracted % Moleture Location Lindens Hephachtor Epodde Endoeullen i Endoquillen Sulfate Gemme-Chlordene Alpha-Chlordene Endth katone Ma BHC Endoeuten B Methosychior Heptechter dete-BHC Aoctor-1242 Aractor-1016 Andor-1221 Andor-1232 Aroctor-1248 Andor-1254 Aodor 1260 Totaphene 4.4.DDE 4.4.000 4.4.00T Diebbe Endrin 8 2 288 99 3 3 2 2 8 8 8 2 2 88

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

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DATA SUMMARY FORM: VOLATILES Site Name: \$ 1/1.25 1.1 16. 1. 10

	Site Name:	14.49 A. 1 the free	1,1		<u></u>		SOIL	SAM	PLES							
	Caro #: £1/51_ San	Sempling	Date(s):	गरा	(0) (0) (3) (8) (8) (1) (1) (1) (1)	110	3/2/2	0/Kg)			 o ceta	To celculate sample quantitation limit:	₹ 8	ntiketion	į	
	Semple No.	4. (C12, 2. C.)	100						į	ļ	CHOL	(CROL * Disulton Factor) / ((100 - % motsture)	Factory	00L) /	¥	tolsture)
	Dilution Factor	-	اد		1	च्र	11 2 47 (1)	77			r		1		-	
	% Moisture				1,	T		1							\dagger	
	Location	18.18.	-3	0.1		100		1		+					+	
	Date Analyzed	13/8/1/61	(°)			1.6	11117	101		+	+					
ğ	COMPONIAN	* 151.	(a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	100	1	31 18:1	13 11 5 13						+			1
		NEWNALY SISS	r.								-		1		+	}
2	Chibromethene		1	F		1		1							_	
10	Bromomethene		1	\int		1					\mid		\dagger		\dagger	}
2	Wayl Chloride		1	$\frac{1}{1}$		1					-		+		+	1
2	Chloroethane		100	\prod		1					-	T		1	+	}
-	Methylene Chloride	13	11 22	=		1							-		+	1
2	Acetone	87		+	AF	1	da	4							-	
-	Cerbon Disultide	1	12	4				1					-		+	1
5	1.1 Dichloroethene		120	T				1			-				+	1
-	1.1-Ochloroshans		UI	T		1		\downarrow							+	
-	Total 1.2-Dichloroethane		US	F		1		+		+					-	
2	Chibrotom	81	מ	F	-	1		1		+						
5	1.2-Ochloroethene		123	T	4	1		+		-			-			}
2	2-Butanone	29		1				1		+					$\frac{1}{1}$	
-	1,1,1-Trichloroethane	1	12	F				1		-			-		+	
-	Carbon Tetrachloride		17					1		-					+	}
2	Why Acetato	3	03	I	T	\dagger		1		+						}
7	Bromodichicromethane	2	2			1		1	1	+			-	-	H	}

CRDL - Contract Required Detection Limit

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revised 12/88

* Original results not activited

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DATA SUMMARY FORM: VOLATILES

Sto Name: (1/1.10. km) /2. 1

Case #: 177.37 Sampling Date(a): 13/14/195, 13/18/185, (ug/Kg)

To calculate sample quantitiation limit:

									<u>5</u>) Factor	Diffusion Factor) / ((100 - % moists	*	noiste
	H HOWER TO	1.4-1.02		1 23 11 2	27 11 17	14 17 10 10 10 17 19 18 18 18 18 18 18 18 18 18 18 18 18 18	1 7 7 1			ŀ		ŀ	İ
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	A Mosture	2,7	7,		18					\dagger		1	
	rocation	/ E - / .]	1. '.	ر. د	cr /]:) i	07			\dagger		+	
	Date Sampled	12115/2		ころかつか	20111121		2/11/16			+		\dagger	
	Date Analyzed	051E111	168 181	1	11130100	~ - \;	1 -		Ť			+	
2005	COMPOUND	SEGDIN SA	3							+		+	
\$	1,2 Dichloropropene	10		1	-	\downarrow	-	1	1	_			
Ş	Ca-1,3-Dichloropropana		 	1	\dagger	+	+	1				\vdash	
9	Vichiorosthene		7		1	1	3	1				\vdash	
5	Othermochlanement		7.1		\dagger	+	1					\vdash	
•	1.12-Trichloroethene		7.7	1		1	<u> </u>	1				\vdash	
5	Benzene	81	, _	1	=	1	+	1	1			Н	
5	Trans-1,3-Dichtoropropens	15		3 <u>1</u>	3	7		1	1				
2	Branclarin	=	1	+	1		1	1	#			-	ļ
10	4-Methyl-2-pentenone				\dagger	-	$\frac{1}{1}$	1	+				
0	2-Hexanone	TU			+	+	+	1	1	1		1	
S	Tetrachioroethene	In	J-M			-	+	1	1			1	
5	1,1,22-Tetrachloroethans	10	17			-	$\frac{1}{1}$	1	1			+	
9	Toluene	173	1	1:		1		+	1	1		+	
5	Chlorobenzene	151	-	1:	7 =	1	+	1	#			1	
5	Ethythanzana	3	1	1 +		1		1	1			1	
\$	Shrene	3	17	3 5	3 =	31:	+	1	\downarrow	\perp		7	
5	Total Xyb.nes	15	,	 -	75	1	+	1	1			-	

CROL - Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION

DATA SUMMARY FORM: B N A S

Name: Ellington Bratis Krave Krave Som Si

SHe

C ...

SOIL SAMPLES (ug/Kg)

#: £9[6] Sampling Date(s): 12[14] 45.

To calculate sample quantitation limit

(CROL * Disultion Factor) / ((100 - % moisture), 02.5812A.A 02.5812 B.A 02.5812 C.A 01-53.03.A 181-181 114 190 12/18/85 7.07 Ū beston not Anheue nat 13/8//2/ 0,-5,0 63/18/21 114/90 % Moisture Location Dilution Factor Sample No. Date Sampled Date Analyzed Date Extracted Dist2-Chloroethouvimethane bis 2. Chlorolsopropyflether N-Natroso-di-n-propylamine bis 2-Chloroethy Bether 1,3-Dichlorobenzene 1,4 Dichlorobenzene 1.2-Dichlorobenzene 2.4 Dimethylphenol 2.4 Dichlorophenol Hexachloroethane 2-Chlorophenol 4-Methylphenol Benzyl Alcohol 2-Methyphenol Benzolc Acid 2-Nitrophenol Nikobenzene Isophorone 1600 8 2 2 2 2 330 8 8 2 2

CROL = Contract Required Quantitation Limit

12.4 Inchiprobenzene

4 Chlorosoffoe

Nachthelene

2 2

8

SEE NARRATIVE FOR CODE DEFINITION

Page 16 of 18

DATA SUMMARY FORM: B N A S

~

She Name: Elling to Are Facir Back
Case #: £41721 Sampling Date(s): 12114185

SOIL SAMPLES (ug/Kg)

To calculate sample quantitation trut:

	Contraction							ğ	(CROL · DELET	on Factor	Diffution Factor / 1110n		444
	Contract No.	102.5812A . A 62.5A	03.5A.P.R.A		2000	-	}						
_	Dilution Factor	1.0		H-8-15/2-17 H	1577.7	N. C.	1					L	
	% Moisture	32			1.5.1								
	Location	12-10			1:-		1					-	
	Date Sampled	68/3//2/			16,18,	>>						·	}
	Date Analyzed	06////			1811/180	23.						1	
2082	Date Extracted	12/1/59			2018/	200							
83	Herachlorobutaciena				0 0	io							
82	4 Chlore-3 methylphenol		+	+								ig	Γ
ខ្ល	2 Methytnaphilhaiene						+					-	Τ
ş	Herachlorocyclopentedlene		na	1		+						-	T
ន្ត	2,4,6-Trichtorophenot		1,200	1011		1	1					-	Τ
<u>5</u>			a change	Sa Acur		1	+	1					Γ
ន្ត	2-Chloronephthalene						+						
2	2-Nitroeniine						1						
ន្ត	Directlydphthalate					+	+	1				_	
ន្ត	Acemaphilitylane						+	1					
ន្ត	2.6-Dintrototuene						+	1				-	
8	3-Nitroeniline					1	+	+					
ន្ត	Acenaphthene						+	1	$\frac{1}{1}$				
8	2,4-Dinite a, them of						1	+		1			
3	4-Ntrophenol						+	1	1	1	1	$\frac{1}{1}$	7
3	Dibenzok: 1st						+	1	1	1		-	7
3	2,4 Dinitrololuene						+	+		1	1	4	7
S .	Diethytphthelete						+	+	+	+		-	7
S.	4-Chlorophenyl-phenylether					<u> </u>	+	+	1	+	1	$\frac{1}{1}$	
g	Fluorene						+	+		1	1		
900	4-Nitroenitine				-	<u> </u>	+	+	1	1	1	_	
<u>8</u>	4.6 Dinitro-2 methytohenol				_	1	+	1		1	1		
i							_	_		_	_	_	Γ

CROL * Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION

SNo Namo: Ellington the Force Buse

Case #: £77/3/ Sampling Date(s): 12/14/89

SOIL SAMPLES (ug/Kg)

							<u> </u>	(CROL * Dikulton Factor) / ((100 - % motsture	Factor) / ((8	molsture
	Sample No.	N. 1515.50	A. 58128 A	A-56/22-50	02.58 DE-A 01-5/302.A						
	Dilution Factor	7.0			7.000						
	% Moisture	22			1						
	Location	, 2-,0			181-101						
	Date Sampled	68/8//2/			58/15/16/						
	Date Analyzed	114790			77						
CROL	Date Extracted	68/nafer			13/18/18						
ă	N-Mirosodiphenylemine					-			1	-	
330	4-Bromophenyl-phenylether								1	+	
330	Heuschlorobenzene								1	1	
1900			200	200					+	1	
83			2 market	Justin					1	1	
۶	Anthropen								+	+	
5	O's brackship to to								1	1	
Ş	Florenthene									T	
3	Penne			_			+		1	1	
8	Butchenzylohibainte							1		1	
1600									<u> </u>		
SS									<u> </u>		
330	Chrysene										
330	bis(2-Ethythexy@phthelate								-		
330	Di-n-octytohthelete										
330	Benzo(b)@uoranthene									F	
330	Benzo(k)fluoranthene								_	F	
330	Benzo(a)pyrene					_					
330	Indeno(12,3-cd)pyrene										
330	Dibenz(e,h)enthracene										
330							_				

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIO

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DATA SUMMARY FORM: PESTICIDES AND PC

Nome: Elling has like to see suse

#: £31.31 Sampling Date(s):

. .

Ske

SOIL SAMPLES (ug/Kg) To calculate sample quantitation limit:

(CROL * Ditulion Factor) / ((100 - % moleture)/100) 02.5812A. A 62.5812A. A 62.5812C. A 01.526.7.A 981411EL 1112/20 13/18/121 181 191 0000 Barker aet 200/12 Bol Suchal 100 Sample No. Dilution Factor Date Sampled % Moisture Location Date Analyzed Date Extracted (Indens) Heptechtor Eposide Endosullan Sullate 4,4-00T Methonychlor Endin ketone Apha Chlordene Genma-Chlordene Endocution # Germe-BHC alphe-BHC beta-BHC Endoeullen Heptechter Aldte Aroctor-1016 data BHC Toughene Detth 4.4-DDE 4.4.000 Endrie 8 3 8 2 2 2 2 2 2 2 8 = 8 • •

CROL = Contract Required Quantitation Limit

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Aoctor-1254

3 3

Aoctor-1260

Andor-1221 Andor-1232 Andor-1242

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SEE NARRATIVE FOR CODE DEFINITIONS

rentend 12/40



C-49-0-4-130

TO:

LINDA STEAKLEY

DATE: APRIL 18, 1990

FROM:

DEB SCHEIB

cc: FILE

SUBJECT: ORGANIC DATA VALIDATION - VOA/BNA/P&P

ELLINGTON AIR FORCE BASE CASE NO. EAFB1, SDG EAFB2

SAMPLES:

WATER

01-FD02-A	02-SB13C-A	01-TB04-A
01-SB05A-A	01-SB14A-A	02-RB05-A
01-SB05B-A	01-SB14B-A	RB06-A
01-SB13A-A	01-SB14C-A	FB04-A
01-SB13B-A	02-TB03-A	FB03-A

NUS Laboratories analyzed 9 soil samples (including one field duplicate pair) and 6 aqueous quality control samples for Target Compound List (TCL) volatiles. In addition, nine samples were analyzed for TCL semivolatile compounds and six samples were analyzed for pesticide /PCBs. Included with this sample set are two field blanks, two rinsate blanks and two trip blanks.

The data were reviewed with reference to the EPA "Functional Guidelines for Organic Data Validation", and the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data". These analyses were performed under HAZWRAP Level C QA/QC requirements and were evaluated based on the following criteria:

- Holding times
- GC/MS tuning and mass calibration
- Laboratory and field blank analyses
- Initial and continuing calibration
- Surrogate spike recovery
- Matrix spike/matrix spike duplicate (MS/MSD) results
- Field duplicate precision
- Internal standards performance
- Detection limits

The data package was complete as submitted. GC/MS tuning and mass calibration, internal standards performance and surrogate spike recoveries met contract required criteria. Results which did not meet quality control criteria are discussed below.

Volatile Fraction

The aromatic compound seven-day holding time allowance was exceeded by 1 day for samples 01-FD02-A, 01-SB05A-A and 01-SB05B-A. No qualifications were made as this occurrence is felt to have negligible impact on soils.

The seven-day aromatic holding time allowance was exceeded by several days for the following samples:

02-SB13A-A	02-TB03-A	RB06-A
02-SB13C-A	01-TB04-A	
02-SB14C-A	FBO4-A	

In addition, the fourteen-day volatile compound holding time allowance was exceeded by several days for the reanalysis of the following:

02-SB13B-A	02-SB14B-A
02-SB13C-A	02-SB14C-A
02-SB14A-A	FBO3-A

No qualifications were made for field quality control samples as these are not qualified for any non-compliance as per validation protocol. Positive results and Detection Limits (DLs) for affected compounds in affected samples are qualified as estimated "J" and "UJ", respectively.

The following contaminants were detected in trip, field, rinsate and laboratory method blank analyses in the maximum concentrations indicated:

<u>contaminant</u>	maximum concentration	(ug/kg)
benzene	8	
bromodichloromethane	16	
bromomethane	2	
chloromethane	1	
chloroform	40	
dibromochloromethane	33	
1,1-dichloroethene	1	
total-1,2-dichloroethene	2	
trans-1,3-dichloropropane	1	
2-hexanone	1	
1,1,2,2-tetrachloroethane	1	
1,1,1-trichloroethane	1	
1,1,2-trichloroethane	3	
vinyl acetate	1	

(continued)

common contaminant	<pre>maximum concentration (ug/kg)</pre>
acetone	16
2-butanone	3
methylene chloride	17
toluene	3

Action levels of ten times the maximum amount of common lab contaminant and five times the maximum amount of other contaminants were used to evaluate the data. Sample size and moisture content adjustments were considered prior to application of the action levels. No qualifications were made for bromomethane, 1,1-dichloroethene, total-1,2-dichloroethene, trans-1,3-dichloropropene, 1,1,1-trichloroethane, vinyl acetate and toluene as no positive results were reported for these compounds. Sample contaminant concentrations below the Contract Required Quantitation Limit (CRQL) have been deleted. Sample contaminant concentrations above the CRQL but within the action level are qualified "U", as undetected.

The average Relative Response Factor (RRF) for the initial calibration of 2-butanone was below the 0.05 quality control limit. Only the reanalysis of sample 02-SB13B-A was affected. The DL for 2-butanone in this sample is qualified as unrelaible. "R".

Percent Relative Standard Deviations (*RSDs) for the initial calibration of chloroethane, methylene chloride, acetone and total xylenes exceeded the 30% quality control criteria. No qualifications were made for acetone as only field quality control samples were affected. No qualifications were made for chloroethane or total xylenes as no positive results were reported for these compounds in affected samples. The positive result reported for methylene chloride in the reanalysis of sample 02-SB13-B-A was previously qualified as estimated based on holding times. No further action was taken.

Some continuing calibration Percent Differences (%Ds) for trans-1,3-dichloropropene, carbon disulfide and total xylenes exceeded 50%. DLs for these compounds in affected samples are qualified as estimated, "UJ". The positive result for acetone in sample 02-SB14A-A was previously qualified as estimated, "J", based on holding times.

Some continuing calibration %Ds for several compounds exceeded the ±25% quality control limit. No qualifications were made, however, as no positive results were reported for these compounds in affected samples.

The Tentatively Identified Compounds (TICs) 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113) and methylcyclopentane were detected in blanks analyzed with this sample set. Several unknowns and

alkanes were also detected. No qualifications were made as no TICs occurring in the blanks occurred in the samples.

Semivolatile Fraction

The following contaminants were detected in laboratory method and field quality control blank analyses in the maximum concentrations indicated:

contaminant	maximum concentration	(ug/kg)
pentachlorophenol	230	
pyrene	99	

common contaminant	maximum concentration	(ug/kg)
bis(2-ethylhexyl)phthalate	16	

Action levels of ten times the maximum amount of common lab contaminant and five times the maximum amount of other contaminants were used to evaluate the data. Sample size and moisture content adjustments were considered prior to application of the action levels. No qualifications were made for pentachlorophenol and pyrene as no positive results were reported for these compounds. Bis(2-ethylhexyl)phthalate results below the CRQL have been deleted.

The 30% RSD initial calibration criteria and the \pm 25% D continuing calibration criteria was exceeded for several compounds. No qualifications were made, however, as no positive results were reported for the affected compounds.

Sample 01-SB05B-A was determined to be free of semivolatile contamination, however, phenol and bis(2-ethylhexyl)phthalate were detected in the field duplicate. No action was taken as the presence of bis(2-ethylhexyl)phthalate is felt to be attributable to blank contamination and the concentration for phenol is well below the CRQL for soils.

Positive results for phenol and naphthalene are qualified as estimated, "J", as they are below the CRQL.

Several TICs were detected in associated blank analyses. A summary of the maximum amounts of TIC contaminants found follows:

Contaminant (RT)	Max. Amount Found (ug/kg)
2,5-dimethyl-2-hexene	180
2,3,6-trimethyl heptane	240
aldol condensation product	4100
-	(continued)

2,3-dimethyl heptane	610
3,4-dimethyl heptane	310
3,5-dimethyl heptane	180
2,3,4-trimethyl pentane	770
4-(1-methylethyl)-heptane	660
5,5-dimethyl-2-furanone	560
3-methyl octane	210
4-methyl octane	200
2-butoxy ethanol	1100

Several unknowns were also detected. Sample results less than five times the maximum amounts of TIC contaminants shown above have been stricken (crossed-out) on the Form I-BNA TIC reports.

Pesticide/PCB Fraction

The Matrix Spike (MS) recovery for heptachlor fell below quality limits in the MS/MSD analysis of sample 01-FD02-A. No qualifications were made as the Matrix Spike Duplicate (MSD) recovery for heptachlor was acceptable.

Samples 02-SB05B-A and 01-FD02-A constitute a field duplicate pair. Results for heptachlor exceeded the 50% Relative Percent Difference (RPD) field duplicate criteria for soils. The positive result for heptachlor in sample 01-FD02-A is qualified as estimated "J". The DL in sample 02-SB05B-A is qualified "UJ".

DAS: O-EAFB2

DATA SUMMARY
TABLE A

VOLATILES

She Name: $\frac{2(L_1\Omega_3) L_2 L_3}{L_1\Omega_3} \frac{L_1 L_2 L_3}{L_2 L_3} \frac{L_2 L_3}{L_3} \frac{L_3 L_3}{L_$

(CROL * Diadlon factor) / ((100 · % moisture)/100

	Sample No. [01-FD02-4 01-56058-4 01-580574-4	H-5003-10	85085-1011	Aloi S	305A4	15-10	4.8618	01-53138-4 00-53134-4 CA 36137-4	A C2 131	131.4				
	Dilution Factor	1.00	1.00	1	. b C	T.	300	0.900	33.1	Ú				
	% Moleture	כו	77		14	7	7	99	SP	C				
	Location	18:33'	18:33	10'-	-131	-, h	- رد ،	, K. 1.2	, 58-, 78	33'				
	Date Sampled				2121139	1181	15/195	12/16/20		21191963		T	_	
	Date Analyzed	7		181	3129 189	1/1	3190	12 35 199		185			_	
Sec	COMPOUND	- FIELD DU	- FIELD DUPLICATE PAIR-			Ť Ž	Re Assabase		REANALYSIS	SISK				ĺ
2	Charamethene			_	\vdash		103		-	2			-	H
5	Bromomethane						5			Ŋ			-	
9	Veryt Chiloride						20			UI			_	
2	Chibrosthans				_		UJ			בח			_	
5	Methydene Chloride	1 18	21	7	n °	2012	1	35 1	6 1	1			_	
9	Acatone						0.1	الما		LU			1	+
5	Cerbon Disurito						UT		บร	UI			1	-
•	1,1-Okchioroethene						נא			נס				1
5	1,1-Dichtbroethane						UJ			UI				_
S	Total-1,2-Dichloroethene						UJ			17				_
s	Chieroterm	A7 1	23 1				νī		4	3	1			-
•	1.2-Ochloroethane						עלא			13				+
2	2-Butenone						~			5				+
2	1,1,1-Trichloroethane						17			3				+
s	Carbon Tetrachioride						10.7			Z				+
92	Veryl Acetate			-			בח			5				7
\$	Bromodichloromethene			4			M		3	3				7
5	CRDL - Contract Required Detection Limit	Detection L	jak					SEE N	NARRATIVE	E FOR	FOR CODE	DEF	DEFINITIONS	SNC

CRDL * Contract Required Detection Limit

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S VOLATIL DATA SUMMARY FORM:

Ste Name: Elling for lic To die Lasse (sprense) Son Samples Case 8: E-1862 Sampling Date(s): 1.4 (1) (2) (4) (1) (1) (1)

To calculate earnois quantitation limit:

(CROL * Disulton Factor) / ((100 - % moisture)/) 67-39131-4 36,32 25 13/19/18/ ないけ 45 2 183 C) 710 C2-561364 02-5034-A スな U.I 12/2/89 12 115 189 N: 2 180 113/90 Ki Chirchess いいいいい UI I H 7 검검 はては I 13/15/P 2/2 2100 12000 DE-FIXE-4 01-530:234 121-56581 12/3/189 12/25/25 3 161-121 181-331 -FIELD ONPLICATE PAIR-12/21/85 2125/89 13/36/86 181-321 2121189 Sample No. Dilution Factor % Moisture Location Date Sampled Date Analyzed Trans-1,3-Dichloropropens 1,1,2,2. Tetrachloroethene COMPOUND Cle-1,3-Dichloropropene 4-Methy 2-pentanons 1.2.Dichloropropene 1.1.2-Trichtorouthane Tetrachiorosthene Chlorobenzene Total Xydenes Ethyberzene Tolera Sycas 200

CROL - Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION

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BNAS

She Name: Elling to dir Turne buse soll soll.

Com 8: EAE3/ Sampling Date(s): 12/19/99-13/21/89

SOIL SAMPLES (ug/Kg)

To celculate sample quantitation limit:

(CHOL * Dilution Factor) / ((100 - % moisture)/): FIELD DUPLICATE PAIR >

			/WW/	\			•			į.
	Sample No.	01-FD03-A 01-500	PI-5005-19	DI-50054A		A-88138-50	1 08 - 58/3A . A	02-5813C - A	L	l
	Dilution Factor	1.000	1.000	1.000		1.000			 -	!
	% Moisture	17		hl		12				1
	Location	151-33	181-22,	, e1-, a1		19-14			L	1
	Date Sampled	12/21/26	12/21/89	12/18/18		12/19/89			<u> </u>	
	Date Analyzed	119150	119190	961411		06/4/1			-	
Sept	Date Extracted	12/21/89	13/12/189	12/2/189		12/12/69			_	}
330	Phenol	33 3			_	+			+	۲
330	bing-Chloroethy@ether								-	T
330	2-Chlorophenot								-	1
330	1,3-Dichlarobenzene						not	not	-	T
22	1,4-Dichtbrobenzene						Bushine	Justine	-	T
33	Denzyl Alcohol									Τ
8	1.2-Dichlorobenzene									T
330	2-Methyphenol									T
ğ	bis 2-Chloroleogropy Bether									
33	4-Methylphenol									Τ
S	N-Nitroso-di n-propylamine									
338	Herechloroethane									L
330	Mirobenzene									
82	Isopharone									
Š	2-Netrophenol									
82	2.4 Dimethytohanol									F
1600										-
Ş	bis/2-Chloroethouv/methene									
Ŗ	2.4-Dichlorophenol									
Ş	12.4-Trichtorobenzene									
330	Nachthelene					Z 200				
330										

CROL - Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION:

Page 4 of 18

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SHe Name: Elling to the Trice Bush Soll Samples

Case #: £AFBL Sampling Date(s): 12/19/29 - 13/21/80, (up/kg)

To calculate sample quantitation limit: (CROL * Dilution Fector) / (100 - %

		FIELD DUPLICATE PAIR	47E PA/R		<u>.</u>		ු වී	To calculate sample quantitation finiti	Cultifier Factor 1 11000 -	
	Sample No.	OI-FOO3-4 OI-SPORMA	1.2.7	N. 520051 3						motebure)/100
		300	_	ביינייניינייניינייניינייניינייניינייניינ		V-65/B5-20	1 02.58134.4	A 02.58/35.A		
	W. Molecular		CONT.	200		1.000				
				5		22				
	Pate Callon	18-95	181.321	10:121		19:4				
	Date Analysed	1919/185	13/2/180	12 Jan 189		68/6//2/				
	Date Extracted	┿	061611	14150		06/4/1				
CACL		12/2/	138102121	।त्रीवर्गाश्य		12/21/96				
330	Herachlorobutadiena					-				
22	4 Chlore-3-methylphenol						+			
330	2-Atethythaphthalane			+						
ă	Herechlorocyclopenteclene					640	\ \ \ \ \ \ \			
330	2,4,6-Trichlorophend						707	700		
1600	2,4,5-Trichtorophenol						20.Xy and	1024/201		
ន្ត	2-Chioronaphthalane						+			
1 00 0	2-Miroaniine				-	-	+		1	
ä	Directly phythelete									1
ş	Acenephthylene							1		
8	2,6-Destrototuene									
9	3-Ntroenithe							+		
22										
8										
Š	4-Nitrophy not									
ន	Dibenzou: en							-	1	
ន្ត	2,4-Dinitrolotuene						-			1
g	Diethytphthelate									
82	4-Chlorophenyt phenytether									
2	fluorene									
8	4-Nitroenithe									+
89	4.6 Dinitro-2 methylphanol									

CROL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

12/88

SHO NAMO: Ellington Pia Fusice Exist Soll Saudi Fe

SOIL SAMPLES (ug/Kg)

			76725		SOIL SAMPLES	AMPLES				
3	Case #: LAFE! Som	Sampling Dat	Date(s): 13/1	119180-12/21/89		a	•			
		FIELD DUPLICATE	PLICATE				් ප්ර	10 calculate sample quentitation timit; (CROL * Dilution Factor) / //// /	quentitation from	
	Offinition Factor	-F003-10	उत्पार निय	01-FD02-A DI-SASSBA DI-SASSA-A		02. SRI 38.4	103.50	42.00.00		Meanwar &
	W. Marie		020-1	1.000		1.000	N 10 10 2	V- 30/ 20		
			7	+		22				
		18-32	7			17-17				
	Date Sapled	12/2/189	IPIANSS	1212189		12/11/59				
	uste Analyzed	051511		_		14/90				
DIS.	uate extracted	12/27/89	10	12		21/11/2				
97	M-Minorodinhen den in	מציאה שפו שתה	8	+		68/12/71			_	
ļ										
1	4-Bromophenyl-phenylether					1				
¥ 82	Hewachtorobenzene									
2000	Pentachtorophenol									
88	Phenenthrene	_								
330 A	Anthracene			1			nt	1900-		
2000	Di-n-bubyphtheiste				-		Milyard	ZAZKIZAZI		
500 F	Fluoranthene				+		,	,		
	Brene									
300	Buty Consysty the lete									
1600	3,3-Dichtorobenzidine									
330	Benzo(e)enthrecene				1					
\downarrow	Chyraene									
4	Die Z Ethythen diphihaiaia									
_	Of-n-octyphthelete									
\downarrow	Benzo@lauoranthene									
\downarrow	Benzoft Buoranthene									
330 Be	Benzolelpyrene									
330	Indeno(1,2,3-cdpyrene				+					
330	Dibenz(a,h)anthracene				1					
28	Benzolo h Boerviene									

CROL = Contract Required Quantitation Limit

revised 12/86

SEE NARRATIVE FOR CODE DEFINITION

DATA SUMMARY FORM: PESTICIDES

PCBS O N O

3/ 10 9 ofed

SHe Name: ELINGTON AIR FORCE BASE (SHEZ) SOIL SAMPLES
Case #: EAFS | Sampling Date(s): 12/11/89 (ug/kg)

To calculate sample quantitation limit:

							(CROL	•	Dilution Factor / 1/100	<u>.</u> 1	į
	Official Forty	01-FOIZ-A 01-5005-10	02-5805 B-A	B-4 045605A-A		A.02182-50	7.5.00	L.		e moreture)/100	(M)
		7.0	7.0	0.7		1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	74.30150.00	02-581X-A			
	A Moisture	12	17	#/							
	Location										
Ş		FIELD DUDICATE AS	Verze AAK		-		-				
	COMPOUND										
0	athre-8HC									_	
•	beta-BHC			1				L	-	1	
	delta-BHC									1	\downarrow
	General-BHC (Lindane)				1					-	T
	Heplachion	13	1							-	Ţ
	Aidtin		3			Tot	Trot	nal	+	1	1
•	Heptachlor Epoxide					Salvad	Asheno	Sachere			
•	Endosullan 1					•					$oxed{\Box}$
16	Dieldrin			1	+					-	
9	4.4.0DE										I
2	Endrin				+						
2	Endosulian II				+						I
2	4.4°.DDD				+					_	\prod
2	Endosullan Sulfate				+						
2	4,4.001				+						I
8	Methoxychlor										I
힐	Endrin ketone				 					 -	
8	Apha-Chlordene				+						
8	Gamma-Chlordane				†						
2	Toxaphene				+						
8	Aroclor-1016	-		1	\ 					-	
8	Aroctor-1221										
8	Aroctor-1232			 	+	1					
8	Aoctor-1242				1						
8	Aroctor-1248				+						
3	Aroclor:1254				+						
3	Aroclor 1260		-	1	+	1					
į				1		_	_				

CROL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

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	THE STATE OF THE S	- Internation	:								g weller .	ذ
			113			 }						
		3			- 3	-				į		
		2	DATA SUA	AMARY FOR		1	.		Page	7 0	8	
	She Name: Elling to 1812 From Const.	11/1/10	2 15.21	6.60	EAF 82)	-						
	2321			Kar Kor		SAMP 2/Kg)	LES					
		Bujjdt)ate(s): 3 ∟	181-131	13/18	i		10	To calculate sample quantitation in a	Quantifiation in	ż	
L								(CA	(CROL * Dilution Factor) / ((100 - %	ctor) / ((100 -	% moisture)/100)	905
	Mindless Easter	A BAILE	A.	192.50	02-56146A 02-5814C-A	46.4		102-Tar's-	02-TAC3-4 101-12-04-A	An Dans-A		1
	The Moleculary	30.5		72.1	1.00	L		00.1		120	<u> </u>	
	_	9 6		27	7			,		24-		
		0010.101	0	- 1.	181	,02	į	1	,			
	Date Analyzed	181111	7	12/19/185	13	19180	1	13119199	201010	121000		
		10100	2	11/2/50	-	30185		112190		7) :	7	
ਰ 8	COMPOUND	XX. 27.27.X	<u></u>	17.4 (1 no. 145)	44		•	TRIP Blank	K 72:0314	1 00 - 1 Z		
91	Chloromethene	12	1		1	+				BME		
2	Bromomethane	2			72	+						
2	Vinyl Chloride	13	-		72	+						
2	Chloroethane	2	5		7.	1	1					
•	Methylene Chloride	3	-		7		+					L
5	Acetone	250		75	2 5	1	+	-				
5	Carbon Disutitie		-		7 1	Ī			4			
5	1,1-Dichloroethene	3	-		3 5	3		+				
-	1.1 Dichloroethane	5	1		7.5	+	+	1	+			
8	Total-1,2-Dichloroethane	10			15							
5	Chloroform	2	-		1		1	1				
5	1.2-Dichloroethene	2		12	35	4	1	70	40			
2	2 Butanone	41 3			72	+						_
5	1,1.1-Trichloroethane	5	-		3 5	1	1	+				
5	Carbon Tetrachloride	5		7 2	35	+		1				
2	Vinyl Acetate	5			7 12	1		+		1	_	
5	Bromodichloromethene	La			12	+						
((1	2	_	-	_	_	_	_	_

CRDL = Contract Required Detection Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITIONS

She Name: Ellington lie Trice 2250 (600 to 801L SAMPLES
Case #: £47.62 Sampling Date(s): 10/10/25-12/31/89

To calculate sample quantitation imit:

	Seconds No.				ල් දිරුව	(CAOL * Dikulton Factor) / ((100 - % molstures/)	4 · (001)) / L	moistare)/1
	Piletion Cont	A-HEIGGER	102-59148-4 D2-5014C-A	D3-5014C-A	101.72.11.1	0) - TAND - O		
		1.00	00.1	00.		H-127	NA-81905-4	
	A Moleture	36	27		132:	30.1	1.00	
	Location	16.10	10 "	100		,	1	
	Date Sampled	17/2/06	0 0	18 - aC.	1	1	,	
	Date Analyzed	10101	18151171	13112185	13/19/89	13121189	58/61/81	
- 700		aciviti	1119/50	12/36/185	113190	112190	12/20/06	
	COMPOUND	Ke Unalyst	Re aire Lesis		TRIO CHAIK	TRIO BEAK TRIP Blank	4000	
5	12-Oktherensones		5			-	170	
		60	12				Number 1	
\dagger	Car. I. S. Carante optionens		-					
_	Trichloroethene	10	3!					
8	Othermochiloromethans	1						
6	1.12-Techiorethene	**	72					
		1	ולא					
	Designe	13 M	10					
-	Trans-1,3-Dichloropropens	1.0						
5	Dromotorm		31:	K 2				
91	4-Methy4-2-pentanone	7.7	131					
91	2-Herenone							
\$	Tetrachtorouthere	1	315					
5	1,1,2,2-Tetrachloroethene	7.5	315					
•	Totuene	200	3 !					
5	Chlyspharian	3:	EM	15				
		3	73	LOL				
+	C uniform Clark	IVI	3	5				
	Sylvene	ולטו	5	5		†		Ì
-	Total Xidenee	Ea		1	+			
			1 5 7 1	2	_	_		

CROL - Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION

SHO NAME: Elington Par Take (50° tree?) SOIL SAMPLES
COO. 8: EATEL Sompting Date(0): 13/19/89

Rinsatur By Prink To calculate sample quantitation link: (CROL * Division Factor) / ((100 - % moisture)/))

	Sample No.	A-AP182-50	4-8H/85-20	_	62-58/4C.A	61. TB0 \$.A	A-1804-A	02.8805.4	
	Dilution Factor	6007		-					
	# Malaka	26		1				7:620	
				$\frac{1}{1}$				•	
	Location	0/-2/							
	Date Sampled	13/11		-				12/19/89	
	Date Analyzed	1/4/20		-				06/4//	
d	uste extracted	4/17/2		. .		trip blank	trip Stark	18/12/21	
82	Phonoi			L			_	-	_
ă	bla 2-Chloroeth dether								
2	2-Chlorophenol								
2	1,3-Dichlorobenzene								
2	1,4-Dichtorobenzene					not	not		
82	Benzyl Alcohol		Tiot	704	,	202/1200	molecia		
2	1.2-Okthorobenzene		pshare	210	2100hzad				
ž	2-Methybhenol								
22	ble 2. Chlorolsopropy dether								
2	4-Methyphenol								
22	N-Natroso di n-propidentine								
336	Herechloroethene								
Ş	Nitrobenzene								
82	hopherone								
22	2-Nerochenol								
22	2.4 Dimethytohanol								
1600									
22	ble/2 Chloroethouvingthene								
330	2.4-Dichterophenol								
2	1.2.4 Trichlorobenzene								
33	Nachthelene								
330	4. Chloropolpo					-			

CROL - Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITIONS

DATA SUMMARY FORM: B N A S

She Name: Elling for line Turce 2005 (poeris) Soil Samples Case 8: EAFBI Sampling Date(s): 17/19/89

Rinsatenk

To calculate sample quantitation limit: (CROL * Dilution Factor) / ((100 - % moleture)/10)

	Semole No.	V-Vh/85 - 20		M. SRIUR.A	12. CRIMC.A	61. 10.7 4	4 moder 10	753000	
	Diffution Factor	/.000		77122 72	1	1003:4	W. LOG !	V_50519-F0	
	A Moleton	26						J 200:	
	Location	0'- 2'						,	-
	Date Sampled	12/11/89							
_	Date Analyzed	06/6//						2815116	
8	Date Extracted	48/12/21				trip 6 120K	Any blank	12/2/185	
OCE	Henchterbutedene		_					_	
2	4-Chlore-3-methylphenol								
8 28	2-Methytraphtheione								
2	Hemothorocyclopentecliene								
2	2,4,6-Trichtorophenol								
2									
3	2-Chlorenghithelene			204	not	not	1201		
-				propert	maked	Judge	200heed		
22	Dimethylphthelete								
8	Acenephthylene								
22	2,8-Dintrotoheme								
1686	3-Miroaniline								
2	Acenephthene								
1600	2,4-Dinttro,henoi								
- 8									
8	Denzou: In								
82	2,4-Dintrototuene								
ğ	Diethytphthelate								
330	4-Chlorophenyl-phenylether								
330	Fluorene								
1600									
1600	4.6-Dinitio-2-methydohenol								

CROL - Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION!

8/ 10 // obed

She Name: Ellington Ris Fusir (2000 BONES (00/18) (00/18) Case #: £4£3/ Sempting Date(s): 12/19/89

Rinsatrank

	l.	A. AMB2 . 50	-	F	13. 60111			-				. ((100 · (100 ·	-		* motetanely
		000-7			7700	2	26 30/10 M 06: 58/40. A	۲.		61. TROZ . A	12.4	A TOOT 10		10000	
			1	1						1		7. 1001. H		ナシュ	
	S MONETURE	25				-		1					1	000	
	Location	,2-,0				-		1		1				ŧ	
	Date Sampled	12/14/89				+		1			1				
	Date Analyzed	01/6/1				+		-					Rel	98191E	
8	Date Extracted	63/12/21				-		1			1		1	14190	
						_		_		trip blank	Bak	trip blank	E	13/21/80	
1	N-VIDOSOGDNetydemine					-	ľ	-			1		4		
2	4-Bromopheny4-phenytether					\dagger	\dagger	+	1		1				
ន						+	1	$\frac{1}{1}$	+						
Ş		-			1	\dagger	1	1	+						
ž	Phenerthrene			\perp	1	+	1	+	+						
2	Anthroane				1	+	1	+	+	_					
Ŗ	Of a budgohitheliste					4	700	+	+	Not		Tot		_	
ä	Fluoranthene			1	A ALIAN P	1	PANICUL	+	+	20264		Purstac			
Ŗ	Press			1	\dagger	+	1	+	+						
2	Bulgbenrytphthelete	-			1	+	1	+	+						
Š				L	†	+	\dagger	1	+		1				
ន្ត	Benzo(a)enthrecene				\dagger	+	+	+	+						
g	Chrysene					+	+	+	+		#		_		
S	ble(2 Ethytheny@phihaiste			-		+	-	+	+		+		_		
2	Di-n-ochiphtheime			-		+	1	+	+		+		8		
ន	Benzo (b) Automathene			\vdash		+	+	+	+		#		4		
ğ	Benzoft/Aucranthene			+		+		+	+		#			-	
ğ	Berzelelpyrene			+		+	+	1	+		+				
82	Indeno(1.2.3-cd/pyrene			-		+	+	+	$\frac{1}{1}$		+	1	1		
ä	Dibenz(a,h)anthracene			-	+	1	+	+	1		1				
330	Benzola h Boardene			-	1	+	1	+	+						
						1		_	_	_	_	_	_	_	

CRQL = Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION

Page 12 of 18

PCBS N N

SHO NAMO: ELLINETON HIR FORCE BASE (SAF ENTEZ) SOIL SAMPLES

Case #: EAFB1 Sampling Date(s): 12/19-12/21/89

To calculate sample quantitation first:

(CROL * Dilution Factor) / ((100 - % molature)/100)

	Samula No	A3. COLLIA.A				- 1			
	Diletton Factor	1	7 01105 37	T 36/86-30 W at lac 30	01-1605-A	_1	01-1804-A	A-2087-50	
	% Moisture					1			
	Location								
SP C	COMPOUND								
-	apha-8HC		-			1			T
•	beta-BHC					+			Ī
•	delta-BHC					-			T
	German-BHC (Lindene)					+			T
	Heptechlor		200	mat.	- And	No		1	1
•	Akth	ton.	harlow	Siehand	30.36.00			////	T
-	Heptechtor Epoudde	202ked					and harries	- Control	T
•	Endosullan (
16	Dietrin								1
2	4,4°.DDE								1
=	Endrin								
2	Endosullan #								ĺ
9	4.4.000								T
2	Endosullan Sullate								-
2	4,4'DDT								1
8	Methorycidor								
2	Endrin ketone								
8	Alpha-Chlordene								
8	Genna-Chlordene								
3	Toxaphene								
8	Aroctor-1016								
8	Aroclor-1221								
8	Aroctor-1202								Ī
8	Aoctor-1242								
8	-								
8	Aroclor: 1254								Ī
160	Aroctor:1260								Ī
									1

CROL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

100 (CAOL * Divulon Fector) / ((100 - % /3 0 To calculate sample quantitation limit: S VOLATIL 143 SOIL SAMPLES (ug/Kg) 1112190 HPLC WAYER R-CLICKLYSE 1212189 1.00 J She Name: Ellington (listings of se (gold) DATA SUMMARY FORM: 131186 12131185 manicipal FBC4-A 00 Sempting Date(s): 12121185 112190 KINS: ** BANN K 1.13 Date Sampled Date Analyzed Sample No. * Moisture · 54FB1 COMPOUND Methylene Chlodds Acatione Cerbon Daudide 1,1 Dickleroethene 1.1-Octionesthere Total 1,2-Octionosti 12-Dichloroethene Chicoethene Chlorotom 2-Butanone

3

2 2

2 2

(2)

•

• 47 8 •

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3

CRDL = Contract Required Detection Limit

Carbon Tetrachloride 1.1.1 TACHOROSTANO

2

Very Acetato

2

revised 12/88

SEE NARRATIVE FOR CODE DEFINITIONS

DATA SUMMARY FORM: VOLATILES

She Name: Ellingthe live Force Person ("De Force Person ("D") SOIL SAMPLES

Case 8: £4.62 Sampling Date(s): 12|21|84

(CROL * Ditution Factor) / (1100 - % To calculate sample quantitation limit:

										· Annual ·
		BBCV A	FCC4-A		F8o3 · A		L		F	
	Dilution Factor	0.01	1,00		1.00					
	% Moleture	1	1						+	
	Location	,			-					
	Date Sampled	12121189	12121181		12 21 39					
		I	112150		06 21 1					
CBO	COMPOUND		かいいいいのい こうしょくかい		HPC Water					
Š	1,2 Dichtbrapropene	•		-	-		-	-	t	
2	Cle-1,3-Olchloropropere							+		
\$	Trichloroethene									
\$	Othermochloromethene		33							
3	1,1,2-Trichloroethane									
\$	Benzone						L	_		
5	Trans-1,3-Dichloropropens							_		
5	Bromotorm									
10	4-Methyd-2-pentenone							<u> </u>		
20	2 Henanone									
5	Tetrachiorosthene									
5	1,1,2,2-Tetrachtoroethane									
5	Totale									
5	Chlorobenzene									
\$	Ethybenzene									
5	Shrane									
5	Total Xylenes									

CROL - Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION

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> BNAS DATA SUMMARY FORM:

Case #: EAFB1 Sampling Date(s): 12/21/89 She Name: Ellington dir Torce Baix

SOIL SAMPLES (ug/Kg)

To calculate sample quantitation finit:

	Spends M.	, KE			į					<u>ğ</u>	•	tion Fa	Offution Factors / 1/1/nn	2		į
	Minter Service	A-9035	FGC4-A	A		FB03. A	-								Ol/lemsmu -	Š
	A PECIO	020	1.000			1.000			\downarrow		\downarrow					J
		- 6	-				_					-)
	Date Samled	अंद्रिक्	Field bran	ग्य		FIELD BLANK	ž.				1		1]
	Date And	18181	1312185	9		12/21/89	6						\downarrow			
-	Date Extracted	119190	119 190	2		06/5/	0						1			, ,
3		12/27/89	18/16/EIEI	55	_	2/27/00							\downarrow			!
4	Pend		1	+	1					!	-					
4	the 2-Chicrosthy Bether			+	1	1						H		1		L
S	2-Chlorophenol			+	1					_				+		+
8	1,3 Dichlorobenzene		1	+	1							+	\downarrow	+		+
S	1,4 Dichlorobenzene		1							_		+	1	+		+
	Bench Alcohol		†		1		-					H		+		4
4	12 Dichlorobenzene				1	1	+	4				-				+
4	2-Methylphanol		1	+	$\frac{1}{2}$	1		4				L		-		+
4	DING-Chlorelsopropydether				$\frac{1}{2}$	1	+	4								·
4	4-Methyphenol				+	†		4				L		I		1
4	N-Nitroso-d-n-propytemine				+	1		+				L				
4	Herachloroethana				$\frac{1}{1}$	1	+									
4	Mirobenzene				+	1	+	+								<u>.</u>
4	1900horone				+	+	+	1		\downarrow		_				!
1	2-Nirophenol				1	1	-	1		\prod		4				
	2.4-Dimethylphenol				+	+	+	igg		\downarrow		_				<u></u>
1	Benzoic Acid				+	\dagger	-	1								L
4	bis 2. Chloroethoxylmethens				+	1	1	4								
4	2.4-Dichterophenol		-		+	+		1								1
4	12.4 Inchiprobenzene				+	1	1	1								1
4	Nephihelene				+	+	1	1								1
7 07	4.Chlorosodina				1	+	+	1								!

CROL * Contract Required Quantitation Limit

revised 12/68

SEE NARRATIVE FOR CODE DEFINITIONS

8 10 dl sage

DATA SUMMARY FORM: B N A S

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She Name: Ellington Cir Face Paise (goether) Soll SAMPLES (49/Kg)

To calculate sample quantitation finit: (CROL * Dilution Factor) / ((100 - %)

									•	/ / Lane		2	3
	Surphy No.	H506.A	FBC4-	A		F803-A	1	-	ſ				
	Darrion Factor	000:	1.000			1.000	9						
	A Moleture	,	┪			-		-					
	rocation .	K105418	Ӵ	COX		FIEWBUNK	3	+					
	Defe Sampled	12/2/5/5/	1	53		12/2/	8	\dagger					
	Date Analyzed	19 150	119190	a		06/6/1	0	+					
8	מוה בארופנובם	18/ce/e1	_	58		53/22/21	65,	 					
330	Herachlorobutadiene			+	-		1	†	1				
330	4 Chlore-3-methyphenol			+	+			\dagger			\int		Н
330	2-Methytnephthelene				-		+	\dagger			$oldsymbol{oldsymbol{oldsymbol{eta}}}$		-
923	Herachiorocyclopentaciene							\dagger			1	4	4
828	2,4,6-Trichtorophenol				1		\dagger	\dagger			<u> </u>	\perp	\dashv
1600				-	<u> </u>		+	\dagger			1	1	+
Š	2-Chtoronaphthalane				-			\dagger			\prod	1	+
<u>.</u>					_			\dagger]		1		+
330	Dimethytphthalate				-			1	1		1	1	+
900	Acenephthylene				1		\dagger	\dagger			\prod	\downarrow	+
330	2,6-Dintrototuene				<u> </u>		\dagger	\dagger	brack		\prod		+
1800					-			\dagger	1		\prod	1	+
330	Acenephthene				-			+	Ţ		\prod		+
8				_				-			\prod	1	+
8											T	1	+
ន្ត	Dibenzok: en				-						T	1	1
ğ	2,4-Dinitrototuene				_			-	I		Ţ		+
S	Diethydphthainte							-	I			\downarrow	+
33	4-Chlorophenyf-phenyfether			_	_		_	+	I		Ţ	1	+
8	-							+	I		I	$oldsymbol{\perp}$	+
8	-							+				1	+
1600	4.6 Pinkro-2-methylphenol						\vdash	\dagger	T		I	Ţ	+

CROL * Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITIONS

8/ 10 8/ of ed

PCBS A N DATA SUMMARY FORM: P E S T I C I D E S

SHO NAMO: ELLINGTON HIR FORCE BASE (SW ENR2) SOIL SAMPLES (UB/Kg)

Case #: EMPB/ Sampling Date(s): 12/21/99

To calculate sample quantitation limit: (CRQL * Dilution Factor) / ((100 - % moleture)/100)

COMPOUND COMPOUND												
Welsture COMPOUND		Sample No.	K806-A	F804-4		E803-A			_			
No between No between		Dilution Factor	70	2		0.7	_					
COMPOUND alpha BHC beta BHC delta		% Moisture	1	l		1	<u> </u>					
COMPOUND abha-BHC beta-BHC dela-BHC Garrana-BHC (Lindane) Heplachlor Adrin Heplachlor Eposide Endosultan I A-4-DDE Endosultan II 4-4-DDF Endosultan II 4-4-DDF Endosultan II A-4-DDF		Location										
## COMPOUND ### BHC ### BHC ### BHC ### BHC ### BHC ### BHC #### #### BHC #### ##### ###### ####### #######												
alpha BHC beta BHC defta BHC Garwine BHC (Lindane) Heptachlor Addin Heptachlor Epoxide Endosultan I 4.4-DDE Endosultan II 4.4-DDF Endosultan Bullate 4.4-DDT Methoxychlor Endrin ketone Apha-Chlordene Garmin-Chlordene Toxaphene Accior:1221 Accior:1221 Accior:1232 Accior:1242 Accior:1246 Accior:1256	SROP.	COMPOUND										
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deta-BHC Gamma-BHC (Lindane) Heptachlor Addin Heptachlor Epoulde Endosultan 1 4.4-DDE Endosultan II 4.4-DDI Endosultan Sultate 4.4-DDI Methoxychlor Endosultan Sultate Accion 1231 Accion 1232 Accion 1234 Accion 1234 Accion 1234 Accion 1234 Accion 1234 Accion 1234 Accion 1234 Accion 1234 Accion 1236	•	beta-BHC								_	_	igspace
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Endosultan II 4.1-D0D Endosultan Sultate 4.4-D0D Methoxychlor Methoxychlor Endrin ketone Alpha-Chlordane Garmna-Chlordane Toxaphene Accior:121 Accior:1221 Accior:1242 Accior:1246 Accior:1254 Accior:1256	16	Endrin										
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Garnina-Chlordene Toughtene Toughtene Avoclor: 1016 Avoclor: 1221 Avoclor: 1232 Avoclor: 1246 Avoclor: 1254 Avoclor: 1254 Avoclor: 1256	8	Apha-Chlordane										
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\dashv	8	Aoctor 1232										
	8	Aroclor-1242										
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_	9	-										_
	9	_										

CROL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

Page 17 of 18

DATA SUMMARY FORM: B N A S

n

Nome: Ellington dia Force Buse

#: £4F3/_ Sampling Date(s): 13/3/189

3

SOIL SAMPLES (ug/Kg)

MPLES

To calculate sample quantitation Enti:

moleture)/100 (CROL * Dilution Factor) / ((100 - % Field Blook 61/12/21 55/27/21 1/9/20 1.000 F803-A 230 25 FELD BROK 119/90 F604-A 020: Rinsate 12/21/89 119190 A BOG-A 12127189 9901 Date Sampled Date Extracted Date Analyzed * Molsture Location Sample No. Ollution Factor 4-Bromophenyl phenylethe bis (2-Ethythenythphilheiste N-Mirosodiphenylemine Indeno(12,3-cdpyrene Dibenz(e,h)anthracene Benzo(b) fluoranthene 3,3-Dichlorobenzidhe Benzola hilbendene Buty Cenzy philheleie Benzofk)Augranthene Hexachlorobenzene Benzo(a)anthracene Pentachtorophenol Di-n-octyphithelete Of n-butydphilhelete Benzolalpyrene Fluoranthene Anthracene Chrome Press 왕 중 왕 CHOL 88 88 8 8 8 S S 5 3 3 3 8 8 8 8 8 330 330

CROL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

4 - 1

PCBS A N D DATA SUMMARY FORM: PESTICIDES

8 10 8/ of 8

SHO Name: ELLINGTON HIR FORCE GASE (SA EARZZ) SOIL SAMPLES (UB/Kg)

Case #: EM-B/ Sampling Date(s): 12/2/99

To calculate sample quantitiation limit:

	Samole No.	10001						İ		CRO	•	Difution Factor) /	lor) / (100	* . 0	moleture)/100)	001/
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8	COMPOUND															
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•	della-BHC				+	+										
•	Gemme-BHC (Lindene)					+										
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	Aldrin				+	1										
•	Heptechlor Epoxide							İ								
•	Endosultan I					1										
2	Dieldrin				-	1		1								
5	4,4'-DDE					1										
16	Endrin															
9	Endosultan II					\prod										
9	4,4:000					<u> </u>										
2	Endosultan Sulfate				1	\prod										
2	4.4.DDT				-			1								
8	Methoxychior				+					1						
2	Endrin ketone				-					1						
8	Alpha-Chlordane				-			T	T	1						İ
8	Gamma-Chlordene															
8	Toxaphene					T		1								
8	Aroctor-1016					T		†								
8	Aroctor-1221				-			+	T	+						
8	Aodor-1232				+	T		\dagger		Ť						
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2	Aroclor-1248				-	<u> </u>		+	1	\dagger						
8	Aroclor 1254				<u> </u>	+		\dagger	1	\dagger						Ī
3	Aroclor 1260					<u> </u>		+		+						
-						1		1		_		_		_		_

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS revised 12/88



C-49-0-3-160

TO:

LINDA STEAKLEY

DATE: MARCH 29, 1990

FROM:

D. A. SCHEIB

CC:

AMY HUBBARD

SUBJECT:

INORGANIC DATA VALIDATION - METALS

METALS AND PETROLEUM HYDROCARBONS ELLINGTON AIR FORCE BASE

CASE NO. EAFB1

SDG EAFB4

SAMPLES:

WATER

01-MW03-A	01-MW02-A
01-MW04-A	01-MW05-A
01-FB10-A	01-FD05-A
01-FB11-A	01-RB13-A
01-MW01-A	

NUS Laboratories analyzed 6 water samples (including one pair of field duplicates) and three associated aqueous quality control samples taken from the Ellington Air Force Base for TAL Metals and Petroleum Hydrocarbons. Data from these samples were evaluated under the following HAZWRAP Level C QA/QC criteria:

- Holding Times
- Interference Check Samples
- Matrix and Analytical Spike Results
 - Initial and Continuing Calibration
 - Laboratory and Field Duplicates
- Laboratory and Field Blank Analyses
 - Laboratory Check Samples
 - Serial Dilutions
 - Detection Limits
- o Indicates that quality control criteria were not met for this parameter.

TAL Metals

Blanks

Cobalt, iron, mercury, barium, calcium, lead, magnesium, manganese, potassium, sodium, silver, and zinc were found in laboratory and field quality control blanks. Positive results less than 5 times the highest blank concentrations are qualified, "U", as undetected.

Linda Steakley C-49-0-3-160 March 29, 1990 - Page 2

Matrix Spikes

Matrix spike recoveries for silver were below the $\pm 25\%$ quality control limit. Therefore, detection limits reported for silver are qualified as unreliable, "R".

Petroleum Hydrocarbons

Samples 01-MW05-A and 01-FD05-A constitute a field duplicate pair. No petroleum hydrocarbons were detected for sample 01-FD05-A, however, a concentration of 0.9 ng/l was reported for sample 01-HW05-A. This positive result has been qualified as estimated, "J" due to lack of precision for field duplicate results.

/bpk

TABLE 1 - METALS

SUMMARY OF QUALIFIERS AFTER DATA VALIDATION ELLINGTON AIR FORCE BASE CASE NO. EAFB1, SDG EAFB4

Analyte	Sample No.	<u>Positive</u>	<u>Undetected</u>	Bias	Comment
Cobalt	All	ŭ		High	1
Iron	All, except 01-MW04-A	υ		High	1
Mercury	01-MW03-A, 01-MW01-A, 01-MW02-A	ט		High	1
Barium	All, except 01-MW03-A	υ		High	1
Lead	All, except 01-MW02-A	U		High	1
Magnesium	All	מ		High	1
Manganese	01-MW03-A, 01-MW02-A	U		High	1
Potassium	All	U		High	1
Sodium	All	U		High	1
Zinc	All	U		High	1
Silver	01-MW03-A, 01-MW02-A	U		High	1
	01-MW04-A, 01-MW01-A, 01-MW05-A, 01-FD05-A		R	N/A	2

Comments

- 1. Blank contamination.
- 2. Low matrix spike recovery.

<u>Note</u>

Aqueous quality control samples (field blanks) are not qualified on the basis of blank contamination or any other non-compliance.

DATA SUMMARY
TABLE A

DATA SUMMARY FORM: I N O R G A N I C S

Stie Name: £[[ing long link Figure (2,15 & 500 & 45 & 400 MIER SAMPLES

Case #: £4762 Sampling Date(s): 1/23 - 1/25/90

Lab No. #15605 H15606 H15614 H15615 1115931 H15932

Due to dilution, sample quantitation limit is affected Lice 2 See dliution table for specifics. MISYS WIE922

190 70.		712607	1113000	MISGIT	H17617	15.15/	M575C	HI5933	11/5934	HIS935 HIS934 THIS137	
	Sample No.	01-m 303-4	01-ma03-401-ma-104-4 01-F610-4		O1-FB11-A	DI-MU01-9 17-MU02-A	M-mas-A	2	4-E197-101-5007-101-6013-10	01-8013-4	
_	Dilution Factor	1		l t			,	1	1	•	
	Location			1 POIC WAR	KF Hudgeot	•	,	•	Dig Cop 1	Rinsale	
_	Date Sampled	1123190	112315p	1124190	1184150	1125/90	1135 40	1125190	1125190	1125190	
CHO D		ala 190	31a 150	313 190	ala 190		ala 190	212 190	312 190		
8	Aumhum		2910				_				F
8	Antimony										
2	*Arsenic										
200	Bartum	213	334 11		(43.4)	17 [31]	1151) u	266	266 11		
S	Beryttium		1.37								
S	*Cadmium										
2000	L	00206	153cc	[הוכ]	0011	176000	28485	20400	loice	[226]	
2	•		172.97								
ន	Coball	17.33 11	To. (2) 4	(F:3)	[61:87]		[6.7] U	19.9] u	[G.67] U	[8.47	
22	Copper										
5		[33.0] U	3710	[34.00 [34.00	ا ا	(J. 10.0)	11 [0,48]	126.0) U	(23.c) W	[53.0]	
S	*Lead	11.3 L	12.51 U		[[]	[0.70] W	1D. Co	11.27 W	10.70] L	<u>၂</u> (၁၈)	
2000	0 Magnesium	14 300 11	20000 11		[4230]	11100111	1320c N	11100111	1100011		
15	Manganese	14.77 U	498		16.5	455	32.8 4				_
0.2	Mercury	0.21		D:31	c.35	10:11 W	10.07				_
4	*Nickel		[[12:1]								
2000	D Potassium	1 (015)	[1350]		1107	11 िंक्स्य	य जिल्ला	<u>با [۲۵۵۲]</u>	भ / धन्न		
S	Selenium									-	
9	Silver	11 [21.6]	3			8	19.67	B	αi	[b.9]	
2000		30100	रा त्यान		DODUCO	5560 H	3370C W	33300 11	7) 001EE	[540]	
2	Thalkim					-					
S	Vanadium		[10.9]								
2	Zinc	111.87	<u> </u>		195	80.5 U	7 [h. 8]	1) 29 K	111.01	878	
0	-45venide						,				-

CRDL = Contract Required Detection Limit

*Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS

revised 12/00

DATA SUMMARY FORM:

She Name: EAFBI - Ellingfort Air Force Base

WATER SAMPLES

Case #:	EAF8-4	EAF8-4 Sampling Date:	Date:	1/23 - 1/26/90	06/22			
Lak No.	٠	Holls	186-	HO115931 HO115932 HO115605 +	HO115605	H0115606	40115606 HO115933	- [
2017	Samole	No OV. AL	01.HW01.A	4.20MW-10	01. MWB.A	4 01. MWB.A 01. MWO4.A 01. MWOS.A	01. HW05.A	
	Dilation Factor	_		ı	1	,		1
	Date Sampled	pled //2	01/5	425/90	1/23/90	08/52/1 06/52/1 06/52/1 06/52/1	1/25/30	- 1

7	· 0\/ 0\/ 7	- 1	שבו בוופנו	, , , , , , , , , , , , , , , , , , , ,						
	Sample No.	01.MW01.A	8.20MH-10	OV. MIMB.A	01. MW04. A	01. HW05.A	01. FD05 . A	V-60MV-20	1.864-4-20 A-104-4-50	1-80MM-20
	Dilution Factor	ì	I		ł		1		- 0/ = 1	2/20//
	Date Sampled	1/25/10	425/90	1/23/90	06/82//	01/52/	01/22/1	01/12/	1/22/10	A tooli
	Date Analyzed									
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Tabulated by D. A. Schib 3/28/90

DATA SUMMARY FORM:

She Name: EAFBI - Ellington Air Face Base

Caso #: EAF8-4 Sampling Date: 1/23-1/26/90

WAILH SAMPLES

Sample No. 02-Awlio-A 02-E801-A 01-E80-	Lak	Lab No.	H0115604	H0115612	H0115614	H0115615	H0115609	H0115935				1
Date Sampled		1	02-AW110-A	A-F003-50	01 - F810. A	A-1183-10	02.R811.A	07. R013. A				i
COMPOLINI Pehaturi Hydrocarbans Pehaturi Hy		Dilution Factor Date Sampled	05/27/1	05/42/1	424/90	ō6/#zħ	1/23/90	1/25/10				111
		COMPOUND		Polspigot	1 1		Rinsate Blank	Rinsate Blank				1 1
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Tabulated by D. A. Schulb 3/28/40



C-49-4-0-117

TO:

LINDA STEAKELY,

DATE: APRIL 18, 1990

FROM:

D. A. SCHEIB

CC: FILE

SUBJECT: ORGANIC DATA VALIDATION - VOA/BNA/P&P

ELLINGTON AIR FORCE BASE CASE NO. EAFB1, SDG EAFB4

SAMPLES:

Water

01-FB10-A	01-MW03-A	02-MW108-A
01-FB11-A	01-RB13-A	02-MW110-A
01-FD05-A	01-TB09-A	02-RB11-A
01-MW05-A	02-FB09-A	02-TB07-A
01-MW01-A	02-MW07-A	02-TB08-A
01-MW02-A	02-MW09-A	01-MW04-A

NUS Laboratories analyzed 10 water samples (including one pair of field duplicates and 8 aqueous quality control samples for Target Compound List (TCL) volatile and semivolatile compounds. samples were also analyzed for pesticides and PCBs. Included in this sample set are three field blanks, two rinsate blanks and three trip blanks.

The data were reviewed with reference to the EPA "Functional Guidelines for Organic Data Validation" and the Hazardous Waste Remedial Action Programs's (HAZWRAP) "Requirements for Quality Control of Analytical Data". Analyses were conducted and are evaluated under the following HAZWRAP Level C QA/QC criteria:

- Holding times
- GC/MS tuning and mass calibration
- Laboratory blank analyses
- Initial and continuing calibration
- Internal standards performance
- Surrogate spike recovery
- Matrix Spike/Matrix Spike Duplicate results
- Field duplicate precision
- Detection limits

The data package was complete as submitted. GC/MS tuning and mass calibration and internal standards performance met contract required criteria. Data which did not meet quality criteria are discussed below.

Volatile Fraction

The seven-day holding time allowance for aromatic compounds was exceeded by five days for the following samples:

01-MW01-A	01-MW04-A	01-MW107-A
01-MW02-A	01-MW05-A	01-MW108-A
02-MW03-A	02-MW09-A	02-MW110-A

Positive results and detection limits for aromatic compounds in affected samples are qualified as estimated, "J" and "UJ", respectively.

The following contaminants were detected in trip, field, rinsate and laboratory method blank analyses in the maximum concentrations indicated:

contaminant	maximum concentration	(ug/L)
benzene	16	
bromodichloromethane	41	
bromoform	21	
carbon disulfide	85	
chloroform	53	
dibromochloromethane	44	
1,1,-dichloroethane	16	
ethylbenzene	5	
2-hexanone	19	
4-methyl-2-pentanone	4	
1,1,1-trichloroethar		
total xylenes	37	
common contaminant		
acetone	23	
2-butanone	110	
methylene chloride	23	
toluene	16	

Action levels of ten times the maximum amount of common lab contaminant and five times the maximum amount of other contaminants detected were used to evaluate the data. Sample contaminant concentrations below the Contract Required Quantitation Limit (CRQL) have been deleted. Sample contaminant concentrations above the CRQL but within the action level are qualified "U", as undetected.

Initial calibration Percent Relative Standard Deviation (%RSD) for chloroethane exceeded 50%. Detection limits for chloroethane in affected samples are qualified as estimated, "UJ".

Initial calibration %RSDs for total xylenes and carbon disulfide exceeded the 30% quality control criteria. Affected sample data was not qualified further as results for these compounds were already qualified "U" based on blank contamination.

The continuing calibration Percent Difference (%D) for vinyl acetate exceeded 50%. Detection limits for vinyl acetate in affected samples are qualified as estimated, "UJ". The continuing calibration %D for acetone exceeded 50%, however, no qualifications were made to detection limits for acetone were previously raised (via use of the "U" qualifier) due to blank contamination.

Some continuing calibration %Ds for acetone, carbon disulfide, vinyl acetate, tetrachloroethane, total xylenes and chloromethane exceeded the ± 25% quality limit. No qualifications for acetone, carbon disulfide and total xylenes were made as affected results for these compounds were already qualified "U" based on blank contamination. No qualifications for vinyl acetate, tetrachloroethane and chloromethane were made as no positive results were reported for these compounds.

Percent Recoveries (%R) for 1,1-dichloroethene and trichloroethene exceeded matrix spike/matrix spike duplicate quality control criteria. No qualifications were made as no positive results were reported for these compounds.

Relative Percent Differences (RPDs) for benzene and carbon disulfide exceeded the 30% quality limit for waters for the field duplicate analyses of samples 01-MW05-A and 01-FD05-A. No qualifications were made as these occurrences are felt to be attributable to blank contamination and not field duplicate imprecision.

A maximum concentration of 44 ug/L 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113) was detected at a TIC in blanks analyzed with this sample set. Several unknown compounds were also detected in the blanks. All sample TIC results for Freon 113 were less than the corresponding 220 ug/L action-level and have been stricken (crossed-out) on the Form I-VOA TIC reports. No unknowns occurring in the blanks occurred in the samples.

Semivolatile Fraction

Maximum concentrations of 1 ug/L naphthalene and 2 ug/L of the common blank contaminant bis(2-ethylhexyl) phthalate were detected in field and rinsate blank analyses. No qualifications were made as no positive sample results were reported for these compounds.

Some %Ds for the continuing calibration of several compounds failed to meet the \pm 25% quality criteria. No qualifications were made as no positive sample results were reported for the affected compounds.

The Percent Recovery (%R) for the surrogate 2-fluorobiphenyl was below acceptable limits in sample 01-MW02-A. No qualification based on this single occurrence is required.

A maximum concentration of 5.8 ug/L cyclohexanone and several unknowns were detected in blanks analyzed with this sample set. None of these particular TICs were found in the samples, hence, no qualifications were made.

Pesticide/PCB Fraction

Delta-BHC, gamma-BHC (lindane) and heptachlor were detected in the rinsate blank. No qualifications were made as no positive sample results were reported for these compounds.

Positive results for alpha-BHC and methoxychlor are qualified "J", as estimated, as they are below the CRQL.

DATA SUMMARY
TABLE A

VOLATILES DATA SUMMARY FORM:

Ste Name: Elling hallis Foure Area (SDG 8.47.33)
Case 1: \$4731 Sampling Date(s): 1/12 -1/16/90

SOIL SAMPLES (ug/Kg)

To calculate sample quantitation timit: (CRQL * Disulton Factor) / ((100 - % motsture)/100

L	Sample No. 102-FECSARIO2-FECIA-AIOX-FECT-AICX-FECE-A 102-FOX-A 102-5008C-AID3-FDOYA 102-58104-A 102-RISO	DA-FBCSAA	O. P. P. BOOM. A	03-FB07-A	172-FB08-A	DZ-FDUZ-A	CZ-5008C-A	DA-FDOYA	02-5810A-A	DA-RADA
	Diffution Factor	1.00	1.00	30:1	70.1	ا · ن ت	1.00	<u>ပ</u> -	99.	00'1
	% Moleture	1			:	hŁ7	ħE	EE	18	ţ
	Location	HPLC	my 1. 2. l	2784	My 11.109	1(0,-30,	16,-20,	,01-18	,01-,8	Rine Lo
	Date Sampled	111390	11.3190	11114190	1/11/1/19/90	3512111		11110190	11110190	11960
	Date Analyzed	1113190	1117/90	1119190	1119190	99/21/1	1117190	1127190	1	001011
2080	COMPOUND	Field blank field bu	field Wank	Field blank	Freld black Preld Wank	- FIELD DUP. PAIR	P. PAIR -	- FiELD DU	ď	
2	Chloromethans			_					_	-
2	Bromomethane									
š	Viny Chloride									
2	Chloroethene					10	Fa			
\$	Methylene Chloride	18				93 u	1120 11	11 58	n 81	
2	Acatone	h&				7 16	38 1			
5	Certon Disutide									
•	1,1-Dichloroethene									
•	1.1-Dichloroethene									
5	Total 1,2 Dichloroethene									
9	Chipsolom		20		34	8	<u> </u>	1		
•	1.2 Dichloroethene									
2	2-Butenone									
•	1,1,1-Trichloroethane									
5	Carbon Tetrachioride									
2	Veryl Acetate		23							
•	Bromodichloromethane				18					

CRDL - Contract Required Detection Limit

SEE NARRATIVE FOR CODE DEFINITIONS

revised 12/88

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Ste Name: Elling ten Die Freee Seise (Sine Extraspole Samples Case #: Extra Sampling Date(s): 1/12 - 1/14/90 (ug/Kg)

(CROL * Dilution Factor) / ((100 - % moisture)/10 To calculate sample quantitation limit:

							}		Oldaniemi w . O.W / face	
	Sample No. 102-FBOSAA DA-FBJA-A 103-FBJ-A 103-FBJ-A 102-FDJ-3-A 102-SBCGC-A 104-FDJ-A 102-SBIDA-A 102-BAJJ-	02-FBOSAA	DA-FBOORA-A	DA-FOEZ-A	B-808-19	A-FD03-A	D3-5608C-A	01-F004-A	02-5BIDA-6	DZ-RATZ
	Dilution Factor	- CC	1.00	70"	00,	1.00	O	00.1	00-	00.
	% Moisture	•		-	1	ħ₽	nco	22	18	!
	Location	HPLC WELL IMO	17MO ICIOHI	77041	Munician	16,-30,	10:-20:	,01-,8	,OI-,8	Rinsok
	Date Sampled	1113190	1113/50	111490	11114 1910	1113190	1113190	1116190	111190	_
	Date Analyzed	1117190	0215111	11 19190		112790	1117190	1127/90	06/0E11	-
CROL	COMPOUND	Field Wank	Kold blonk	Fold block	fold Blank	- FIELD DAP. PAIR	PAIR .	- FIELD DU	- FIELD DUP. PAIR -	
S	1,2-Dichteropropene									
5	Cle-1,3-Dichloropropene									
\$	Trichloroethene									
\$	Obsomochloromethene		33		78					
S	1,1,2-Trichloroethene									
S	Benzene	15				20 W	23 11	10	6	
9	Trans-1,3-Dichloropropene									
\$	Bromoform		15		33					
2	4-Methy42-pentanone									
2	2.Heuenone									17
\$	Tetrachioroethene									
9	1,1,2,2-Tetrachloroethane									
•	Toluene									
•	Chlorobenzene		1.8							
G	Ethybenzene							0.5	200	
S	Shrene									
3	Total Xylenes									

CROL - Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITIONS

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#: £A ESL Sampling Date(s): 1/12 - 1/16/90 Ste Nome: Ellingtoffix Face Lise SCG EAFES

SOIL SAMPLES (ug/Kg)

بادام علمه بمعال

03- F.B. 3 - A 107-F Co.3 - A

he bel blank

02-FB05A-4|02-FB0A-A|02-FB07-A

Fold blank

Feld blank

Prid bonk

03-50081-4 0.00

D2-FDC4-A 9001

2

02-88577

1,000

moisture)/10

1119190

1123190 1116 190

1117190

1123190

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1117 190

1119190 111390 161.20

> 1119190 1113190

> > 1124190 1123190

1124190

1123190

1117190 1120190

1117190

blag Chloroethyllether

1.3 Dichlosobenzene 1.4 Dichlorobenzene

2-Chlorophenol

2 2 2 2

1120190 HPLC 11.3990

161-201

MUNICIPAL

1116190

1113/90

Location Date Sampled % Moleture

Date Analyzed Date Extracted

> d ă

2301

1.000

1.000

000

Sample No. Dilution Factor

1116/90

SEE NARRATIVE FOR CODE DEFINITIONS

CROL = Contract Required Quantitation Limit

bis 2. Chloroethouvierethene

33

ä 3 8

2.4-Dimethylphanol

2-Ningohenol

3 3

Acohorone

ä

Penzolc Actd

12.4 Inchiprobenzene

Nachthelme

2.4-Dichtorophenol

bis/2-Chlorohopropydether N-Nitroso-d-n-propylening

> 8 ន្តន

Herechioroethene

Nitrobentene

S

12-Dichlorobenzene

52 52 52 52 52 52

2 Methythenal

Benzy Alcohol

110

revised 12/68

Biosak 051ETT

8'-10'

1116190 1134190

81-10 BB

Da-SBIOA-A

To calculate sample quantitation timit: (CROL * Diution Factor) / ((100 - %

frely dup. page

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FORM:	
SUMMARY	•
DATA	

-	Sto Name: Elling to Pie Face Base Since (Ex1783)	Dis Fare 6	100 SIG	(59.13)	SOIL SAMPLES	APLES			lited . dill	_
	Case #: \$4F6/ Sampting	pling Date(s):	// (e)	06/21/1-21/1	(ug/Kg)	73	led . July .		field ory	
		field blank	feld blank	Fold Work	Fold blonk	10 1		(CROL * Dilution Fector) / ((100 - 1	(CROL * Dilution Factor) / ((100 - % moteture)/100)	moleture)/100)
	Semple No.	B-1805A.A	08-5805A-A 02-FBOWA-A 102-FBO)-A 102-FBO9-A 102-FD03-A	DZ-F1307-A	A-8087-KO	02- FD03-A	03-560	03-F00U-A	02-F004-4 02-54104-0 02 11-21	200 11000
	Offiction Factor	1.000	1.000	1:000	0001	1.000		00//	The second	מאלים
_	% Molsture	,	١	١	ţ	ho	46	22	ne)	2411
	Location	HPLC	Municipa,	HPIC	Dlagge 231	106-111	116-301	Q'-101	, 0, , 6	0
	uate sampled	11/3/90	1113150	06/9//	1110190	11,2100	201211	2017	01.0	0.75.4K
	Date Analyzed	1120150	1120150	1124190	13-1190	00/5///	11/4/90	130/40	08/0///	1112190
CHOL	were extracted	05/1/1	0511111	1123190	1123190	06/61/1	96/11/1	1/23/90	1/23/90	06/2/11
330	Henschlorobutediene									-
338	4 Chlore-3-methylphenol									1
ğ	2-Methymaphthelene							2110		
ğ	Hemschlorocyclopentactene							_	2 25	
ğ	2,4.6-Trichlorophenol									1
Š	2,4,5-Trichlorophenol									
2	2-Choronophibalene									+
Š	2-Miroaniine									+
ğ	Dimethylphthalate									1
ğ	Acenephthylene									
ğ	2,6-Dintrotchiene									
Š	3-Miroaniline									
ខ្ល										
<u>5</u>	.									
ã	4-Mtrophenol									
8	Dbenzok: an									
8	2,4 Ohib otolvene									+
ş	Diethysphothetese									+
ğ	4-Chlorophenyl-phenylether									
ğ	Fluorene									-
<u>\$</u>	-									+
897	4.6 Dinkro-2 methylohenol									+

CROL = Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITIONS

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Z	
FORM:	
SUMMARY	
DATA	•

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₩	Sie	(S) ESTE Pare hise (S)G ESTES	aks P.	's Fagic	6256 SOL	5 83563	SON SAMPLES	101 EC	ı		JE	
	_	Come #: EAFC!	Sampling	D Date(s):	- 2://: :(4	08/21/1-21/1		E. W.	Cold dup. Pair	fiet	To carried some fresh dup. F	
				ld blank	feld blank	field blank field blank fred blank held blank moderness (CAOL . Delution Factor) 1 (1100 . 16 modernes) 10	hold blant		CAOL	• Dilutton Fac	(CROL * Diluton Factor) / ((100 - % moleture)/10	moleture)/10
		Sample No.		-F805A.A	02-F 506AA	02-FBEN-A	P-8087-60	D2-F003-A	D3-50c9K-A	A-HOCT-FO	02-5010A-A	02-6602
		Dilution Factor		00001	000-1	7:00-7	7.00	1.000	000-1	000/	0001	989.
		% Moleture	252	1)!	,	1	74	he	23	24)
		Ĕ	_	HPLC	Musicepar	HPLC	Murreiggt.	16-201	161-20'	,0/-,8	101-18	Birsh
		Date Sampled		113190	1/13/90	1/10/90	1/16/90	1113190	1/13/90	1/16/90	1/14/90	1/13/90
		Date Analyzed		120190	1/20190	1/34190	1124/90	1119190	06/6///	061/12/1	1/23/90	06/61/1
2000		Date Extracted	_	06/11/1	96/01/1	1/23/90	1123190	0616111	0616111	1/23190	1133190	06/11/1
S	N-Miro	N-Mirosodiphenylamine										
8	4-Bross	4-Bromophenyl-phenylethe										
83	Herach	Henachtorobenzene										
Ş		Pentachtorophenol										
8	Phenenthrene	dress										
ğ	Anthracene											
ă		Of a trustabilitatede										
Ş	Pacenthere	frene										
2	Press											
ă	4	Buly Conzy to hitherise										
1600		3,3-Dichtorobenziche										
ន្ត	Denzotelen	alenthracene										
ă	Christin	2										
ន្ត		bio Ellydhen de hilhelete										
ă		Of-a chiphthelete										
ន្ត		Benzofbilkoranthene										
S	Benzo	Benzofkilhoranthene										
8	Benzol	Benzolalpyrene										
S	Indeno	Indeno(12.3 cdpyrene										
\$	Dibent	Dibenzia hianthracene										
330		Benzola h Boendene										

CROL - Contract Required Quantitation Umit

SEE NARRATIVE FOR CODE DEFINITIONS

revised 12/86

Case 8: EAEBL Sampling Date: 1/12-1/16/90 1-10-10 Tield dup part CHOL - Dation Factor) / (11 - 16 mointump) (10) PCBS DATA SUMMARY FORM: PESTICIDES AND SOIL SAMPLES (ug/Kg) Sie Nome: Ellington Av Fare Basa (506 EAFB3) 1/12-1/10/90

				ŀ		111111111111111111111111111111111111111						
	All the second	SKILDONIN OF FOR	DEFERMANA.A	A COB FBOY	02-FB0		02.FD63. A	A. SROP. A	AS. CALL	D. CRAW. A A. ENU A L.		F
		_		_	_	Г				2 06:5 50 P	A 62 - K 50 7	•
	* Moletine					\dagger						
	DATE SAMPLED					+						
	DATE PECENCO					\dagger						
						\dagger						
3	COMPOR				-	-						\top
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•												1
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•	General Brito (Lindana)					1						
•	Magazhler			+		1						
•	Adm	200	1	100	7	1	1	77.0				
•	Maybachter_Epasses	Sisteral	2026.20	20360	777			(())	7207	202	200	_
•	Endealds.			-	7000		2000	2021/200	Jakeur	Justos	200 leed	
2	Distate					1						
2	44.006					+	1					i
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3	Endnouden_1					1						7
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2	Endoculing Sulbio								-			
*	44.001								1			Ī
2	Methespoliter					-						-
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3	Assets: 1246					_						-
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3	Aradar 1280											_
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SEE_NARRATIVE_FOR_CODE_DEFINITIONS

* Action_Level_Exists

CROL - Contract_Required_Quantitation_Limit

Page 7 of 18

VOLATILES DATA SUMMARY FORM:

Case #: £4£121 Sampling Date(s): 1/12-1/16/20 See Name: Ellington (Lie Force Base Eine Ede 13)

SOIL SAMPLES (ug/Kg)

To calculate sample quantitation limit:

										CHOL	(CROL * Dilution Factor) / ((100 · % motsture)/10	f ector)	· (C100)	*	Olshure)/10
	MAN CHARGOTA D2-55014-A D2-58076-A D2-5807C-A D2-580'8A D2-5808B A D2-5809A D2-5809B 4 D2-5809B	DA-KGCI-A	D2-59504-6	1 02 53076	-A D2	S607C	3-EO A-	30'dA	23-580	20 A E	12-5BCO	74 02	3-56096	4	Sire
	A Mainting	33:1	<u> </u>	1.00	7	100	1	ויסכ	ن00. ا	,	1.00		8		9
			250	36	+	8	1	30	26	ļ	30	\vdash	25		76
	Date Sampled	2012	2010:	9-19	7	81-18	\downarrow	, e , j	81-10	7/	21-41		.11-,6	7	10'- 22'
	Date Analyzed	1119190	110190	451211111111111111111111111111111111111	3,	25181]	95/511	113	13190	1115190	7	11590	H	116190
200	COMPOUND	rinsate blank		1_		all att	1_	drial.	9513111	05	1118130		वशिष्ठाग	7	13130
2	Charamethene		-	} 	+	-	1	-		t		+	ŀ	\dashv	
2	Bromomethano				+	\dagger	1	+			1	+	\dagger	+	1
2	Viny Chloride		-		-	+	-	+		1		+	+	+	T
2	Chlorothene		En		170	E		1		1		ţ		+	
\$	Methydene Chloride		1051	130	L	50	1	7	21.0	\$	20	1	2	-	L C
2	Acetone			21	=	2		1	200	1=	7,55	 -	96]	
\$	Carbon Dleufide					\ \		1	d	1	77.00	<u> </u>	7	╁	T
•	1,1-Dichloroethene				\vdash	+		_		İ	T	+	\dagger	╀	T
\$	1,1-Dichlaroethene					-		1				+		+	
8	Total 1.2 Dichlorosthans					+		1		T		 	+	+	
8	Chlorolom		0	6	3	13		-				+		+	0
S	1,2-Dichloroothana				-							+		+	1
2	2-Butanone		7				-	1			42		\dagger	+	Ī
8	1,1,1-Trichlorgethans				-		_					4	Ť	╀	-
\$	Carbon Tetrachlorida					-		-				+	\dagger	+	T
2	Wayl Acetale				-	+	-			<u> </u>	T	╁	\dagger	+	7
8	Bromodichloromethane				-	\vdash	L			T	\dagger	ł	\dagger	╁	

CRDL = Contract Required Detection Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION:

Page

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S

VOLATIL Sue Name: Ellipster Aus Figur (200 84733) DATA SUMMARY FORM:

SOIL SAMPLES (ug/Kg)

#: £3£34 Sampling Date(s):

.

To calculate sample quantitation time:

20190 (CHOL * Dilution Factor) / ((100 - % moisture)/10 02-8609-9 04-58074-9 02-58078-9 02-58088-9 02-58088-9 02-58098-9 02-58098-9 02-58088-9 0 8 1115190 1118190 91-11 و 1115/90 1/18/90 1 30 20 B 1116 190 1113190 36 피 1113190 1116190 30 <u>د</u> 181-191 Malgo 1116190 ٥ 1112190 1111190 8'-10' b 1112190 911111 01-21 Y 1115190 119190 rinsate Wank Sinsate Location Date Sampled % Moisture Sample No. Date Analyzed Dilution Factor Trans-1,3-Dichloropropens COMPOUND 1.1,2.2-Tetrachloroethene Cle-1,3-Dichloropropene Dibramochiaramethene 4-Methyt-2-pentanone 1.2 Dichloropropene 1.1.2-Trichloroethane Tetrachlorouthene Trichlorosthene Chlorobenzene Total Xylanes Elhybenzene 2-Herianone Bromotorm Benzene Tobushe Syrene 2 5 5

CROL - Contract Required Quantitation Limit

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SEE NARRATIVE FOR CODE DEFINITIONS

Page 9 of 18

SHO NAME: Ellingter flix (SDG SAFES) SOIL SAMPLES (UDKg) Come 0: £4731 Sampling Date(s): 1/17-1/14/90

To calculate sample quantitation limit:

(CROL * Dikulion Factor) / ((100 - %

	Comments Air	0000											
	S.ZO B-LOGN-FO	7-109V-F0	DZ-SBOTA - A	·A 02.	02 - 58076.A	2008-50	D3-5607C-4 02-5808A-A	_	808A-A	62. SRORK. A 07. cones. A A. S. Cones A	A 152. 6	1	
	Unition Pactor	1.80				1.000		<u> </u>		01202		2.0100	a. 50/as
	% Moleture	,				81					+		
	Location	1.035 kg				181-191					1		
	nate sampled	115 190				1113190	0				1		
	Date Analyzed	1124190				1119190	0				+		
CROL	Date Extracted	1/23/90				1117190	 				-		
336	Phenat			+	-			-					
ន្ត	the 2-Chloroethy Bether			1	T		†	+	+		\downarrow		
2	2-Chlorophenol		+	-			+	1	+		1		
2	1,3-Dichtorobenzene			-				+	+	+	$\frac{1}{1}$		
ă	1,4-Dichtbrobenzene		not	2000			700	-	+	+	-		
ä	Denced Alcohol		Suskee	be AGNE	1		1000	1000		700	100		not.
ä	1.2.Dichlorobeazene			1			+ material	1	1	pozkrać	MANAGERA	ğ	Jazhene
ន្ត	2-Methylphenol				-		+	 	†	-	1	-	
ä	bls/2-ChloroleopropyBether								†		1	1	
2	4-Methyphenol			L			+	-	+		1	1	
ä	N-Mitoso-d'in-propidemine						+		†		1	1	
ä	Herachlorosthans								†		1	1	
ន្ត	Nerobenzene			_			-		†		\downarrow	7	
ä	lecohorone			_					+	+	1	1	
ä	2-Nirophanol								+	+	\downarrow	+	
2	2.4-Dimethylphanol			-					†			1	
99								<u> </u>	+		1	1	
ä	Disc. Chicrosthoxylmathans						-	+	+		1	1	
8	2.4-Dichlarophenal			_					1	1		1	
8	12.4-Trichlorobenzene			_			1	-	+	+	1	+	
8	Nachtheime				1		+		+			+	
330	4-Chloroentoe			-	<u> </u>				+	1	1	1	

CROL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION

revised 12/88

Page 10 of 18

She Name: Elingth List Turc Sice (5)6. Edites Son Samples
Case 4: EAFG Sampling Date(s): 1/12-1/16/90 (ug/kg)

N

To calculate sample quantitation Britt:

							(CROL		* Diffulion Factor) / ((100 - 75 moleture)/10	modelure)//
	Service Topics	OF KOUN-A	02 - 5801A · A	04-K10-4-A 02 - 5801A - A 102 - 5801B - A	A. 58078-4 02.5808A.A	A - A8082 - 50	4. 8808 . 30	1. 5808 A.	12.58094-4 02. SE190.4	9495
-	Laurion Pactor	7007			1.000				V.00.000 .34	V-00/8-35
	A Moleture				/8				-	
	Tocation 1	Kinsule			16'-18'					1.
	Date And Control	1115190			1/12/90					
	Date Control	76/15/27			06/6//1					
200	אבר בעונענובם	1/23190			06/11/1					
33	Menachtorobutacione									
22	4-Chibre-3-mathy/phenol									
330	2-Methytraphthalene									
8	Menachilorocyclopeniacliene									
ğ	2,4,6-Trichlorophenal									
1600	2,4,5-Trichlaraphenai									
ğ	2-Chloronephthelene									
1600								_	1	
82	Dimethylphthelete									
ğ	Acenephthylene								1	
ğ	2,6-Dinterototuene									
5									1	
ន្ត	_1									
5										
2	4-Mitrophenol								1	
ន្ត	Ofbenzok: In								1	
ន្ត	2,4-Dinitrololuene									
ន្ត	Diethytphithalete								+	
ន្ត	4-Chlorophenyf-phenyfether									
ន្ត	- 1									
8	1									
200	4.9 Dinitro-2-methydohenol									
İ										

CROL = Contract Required Quantitation Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION

DATA SUMMARY FORM: B N A S

Sto Namo: £/(2015/km (1/12 Face 12,500 (5.11 5.5))
Como 8: £/(2) Sompting Dato(1): 1/12 -1/16/10

SOIL SAMPLES (ug/Kg)

To calculate sample quantitation limit: (CROL * Dilution Factor) / (1100 - %

		02-A604-H 02.58	02.5807A .A	₩ 91085 -20	02-5/3076-A 02-5ROFA . A	OZ - S ROKA - A	47 - S. RAPA . A	69.Cenes 4	1.00.00.10	77.00
	Dilution Factor	7.000			2007			שני שני שני	V. OLAGE.SA	20195.70
	% Molature				8/					
	Location	6.0scte			101-101					
	Date Sampled	11(5/90			11.2 190					
	Date Analyzed	1/34/90			05/6///					
8	Date Extracted	1/23/90			05/11/1					
330	M-Mirosodiphenylamine									
8	4-Bromophenyl-phenylether								1	
82	Herechlorobenzene									
26										
33	Phenenthrene									
828	Anthracene									
88	Die-bunghithelate									
S	Fluoranthene									
ğ	Prene									
82	ButyBenzyphthalete									
1600										
ž	Benzola)enthracene									
82	Chrysene									
ğ	bis C Ethythexytiphilhelete									
ä	Di-n-ochiphthelete									
8	Benzo@)@soranihene									
Ş	Benzodt/Buoranthene									
330	Benzolalpyrene									
338	Indeno(1.2.3-cd)pyrene									
S	Dibenz(a,h)anthracene									
330	Benzola h Thoerstene									

CROL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION

revised 12/88

PCBS O N Y DATA SUMMARY FORM: PESTICIDES

Side stame: Ellington Aur Ford Bess (506 EAFB3) SOIL SAMPLES

Case 8: £4F8/ Sampling Date: 1/12-1/16/90

To calculate sample quantitation broot.

									サ・クロノン・シープ・ウン・ウン	20/07:3
	% Moleture									
	DATE SAMPLED									
	DATE PECENED									
	BATE ANALTZED									
4	COMPOUND									
	apas BRC			-	-	1				
-	beta-Catic									
-	della fibiC									
-	General Bric (Lindson)									
•	Heptechior					+				
	Abin									
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	Endés									
2	Endonation II									
•	000.27									
•	Endeauthen Suthide									
3	100.27									
8	Methodolor									
•	Endde Lutone									
	Apple Chierdene									
•	Garana-Chlandano									İ
8	Toughten									
•	Associate 1016									-
	Asadar-1221									
8	Asadar-1232									
3	Asadisr-1242									
2	Asactor-1246									
3	Aradar-1254				<u> </u>					
3	Aradar 1260									

K 13

DATA SUMMARY FORM:

She Name: Ellingballicherte Base (SDG 84733)

VOLATIL

SOIL SAMPLES

(ug/Kg)

1/12 -1/16/90

Date(s):

Case 8: £AFB1 Sampling

To calculate sample quantification timit:

(CROL * Disulton Fector) / ((100 - % moteture)/) DV-1055-10 MV-1055-10 2 mores nat not anahera 04-7855A 02-7806-A 01-805-AE 01.5501-AE not nat 1119190 trip blank 11114190 1.00 TRIP 5 frio blank 1112/90 1117190 यवा 40 TRIP D2-58051C-A ココロ 1124190 1115196 211-23 30. d Ğ Date Sampled Date Analyzed % Moleture Sample No. Ollution Factor COMPOUND Total 1,2 Dichloroethene Bromodichloromethane Carbon Tetrachioride 1.1.1-Trichloroethane Methylene Chlodde 1.1 Dichlaroethene 1,1 Orchbroethene 1.2-Dichloroethans 2-Butanons Carbon Disulide Very Catonde Chioroethane Very Acatala Chibrotom 8 2 2 2 2 2 2 • 5

CADL - Contract Required Detection Limit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION

8/ 10 H offed

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DATA SUMMARY FORM: VOLATILES

Site Name: \$16,7950 18.12 1220 1215 (500 84733 5011 SAMPLES
Case #: \$1722 Sampling Date(a): 1/12-1/16/90 (ug/Kg)

To calculate sample quentitation limit: (CRO) * Dation Early (1100)

	3								And the second of the second o		Molsky K	7
	T-8318-36085-20 ON OND ON ON ON ON ON ON ON ON ON ON ON ON ON	5085-20	16-4 03-76	305-A1	19-1806.	A 01. Fres. 16	BOS-4 DA-7950-A 01.005.45 DV. SON. 45 DV. SON.	100 10				•
	Diffusion Factor	1.00	<u>ر</u>	1.00	00.		JV : 100 0 1 12	MV- /055 . 10	01.3201.10			1
	% Moleture	(1)			,							
	Location	211-23	31 7810		70:0							1
	Date Sampled	1115190	6111	2	11/10/90						+	1
	Date Analyzed	1124190	C1/1	Η-	11/9/90						-	1
d d	COMPOUND											1
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												ſ
	Ce-1,3-Uchloropropene				-							(
5	Trichloroethene				-							
S	Obromochloromethane		-	+	+							l
•	1,1,2-Trichtoroethene			+								1
\$	Benzene	2	=	+	1							ı
•	Trans-1,3-Dichloropropasa	T	4	+	+							l
•	Вготовоти	T	1	\downarrow	1							ı
9	4-Methyl-2-persenone	T		+	+							ı
9	2: Heuseone			+								1
5	Tetrachlorosthene			+	1							ī
•	1.122-Tetrachboosthese			+	1							ı
•	Toluene	1		#	+							ı
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•	Ethybenzene			\dagger	1							ı
~	Shrene	T		+								1
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CROL - Contract Required Quantitation Umit

revised 12/88

SEE NARRATIVE FOR CODE DEFINITION

DATA SUMMARY FORM: B N A S

SOIL SAMPLES (ug/Kg) Ste Name: Elling ton flix Fold 206 877333 Case 8: Edical Sampling Date(s): 1/12-1/17/90

(CHOL * Dikulion Factor) / ((100 - % molstur To calculate sample quantitation limits

L	Sample Mr.	12 50 A-10-10	A. 784.4	47.70%.4	10-ED-C 46	CA-10-32-10-10-40-10-10-5-03-50	CA. 10-12-10	01-5501-40		ŀ
		12.22	25 (00.27)	7000						+
	Dilution Factor	1.000			3.00	3.00	9.00	3.00		-
	% Mointure	CI			1 [0	اله	14	١٦.		
	Location	311-23			D. p. 04- 3501	545	458C1	CN7 6F	,	•
	Date Sampled	1115 190			1117190	061(1)1	05/2111	0615111		
	Date Analyzed	OBERII			1139190		1129 50	1139150		
200	Date Extracted	1123/90			1193190	1123190	11330	1123190		
S	Phenol									Н
922	bis/2-Chlorosthy@sthgr									
22	2-Chlorophenol									-
2	1,3-Dichlorobenzene									-
ă	1.4-Dichlerobenzene									_
Я	Benzyl Alcohol									-
2	1.2.Dichloroberzene		nat	200						
3	2-Mathylphanol		property	payeus						-
2	Dist2-Chlorolsopropy@ether									+
3	4-t-destructional									+
Ž	N-Marcas d'n-propylemme									+
ğ	Henechloroethane									$\frac{1}{1}$
33	Nigopeniane									+
33	tecoharone									+
330	2-Mirochanol									+
330	2.4-Omethytohenal									+
1600										+
330										+
330	2.4-Dichlaroohanal									+
330	12.4-Inchiprobenzene				_					+
330	Nachthalene				190				+	+
330	4 Chiscospins								1	$\frac{1}{2}$
5	CROL . Contract Required Quantitation Limit	Duantitation	Lait				SEE NA	SEE NARRATIVE FOI	FOR CODE	DEFINITY

CROL - Contract Required Quantitation Limit

revised 12/88

BNAS DATA SUMMARY FORM: Nome: Ellington live Free Pase (SDG EITES)

N

SAMPLES SOIL

(mg/Kg)

1/2-1/11/10

#: \$#73/ Sampling Date(s):

3

3

(CROL * Diation Factor) / ((100 - % moteurs)/ fo calculate sample quantitation anti: DI-5501-AD DI-5501-AC 1129/90 1/23190 06/07/ 2.00 CAT LF 11,23190 05/58/1 West LF 0516111 200 C1-FD05-AD1-3501-AE 1/23190 1117190 1/35/90 h EHSILE 2.00 250 370 De 01. 550. 1129/90 06/88/1 2615111 200 095 いてい 560 45.780C.A 02-500 R. A 102-TBUS-A 1115190 211-23. 1123190 1/23190 1.000 Sample No. Dilution Factor % Moleture Date Sampled Date Analyzed Date Extracted Heunchlorocyclopertecliene 4-Chicophenyt-phenytether 4.6-Dintro-2-methylohand 4 Chloro-3-methyphenol 2,4,6-Inchlorophenol 2,4,5-Tetchlorophenol 2-Chtoronephahetene Dimethylphthelete 2.8 Ointrotohene 2.4-Direko, chence 2,4-Dinterototuene Acenephibytene Diethytphshatete Acenephthene + Neropyand 3-Mirosnilne Otherson en 4-Nitroentine Fluorene 3 3 3 2 2 2 52 52 52 50 51 52 3 X 9 33 3 3 8

CROL = Contract Required Quantitation Limit

revised 12/86

SEE NARRATIVE FOR CODE DEFINITION

She Name: Eligiba list Figer (51) (- 8,47155) SOIL SAMPLES
Come #: £21631 Sampling Date(s): 1/15 - 1/17/90 (ug/kg)

To calculate sample quantitation limit: (CROL * Dilution Factor) / (1100 - 9

	ı									
		12-5435/CA	A- 3001 - 20	02. 78 46 · A	P-5003-13	34-1955-10 34-5007-13	(A. S. S. A.)	23.5		
	Dilution Factor	1.000			3.00	200	2000	2 CO - 12 CH -		
	* Moleture	(1			227	(3),3	30.5	200		
	Location	211-021			3	٩	77	14		
	Date Sampled	11/5/100			100	17 15 KZ	47824 LF	100 LF		
	Date Analyzed	02/01/			977	7	1112/90	1112190		
	Date Futured	1133190			1135150	1123190	(124190	05/58//		
CROL	Dence Extracted	1/33190			1123190	11,23190	06188/1	9818211		
82	M-Mirosodiphenytenine									
2	4. Bromophenyf.phenylether									
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0001										
33					300	50		+		}
ă	Anthroome				301-	_		510 T		
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336	Florantiene				5400	2300			1	
330	Preme				17500	2250		303		
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200					+					İ
Ş	Benzolejenthracene				3200	1500		200		
82	Chrone					200		336		
330	the Ethythen Aphilhelete					1		2000		
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33	Berrobilhoravihene				3300	1300		980		
330	Benzofilhioranthene				Ť	<u>1</u>		200		
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2	Indepo(12.3-cdpyrene				1	1		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
2	Diperzie Nanthracene									
330	Benzola h hoerstene									

CROL * Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION

revised 12/86

Page 1/8 of 18

DATA SUMMARY FORM: PESTICIDES AND

She Name: Ellington dis Facto Sees (SDC 84783) soil Samples
Case 8: \$476.6 Sampling Date(s): 115-117/20 (ug/kg)

To calculate semple quantitation truit:

L	Sec. 1						CRO	40		1	:
_	Off Bedrand	N-3085-20	N. SOR1.20	62.78ac.1	N-FD-CAA	100		ı	. Mill / /www	ø	moleture)/100)
_	Unition Factor				102 ME 121-5501-9E	11-2501.04	01-5501-12W	01-9501-40		-	l
_	% Moleture				Jani	-000	000.	2		 	
	Location				٥	16	7	=	1	1	
_	Date Sampled				EAST LF	304 15	┧╴	7			
	Date Analyzed				_	1117190	20101	CROKED LF			
					133140	1 2 6	Ļ	<u> </u>	7		
2					1123/20	7=		25/22/1			
•	ethte-BHC				D.P 01-5561-AG	1149110	1122190	95/22/11	_		
•	bete-BHC								1	$\frac{1}{1}$	
•	defa-fire										1
•	Genne-Bric Aindenei									1	+
•											1
•	Addis										+
•	Heptechtor Eposite	200	100							1	$\frac{1}{1}$
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=	4,4°00€				7					+	+
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=	Endite telone			1	1					$\frac{1}{1}$	+
2	Aphe Chlordene			†						+	<u> </u>
8	Gentine-Chfordane			†	+						$\frac{1}{1}$
3	Tomphene									_	\downarrow
8	Aroctor-1016			†	 	1					\downarrow
8	Aroctor-1221			†	+	1					<u> </u>
8	Aoctor-1232			+	+	1				-	
8	Aodor-1242			 							<u> </u> -
8	Arochor-1248			+		1					_
3	Arador-1254			+						<u> </u>	+
3	Arockor 1260			+	1						1
700			1								1

RGL - Control Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS



TO:

LINDA STEAKLEY

C-49-0-3-173

FROM:

D. A. SCHEIB

DATE: MARCH 30, 1990

CC: AMY HUBBARD

SUBJECT: INORGANIC DATA VALIDATION - PETROLEUM HYDROCARBONS

ELLINGTON AIR FORCE BASE CASE NO. EAFB1, SDG EAFB3

SAMPLES:

SOIL

02-SB07A-A	02-SB09B-A	01-FD05-A	
02-SB07B-A	02-SB09C-A	02-FB05-A	(HPLC)
02-SB07C-A	02-SB10A-A	02-FB06-A	
02-SB08A-A	02-FD04-A	02-FB07-A	•
02-SB08B-A	02-SB10B-A	02-FB08-A	
02-SB08C-A	01-SS01-A	02-RB07-A	(,
02-FD08-A	01-SS02-A	02-RB09-A	
02-SB09A-A	01-2203-A		

NUS Laboratories analyzed 17 soil samples (including three pairs of field duplicates) and 6 associated aqueous quality control samples taken from the Ellington Air Force base for Petroleum Hydrocarbons. Data from these samples were evaluated under HAZWRAP Level C QA/QC criteria.

Petroleum Hydrocarbons

All analyses met quality control criteria. Twenty samples were determined to be free of petroleum hydrocarbon contamination. Three samples were found to contain the following concentrations:

Sample	Amount_
02-SB10A-A 02-FD04 * 01-SS02-A	99 mg/kg 99 mg/kg 220 mg/kg

^{*} Field duplicate to 02-SB10A-A

DATA SUMMARY
TABLE A

DATA SUMMANY FORM:

EAFBI- Ellington Air Force Base News.

Sine

7105

1117 A-89085-50 08/5/1 i FZZHIOH V-16085-20 H0114622 08/51/1 43/90 Pall H0114381 A- 5009-50 A-38002-50 - Field Duply st ०६/टार्ग WO1/4380 V- 98085-20 वह/स्रो HOIIY377 A-18082-50 H0114376 413/90 A. 57082 - 50 06/11/1 H0114379 06/51/1-21/1 A:8008:50 01/21/1 HOII4375 EAFB-3 Sampling Date: 14374 02-5801A-A Sample No. Ditusion Factor Date Sampled No Petroleur Hydrarbus COMPOUND Soci M 2)

DATA SUMMANY FORM:

SAMPLES

7105 #: _ EAFB - 3 Sampling Date: 1/15/90

4	Gass 1: EA/B = 3 Sampling	pund nate.	ā	9577110N	1/1,701100	HO!! 46.34	287/110H	H011463B	Holl4639	HO 114383
		HO[14625 HU1170	10	APPLIATE A		N. 100.10	A.588.10		A. 5063.10	A-508-50
		06.550TC. A		מבינ ומבי ע						i
	Dilution Factor Date Sampled	115 30	01/7/1	1/16/90	08/9/1	ōs/u/1	08/tit	öb/u/1	7/13/30	os/81h
	Date Analyzed	-			1					
_	COMPODING		:	:	:	MESTERN THIRD OF LF	CENTRAL THIRD OF LF	EASTERN THIRD OF BE) I I	MRC Nath
Ε	Ke Petroleur Hydrocarbons		- 32				220			i
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DATA SUMMANY FORM:

Hame: EAFBI- Ellington thin Force Base

STIMMES

7105

OE95110H

1/13 -1/12/80 Sampling Date: EAF8-3

SPG

1/16/90 Rinsati Blank 02-FB08-A 02-RB07-A 02-RB09-4 H0114382 08/21/1 Rinsat Blank 2E9#111H 08/9//1 Hunging! 02.F807.A 1/1/10 169H110H HPLC 02-FB06-A 113 90 Mune. Water H0114384 Dilution Factor Date Sampled Date Analyzed Kg Petroleur Hydrocarbons Sample No. COMPOUND (21m)



C-49-4-0-87

TO:

LINDA STEAKLEY

DATE: APRIL 18, 1990

FROM:

D. A. SCHEIB 64

COPIES: AMY HUBBARD

SUBJECT: ORGANIC DATA VALIDATION - VOA/BNA/P&P

ELLINGTON AIR FORCE BASE CASE NO. EAFB1, SDG EAFB3

SAMPLES:

Soil

02F0B-5A-A	02-RB09-A	02-SB09C-1
02FB06A-A	02-SB07A-A	02-TB05-A
02-FB07-A	02-SB07B-A	02-TB06-A
02-FB08-A	02-SBO7C-A	01-FD05-A
02-FD03-A	02-SB08A-A	01-SS01-AE
02-SB08C-A	02-SB08B-A	01-SS01-AW
02-FD04-A	02-SB09A-A	01-SS02-AC
02-SB10A-A	02-SB09B-A	
02-RB07-A	02-SB10B-A	

The twenty-five samples comprising this set consist of 17 soils (including three field duplicate pairs) and 8 aqueous quality control samples. All Target Compound List (TCL) analyses were conducted by NUS Laboratories. Twenty-one samples were analyzed for volatile compounds, fifteen for semivolatiles and four for pesticides and PCBs. Included in this sample set are four field blanks, two rinsate blanks and two trip blanks.

The data were reviewed with reference to the EPA "Functional Guidelines for Organic Data Validation" and the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data". The analyses were conducted under HAZWRAP Level C QA/QC requirements and were validated according to the following criteria:

- Holding times
- GC/MS tuning and mass calibration
- Laboratory and field blank analyses
- Initial and continuing calibration
- Internal standards performance
- Surrogate spike recovery
- Matrix Spike/Matrix Spike Duplicate results
- Field duplicate precision
- Detection limits

The data package was complete as submitted. GC/MS tuning and mass calibration surrogate spike recoveries and internal standards performance met contract required criteria. Data which did not meet quality criteria are discussed below.

Volatile Fraction

The seven-day aromatic compound holding time allowance was exceeded by four days for sample 02-FD04-A and by two days for sample 02-SB09C-A. No qualifications were made as these occurrences have negligible impact on soil matrix samples.

The following contaminants were detected in trip, field, rinsate and laboratory method blank analyses in the maximum concentrations indicated:

contaminant	maximum concentration	(mg/kg)
benzene	15	
bromoform	22	
bromodichloromethane	21	
carbon disulfide	7	
chlorobenzene	18	
chloroform	51	
dibromochloromethane	34	
2-hexanone	17	
4-methyl-2-pentanone	4	
1,1,1-trichloroethane	38	
vinyl acetate	23	
common contaminant		
acetone	41	
2-butanone	18	
methylene chloride	37	
toluene	4	

Action levels of ten times the maximum amount of common lab contaminant and five times the maximum amount of other contaminants detected were used to evaluate the data.

No qualifications were made for bromoform, bromodichloromethane, carbon disulfide, chlorobenzene, dibromochloromethane, 2-hexanone, 1,1,1-trichloroethane, 4-methyl-2-pentanone and vinyl acetate as no positive sample results were reported for these compounds. Sample contaminant concentrations for the remaining affected compounds which were above Contract Required Quantitation Limit (CRQL) but within the action level are qualified "U", as undetected. Affected sample contaminant concentrations below the CRQL have been detected.

The average Response Factor (RF) for the initial calibration of 2-butanone was below the 0.050 quality control limit. No qualifications were made as only field quality control samples were affected (field quality control samples are not qualified for any non-compliance).

Initial calibration Percent Relative Standard Deviations (%RSDs) for chloroethane, acetone, carbon disulfide and total xylenes exceeded 50%. Detection Limits (DLs) for these compounds in affected samples were qualified as estimated "UJ". The 30% RSD quality criteria was exceeded for total xylenes, chloroethane and acetone, however, no qualifications were made as no positive sample results were reported for these compounds.

Some continuing calibration Percent Differences (%Ds) for total xylenes, acetone, 2-butanone and 2-hexanone exceeded 50%. Detection limits for acetone, 2-butanone and 2-hexanone were not qualified as the DLs for these compounds were previously raised (via the use of a "U" qualifier) due to blank contamination. No qualifications were made for total xylenes as only field quality control samples were affected.

The \pm 25 %D continuing calibration quality control criteria was exceeded for the following compounds:

acetone	chloromethane	4-methyl-2-pentanone
bromoform	bromomethane	1,1,2,2-tetrachloroethane
2-hexanone	tetrachloroethene	total xylenes
2-butanone	vinyl acetate	carbon disulfide

No qualifications were made as no positive results were reported for these compounds in affected samples.

The field duplicate Relative Percent Difference (RPD) for ethylbenzene exceeded the 50% quality criteria for soils. The positive result reported for ethylbenzene in sample 01-SB10A-A is estimated, "J". The detection limit for ethylbenzene in the field duplicate sample 02-FD04-A is qualified as estimated, "UJ".

Maximum concentrations of 49 ug/kg 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113), 72 ug/kg 2-propanol and 44 ug/kg hexamethylcyclotrisiloxane were detected in blanks analyzed with this sample set. Several unknowns were also detected. No qualifications were made as none of these TICs were detected in the samples.

Semivolatile Fraction

Sample 02-SB09C-A was extracted one day beyond the holding time allowance. The data for this sample was not qualified as the impact of this occurrence is negligible for BNAs in soils.

The \pm 25 %D continuing calibration quality control criteria was exceeded for the following compounds:

2-nitroaniline 2,4-dinitrophenol diethylphthalate 2,6-dinitrotoluene dibenzofuran 4-nitrophenol dimethylphthalate hexachloroethane benzoic acid

bis (2-chloroethoxy) methane 4,6-dinitro-2-methylphenol

No qualifications were made as no positive results were reported for these compounds in affected samples.

The Percent Recoveries (%Rs) for 2,4-dinitrotoluene, pyrene and pentachlorophenol were less than 10% for the matrix spike (MS) analysis of sample 01-SS01-AC. MS recoveries for 1,4-dichlorobenzene, N-nitroso-di-n-propylamine and 1,2,4-trichlorobenzene fell beneath the ± 25% acceptance limits. No qualifications were made, however, as all recoveries for the matrix spike duplicate (MSD) analysis of this sample met quality control criteria. These occurrences and the associated non-compliant RPDs are felt to be sample specific and do not affect the rest of the data.

The R for 2,4-dinitrotoluene exceeded the \pm 25% quality limit in the MS analysis of sample 02-SB09C-A. No qualifications were made is all MSD quality criteria were met.

Samples 02-SB10A-A and 02-FD04-A constitute a field duplicate pair. Results for naphthalene and 2-methylnaphthalene exceeded the 50% RPD quality criteria for soils. No qualifications were made, however, as the results for these two compounds are below the CRQL.

Samples 01-SS01-AE and 01-FD05-AE constitute a field duplicate pair. Results for the following compounds exceeded the 50% RPD quality criteria for soils:

naphthalene butylbenzylphthalate dibenzofuran benzo(a)pyrene acenaphthene benzo(k)fluoranthene fluorene indeno(1,2,3,cd)pyrene anthracene benzo(a)anthracene

Results for naphthalene and dibenzofuran were not qualified as both reported concentrations are less than the CRQL. Positive results in these two samples reported for the remaining compounds are qualified as estimated, "J". The detection limits for butylbenzylphthalate and indeno(1,2,3 cd)pyrene are qualified as estimated, "UJ".

Positive results for naphthalene, 2-methylnaphthalene, dibenzofuran and phenanthrene are qualified as estimated, "J", as they are below the CRQL.

No semivolatile TICs were detected in blanks analyzed with this sample set.

Pesticide/PCB Fraction

The DBC surrogate Percent Recovery (%R) was below the 20 - 150% advisory limits for sample 01-SS01-ACNT. No qualifications were made as this occurrence is felt to be sample specific and also because this sample was used for matrix spike/matrix spike duplicate analyses which also yielded low surrogate recoveries.

MS recoveries for gamma-BHC and 4,4'-DDT and MS/MSD recoveries for endrin were below the \pm 25% quality limit. 01-SS01-ACNT sample results for endrin are qualified as estimated "UJ".

Positive results for 4,4'-DDE, 4,4'-DDD and 4,4'-DDT are qualified as estimated, "J", as they are below the CRQL.

DAS: O-EAFB3

DATA SUMMARY
TABLE A

VOLATILES DATA SUMMARY FORM:

Sie Name: Ellington Mist Fisce Pars (SDG EAFBY)

3

WATER SAMPLES (ug/L)

To calculate sample quantitation to

LCAGE , Danton Fragely To Sampling Date: 1/23/30 1/35/50 HIIS 93# HIIS 93# HIIS 93# HIIS 93Z #: £AFBI.

)				4		b		l		
	Semple No. 101-EBID-4 101-FBIL-A 101-FDS-4 101-mwist-a 101-mwist-a 101-mwist-a 101-8 8124 101-7808.0	OI-FB10-A	CI-FBII-A	CL-FDos	-4 T	JMW-10	5-A D	1-mm)C	97-	1- m. 2: 01. 01. 01. 01. 01.	4	00.00		1-8 A124 101-1409-0	101	6/8/8	
	Dilution Factor	1.00	1.00	30.		1.00	_	2	+	00.	<u> </u>	5	-	3		3 2	-
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2	"View Chieride										<u> </u>				-		_
2	Calgroofbane						<u> </u> 		<u> </u>				1		-		
4	**************************************	h	31	13	3	(3	3	17.	1	11		5		5	22	<u></u>	_
91	Acatom						!		<u> </u>		<u> </u>		1			_	_
•	Carbon Disultide							20	3	150	=			67			
3	*1.1-Dichloroethene								\vdash						_		_
~	1.1-Dichlosethene								_								_
8	Total-1.2-Dichlorosthene																_
	Chierdon		33												53		_
	*1.2-Dichloroothene															<u> </u>	_
9	*2-Butterone		011												_	_	
8	*1.1.1-Trichforcethane															<u> </u> 	
-	*Carbon Tetrachloride																_
9	Wand Acatala				5		VI		VI		77						_
4	Bromodichionmethene		41														_
											l						

CROL - Contract Required Quantitation Limit

* Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS

Tabulated by Pat Brush

Veritud by Dod Schuts

Site Name: Elling for this trace laise (SDE 8.4784) WATER SAMPLES

Case 8: 24561 Sampling Date: 1/22-1/25/90

(ug/L)

To calculate sample quantitation limit (CROL * Disulen Factor)

		(
		DI-FBID-A CI-FBII-A	CI-FBU-A	DI-FDCS-A	DI-MUSS-4 101-MUCH-A 101-MUDS-A 101-MUDS-A 101-RB13-A	5.4 Dr-m	A-12M	FOWW-10	1-10 A-1	ج الصار ج	1 M- ABIS	2-4	N- TRN9-A
	District Factor	8	00:1	8	9		20	90.1		100	- 00		
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			1 No Feet I										
ZBOE CHOOS	COMPOUND	Feld blank	field blank	- FIELD DUPLICATE		Prig-					Cinsate	blad -	insate blad to blank
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STACH	Techinosthene									-			
S Debre	Obsernochisramethene		77										
5 1.12	1.1.2-Techtoroethene											_	
S Genzee	2000	ક			9	77	5	6	2	9	2	1	9/
S Trees	Trans-1,3-Dichloropropens									1			
S Bross	Bromotorm		21										
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10 2 110	2 Hamanana					23	3			-			
S of other	Tetrachloroethene												
\$ 1.12.	1.12.2-Tetrachinecthene												
5 Tolson	900					0.3	<u>د</u>		7.7	0.7			
S *Chlereb	probenzene					ובח	7.7		1.0	Ln			
S Ethythe	thenzene				-	0.7	د دع		10	L'O			
5 Shree						11	2		11	2			
S Total	d Xytenes					0.7	17		٧Ţ	U]			
CNO	CROL - Centract Required Quantitation_Limit	uantitation_Li	in it	. Act	Action_Level_Exists	Exists		SEE	MARRAT	WE_FO	SEE_NARRATIVE_FOR_CODE_DEFINITIONS	DEFIN	TIONS

Site Name: ElLingthan (Line there have (SDG 8,4F34)) water samples case #: EHE3L sampling Date: $|128|90 \cdot 148|90$

To calculate sample quentitation time: (CROL * Ditution Factor)

	Sample No.	01-FB10-A C1-FB11-A	CI-FB11-A	01-FDC5-4 121-MW5-4 101-MW0-4 101-MW03-4 101-RB13-4	JOHN WE	5-4 Dt-mc	A. C.	O-mmos	-A CI-1	mw03	101-88		A- POST -10	4
	Dilution Factor	0.500	D.500	0.500	0,500	S C	د. چه	C. 500		0.500	C	Т		
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		र दे	Hydrant											
	Control		* *****	1							`			
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2	Phenol													
2	bisi2 Chloroeth/flether													
2	2.Chlorophenol													
10	• 1.3-Dichlerobenzene								_					
10	* 1.4-Dichlorobenzene													
10	Benzel Alcohol													
9	1.2-Dichbrobenzene													
2	2 Mathriphanol												tou-	
2	hat2-ChlorolsopropyBether												prayere	
2	4-Methybhanol													
9	N-Mineso-d-n-propydamine													
2	Hemotheresthere													
2	Minhadone													
2														
2	2-Minotonia													
9	2.4Dimethabenol													
Я	Bearste Actd													
9	bis 2. Chiprosthow/methans													
9	2.4-Dichtorothenol					_								
9	12.4 Tatchipropenzene									_				
9	Nechthetene						<u> </u>							
٩	4. Chhoanline			_					4	4	4]		٦
Š	CROL = Contract Required Quantitation Limit	uantitation L	init	. Act	Action Level Exists	Exists		SEE	IAHHAI	TIVE F	SEE NARRATIVE FOR CODE DEFINITIONS	E DEFI	INITIONS	

DATA SUMMARY FORM: B N A S Sie Mens Ellington Vie Face Parse 500 841.04

WATER SAMPLES (40/L)

Case #: EAFEL Sampling Date: Las 190-1125 190

To calculate semple quentitation time.

	Contract No.		1					(CBO)	CBO • CBO		
		3		DI-FDOS-A	7-M. WY	3			Lacron Facada)		
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	Contract Hequired Quantitation Limit	militation Lim	7	- Action							_
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SEE_NARRATIVE_FOR_CODE_DEFINITIONS

* Action_Level_Exists

She Name: Ellington Aliz Toxce Sis (SDG EATES 4) WATER SAMPLES

Case 8: 24F61_ Sampling Date: 1/22/9.0-1/2.5/9.0

To calculate sample quantit (CROL * Dilution Factor)

								7	Carrent Lacan)	
	Sample No.	DI-FOID-A DI-FBUI-A		CH-FDOSA	CI-MUDOS.	DI-FDOSAID-MUSTAID-MULLADI-MUSTA IDI-MUTS ADI-REIZ-A 10.7809.4	b-romm-10	P. Sammis A	101-8613-4	A-7801-A
	Offution Factor	0.5780		025.7	D.500	0.500	2050	0.500	0.500	
	Location	7 600	15010fill							
		1 × 2 2 1	H301/65.11							
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2	Floorathene									
2	Press									
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2	Chrome									
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2	Oto-ects philiatrie									
2	Dense Differentiene									
2	Berged (Resembler)									
2	Gengefabrene									
2	Indeposit 2,3 collapsene									
2	Obenzie, hjentimosme									
R						_				
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SHO NAME: ELLY TO LES TICIDES AND

SHO NAME: ELLY TO LES TICIDES AND

CARO 8: EATEL SAMPLES

(UDL)

To calculate sample quantitation limit:

								(CROL · Deb	* Ditution Factor)	
	Semple No.	DI-FORDA DI-FBII	T	DI-FDOSA	DI-MW.05-4	101- FDOS A DI-MUCS-4 DI-MUCH A 101-MUCH A DI-MUCH &	P-Eamw-10	DI-MWC 3-A	DI- KS13-A 01.7801.A	A. 1087-10
	Dihation Factor	OQ'I		1.00	1.00	δ.	00.1	CV/	00	
	rocupo	HPLC	Landfill							
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8	"General BHC (Lindane)								7, 0	
8	Meptechlor								1	
8	Albe									not
8	Haptachter Epositie									Bostoc
8	Endeshden_1									
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3	*Alpha Chlordene									
3	*Comme Chlordene									
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3	*Arecter-1016									
•	• Arecler 1221									
3	*Arecler 1232									
9.0	*Arector 1242									
9.0	*Arector-1248									
1.0	*Aroclor-1254									
10	*Aroctor-1260									
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S ш VOLATIL DATA SUMMARY FORM:

Nome: Elling ton dir Force in se (500 EAFBY) 06/52/1-22/1 Ske

3

WATER SAMPLES (ug/L)

To calculate sample quentitation timil

OI-MUXX+A 15 D3-7608.A (CAS) 5 Proporting 12 try blank 00. 15 8 3 1.00 FINSSE BANK Try bank 30 क्र 9 6 H115609 03-mulota 102-musta 03-mulosa 02-muno-a 04-RAI-A 85 7 A09511H 3 130 73 H115613 8 20 5, li9511H g 150 C 4115602 100 100 ন্ট্র #: £4FBL Sampling Date: H115612 OF TBM-A field blank 100 Soilet Soilet 23 360 Semple No. Dilution Factor Location COMPOUND Total-1.2-Dichlorost Lab No. •1.2-Dichlorooth *1.1-Okchleroeth 110011 on Carte 3 10 ğ =

CROL - Centract Required Quantitation Limit

on Tobrachlorida

91.1.1-Trichiorosti

Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS

DATA SUMMARY FORM: V O L A T I L E S

Site Name: Ellington Aid Force Passe (5003 8.47.84)
Com #: EAFBL Sampting Date: 1/22-1/25/90

WATER SAMPLES (ug/L)

To calculate sample quantitation limit. (CROL * Disulon Factor)

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2	4-Mathyt-2-pentanone								-								T
2	2-Heusenee								1 (0					01			T
S	Tetrachioroethone																T
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3	CROL - Centred Required Quentitation Umit	vanditation LL	7		•	ction	• Action Level Exists	Fylab			SEE MA	LOGATING	202	SEE MABDATIVE FOR CORE DEFINITIONS		340	ł

DI-MUDOYA 0.500 A. 7087.50 To calculate sample quent tripblank (CROL * Ditution Factor) Justin not 0.500 C.500 Finsat blank | trop blank anakaa Trat 0.50 S WATER SAMPLES 0.500 She Name: Ellingtia Clis Face Buse (SNG 5.4FB3) WATER SAM (2007) 0.500 Coso 0: EAFBL Sompting Date: 1122/10 1125 110 0.500 025.0 CROL = Contract_Required_Quantitation_Limit 36.1 36.95 Field blank Semple No. Dilution Factor Location COMPOUND his 2-Chimethene 1.3-Dichlorobenzene hing-Charalegorgon Bether 1.4-Dichlerobenzene bla Chloroeth dether 124-Inchirobenzene 12 Dicherchenzene 2.4-Dichterophenol Benzy Alcohol 2 Mathetahand Dennis Acid 4.Chhean 2 9 = 2 9 9 9 9 9 8 9

SEE_NARRATIVE_FOR_CODE_DEFINITIONS

* Action_Level_Exists

BNAS DATA SUMMARY FORM:

~

WATER SAMPLES (ug/L) Sie Name: Ellington ais Farce Passe SIC EAFEY

Case #: £4731 Sampling Date: 1/23/91 - 1/35/90

CA-Church-A CA-STD To calculate semple quentitation fimil 0.500 0.500 0.500 0.500 0.500 0.500 try blank (CROL * Ditution Factor) Jakod pot frip blank Surface 10 rinsat black CRQL = Contract_Required_Quantitation_Limit Field blank Por Sample No. Dilution Factor Location COMPOUND Heachtorocyclopentactera 4.6-Distro-2-methytchenol 4-Charo-3-methyphenol Herechterobutedlene 2 Methylmophthelene 2.4.8 Trichtorophenol 2.4.5 Irichlorophenol +Chlorophen 4 ph 2.9 Dhibrotohuma 2-Chloronaphtha 2.4 Obstraphenol 2.4 Distrototuene 3-Nitroenilles CAG 2 8 9 8 3 9 = 2 3 9 2 읙

SEE_NARRATIVE_FOR_CODE_DEFINITIONS

* Action_Level_Exists

She Name: Ellingfor Clir Fazue Pare (51)6 Estrag

WATER SAMPLES (ug/L) Case 8: 24571 Sampling Date: 1/23/90-1/25/90

To calculate sample quantitation limit.

								(CROL	* Ditution Factor)	n Factor)		
	8-1809-A DZ-MUNDAGA-MUNDAGA-MUNDB-A DZ-MUND A DZ- BIN-A 02.7807.A	CA-ELECT-A	DZ-Curriost	CA-MWCA-A	CZ-MUNDS-A	122-Mullo	402-RBIL-	A 02.7807		02. TBOK.A	Or- massy-A	A-Haca
	Dietion Factor	222	C.53	025.a	D.57D	C.SPP	2050	C				200
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des	COMPOUND	Field blank					rinsat show	rinst stank trip blank		tup 6 kan K		
2	N-Hitosodiphendenthe					-	-		╅	 		-
2	+ Bromopheryt phenylather										_	+
2	"Hexachlorobenzene									-		
3	*Pentachlorophenol											+
2	Phenenthens											+
10	Anthracene										-	+
2	Discharge and a second							not	100	-		<u> </u>
2	Firemethene							mylene	9	200kind		<u> </u>
2	Press											-
2	But de antigentation										 -	
8	3,3 Dichtoroberatine											
2	Benzofajanthecene											-
=	Chrysens											
=	bis 2 Ethydhen Aphthelate						18					<u> </u>
=	Oto-ectyl phetestale											
2	Desirebilionenthene											
2	DenzeftBrosesthere											
2	Benzefalpyrane											
2	Indeno(12.3 adpuene											<u> </u>
2	Otherste hierdresone											
9	Beazofa b Acendene											

SEE_NARRATIVE_FOR_CODE_DEFINITIONS

· Action_Level_Exists

PCBS A N D DATA SUMMARY FORM: PESTICIDES

WATER SAMPLES (ug/L) Sile Name: Ellington all Tokice Bise SDG 8ATBY

Case #: \$41-61 Sampling Date: [[38]20 1[38190

02-FB09-A 02-MW107-A 02-MW19-A 02-MW110-A 02-RB11-A 02-TB07-A 02-TB08-A CHUNDH-A To calculate sample quantitation limit. (CROL * Difution Factor) Sample No.
Dilution Factor
Location

								-		-					1,00	٦
			-													
CROL	COMPOUND	Freld blank									•					
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8	*Gement BHC (Undane)		$\frac{1}{1}$	1	+	1					<u> </u> 				+	+
8	*Heptachlor		+	$\frac{1}{1}$	+	 					<u> </u>					+
90	Althin		1	+		1									-	+
9.08	Heptechlor Eposide	200	1	+	-	1	-								<u> </u>	+
8	Endochden	7	1101		100	1	100	Tool	7	not		000		200		+
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5	*Aroctor-1221							+	+	1	+					_
6.5	*Aroclor-1232		-			+		+	-	+	1		1			_
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SEE_NARRATIVE_FOR_CODE_DEFINITIONS

* Action_Lavel_Exists

CROL = Contract_Required_Quantitation_Limit



C-49-4-0-111

TO:

LINDA STEAKLEY

DATE:

APRIL 18, 1990

FROM:

DEB SCHEIB

COPIES: FILE

SUBJECT:

INORGANIC DATA VALIDATION -

METALS AND PETROLEUM HYDROCARBONS

ELLINGTON AIR FORCE BASE CASE NO. EAFB1, SDG EAFB2

SAMPLES:

Soil

01-SB05A-A	02-SB13A-A	02-RB05-A
01-SB05B-A	02-SB13B-A	
01-FD02-A	02-SB13C-A	
01-FB03-A (HPLC)	02-SB14-A	
FB04-A (MUNIC.)	02-SB14B-A	
RB06-A	02-SB14C-A	

NUS Laboratories analyzed 3 soil samples (including one pair of field duplicates) and 3 associated aqueous quality control samples for Target Analyte List (TAL) metals and Petroleum Hydrocarbons. Seven additional samples were analyzed for Petroleum Hydrocarbons only. Data from these samples were analyzed and evaluated under the following HAZWRAP Level C QA/QC criteria:

- Holding times
- * Initial and continuing calibration
- * Laboratory and field blank analyses
 - Laboratory Control Sample analyses
 - Interference Check Sample analyses
 - Serial dilutions
- * Matrix and analytical spike results
 - Laboratory and field duplicates
 - Detection limits
- * Indicates that quality control criteria were not met for this parameter.

LINDA STEAKLEY C-49-4-9-111 APRIL 18, 1990 - PAGE 2

TAL Metals

The 0.1 Percent Recovery (R) for the continuing calibration of magnesium was far below the \pm 10% quality control limits. Positive results reported for magnesium are qualified as unreliable, "R".

Following are maximum concentrations of analytes found in laboratory and field quality control blanks:

<u>analyte</u>	<pre>maximum concentration (mg/kg</pre>)
aluminum	14.2	
arsenic	0.23	
beryllium	2.6	
calcium	71.1	
lead	0.33	
selenium	2.2	
sodium	96.3	
zinc	4.3	

Positive sample results less than five times the highest blank concentration are qualified "U", as undetected.

The 136 %R for zinc in the ICP CRDL Standard analysis exceeded the \pm 20% advised limit. No qualifications were made as all results for this analyte have been previously qualified "U" due to blank contamination.

The 43 R for antimony was below the \pm 25% quality limit for matrix spike analyses. Detection limits for antimony are qualified as estimated, "UJ".

Petroleum Hydrocarbons

Petroleum hydrocarbons were detected in two samples, however, 23 mg/kg was detected in the associated rinsate blank. The petroleum hydrocarbon result for sample 02-SB13B-A is qualified "U", undetected. The result for sample 02-SB13A-A is not qualified as it is above the 115 mg/kg action-level based on blank contamination.

DATA SUMMARY
TABLE A

S ပ INOBGANI DATA SUMMARY FORM:

SOIL SAMPLES (mg/Kg) She Name: EAFB - Ellington Airforde Base (SOCEAFBZ

12/21/89

4

Due to chutton, sample quantitation that is affected. See dilution table for specifics. rinset blank 12/21/89 H12876 RB06-1 0 62.0 62.0 3.7 0.49 712895 12/21 Field blank Munk. F804 - A 0 0.35 96.3 0.33 0; 68/12/21 field blank HPLC H12894 F803-A 0 0.44 0.18 ? - Field Duplicate Pair-68/12/21 3 01.5805A.A 01.5805B.A 01. FD02 H12891 82.1 0.66 358 0481 0.35 4.6 501 7.8 5.2 3400 Sampling Date(s): 5 7 H12890 7 3 82.3 68/12/21 0.00 948 224 2.0 8.9 333 1.5 2.9 2:2 156 U 3 12/21/89 112889 85.5 35.1 0.63 6370 4.8 6360 38.6 0641 6.5 11.1 16.9 Cose #: EAFBI Date Sampled Date Analyzed Sample No. Location % Solids Dilution Factor ANALYTE Magnesium Manganese Chromkum Potassium Vanadium Ahminum Antimony Beryffum Cadmium Mercury Selentum Thefium Arsentc Bertum Copper Sodium Cobst Nickel ·Lead SEVE Zinc FO. tab No. 000 000 1000 1000

CRDL = Contract Required Detection Limit

*Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS

revised 12/88

DATA SUMMARY FORM:

SOIL EAFB - Ellington Air Force Base (SDGEAFBE) Site Name:

SAMPLES

Case #: EAFB/ Sampling Date: 12/2/

12/2:/00

KINSATE BLANK K-806-A FIELD BLANK F804 - A MUNIC. 1:0 FIELD RUNK F803-A 1.0 -FIELD DUPYCATE PAIR -A. 5007-10 12.9 01.5005 B.A 12.7 0 % A. 3082.10 0.1 3.41 Sample No.
Dilution Factor
% Molature
Date Sampled
Date Analyzed (20 mg/Kg Petrobur) Hydrocarbuns

DATA SUMMARY FORM:

SHO Name: ELLINGTON AIR FORCE BASE (SDEENFRZ) SOIL SAMPLES

Case #: EAFB! Sampling Date: 12/19 - 12/21/81

4. Rbb4 02.50184.4 02.5013.4 02.5018.4	29./	11-89 12-16-89 12-18-89 12-18-89	37 %	7.77													
01-FBA 01-KB		12.31.89 18.31						1						1			-
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or. 5805 A. A. or. 501	5/11	18-12-21		7./6			-										
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Yes, Food by D. O. Schulk

DATA SUMMARY FORM:

SOIL SAMPLES SHe Name: ELLINGTON HIR FORCE GASE (SDEENTEZ)
Case #: EAFB! Sampling Date: 12/19-12/21/87

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C-49-0-3-

TO:

LINDA STEAKLEY

DATE: APRIL 18, 1990

FROM:

D. A. SCHEIB PAS

cc: FILE

SUBJECT:

INORGANIC DATA VALIDATION - PETROLEUM HYDROCARBONS

ELLINGTON AIR FORCE BASE CASE NO. EAFB1, SDG EAFB1

SAMPLES:

WATER

01-SB01A-A	01-SB04B-A	02-SB12B-A
01-SB01B-A	01-SB11A-A	02-SB12C-A
01-SB02A-A	01-SB11B-A	01-FB01-A
01-SB03A-A	02-SB11C-A	01-FB02-A
01-SB03B-A	02-FD01-A	01-RB01-A
01-SB04A-A	02-SB12A-A	01-RB03-A

NUS Laboratories analyzed 16 water samples (including one pair of field duplicates) and two associated aqueous quality control samples for Petroleum Hydrocarbons. Data from these samples were evaluated under HAZWRAP Level C QA/QC criteria.

Petroleum Hydrocarbons

All analyses met quality control criteria. No petroleum hydrocarbons were detected.

DAS: PHCEAFB1

DATA SUMMARY
TABLE A

Page

DATA SUMMARY FORM:

SNO Namo: EAFB - Ellington Arrived Base (SDEEAFBI)

SOIL SAMPLES

Sampling Date: 12/12 - 12/15/89 Case #: EAFB!

Sample No.	N. 58014.A	01.58016.4	01.5802 A.A	01.5803A.A	01.58038 .A	01.5804A.A	N.84085.10	4. 41185.20	62.5811B.A
Dilution Factor		7.0		1.0	0.1	0.7		L_	0./
% Moisture	20.0	2.5/		7.7/	20.3	4.41	1.22		24.42
Date Sampled	63/21/21	12/13/89	12/14/21	58/21/21	13/21/21	63/27/21	53/21/21	13/3/21	12/16/18
Date Analyzeu									
PH	7.84	8.13	7.7/	7.79	7.53	8.53	7.67	7.54	7.69
(20 mg/Kg Petroloun Hydrocarbons									
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* Note: Detection limits vary proportionately with persont rossture.

Tabulated by D. A. Schulb.

DATA SUMMARY FORM:

SHO NAMO: EAFB - Ellington Ar Force Baso (SOFEAFB) SOIL SAMPLES

Case #: EAFB, Sampling Date: 12/14- 12/18/89

789 770t 770t 770t	7.0 7.7/21 18.1/21 8.54	7.9E 7.9E	1.0 28.7 124.8/11 7.38	16.8 12/18/89 8.43	7.0 /7.0 /E/n/199
not analywe	45.8 131/31	30.3 /2/17/19	28.8 1248/11 7.38	18/99 18/99 8.43	
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DATA SUMMARY FORM:

Site Name: EAFB-Ellington Mr Force Base (SOG EAFBI)
Case #: EAFBI Sampling Date: 12/12-12/14/89

SOIL SAMPLES

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C-49-0-3-138

TO:

LINDA STEAKLEY

DATE: MARCH 26, 1990

FROM:

THOMAS JACKMAN

CC: AMY HUBBARD

SUBJECT:

INORGANIC DATA VALIDATION-METALS

ELLINGTON AIR FORCE BASE

CASE NO. EAFB1 SDG NO. EAFB1

SAMPLE NOS.

SOIL - 01-SB04A-A

01-8B03A-A

01-8B04B-A

01-8B03B-A

01-8B01A-A

01-8B02-A

01-8B01B-A

BLANKS - 01-RB01-A

01-FB01-A

01-RB03-A

01-FB02-A

NUS Laboratories analyzed 7 soil samples plus 2 rinsate blanks and 2 field blanks from Ellington Air Force Base for TAL Metals, pH and Percent Moisture under the following HAZWRAP Level C QA/QC criteria:

- Holding Times
- Interference Check Samples
- Matrix and Analytical Spike Results
- o Laboratory and Fieldd Blank Analyses
 - Initial and Continuing Calibration
 - Laboratory and Field Duplicates
 - Laboratory Check Samples
 - Serial Dilutions
 - Detection Limits
- o Indicates that quality control criteria were not met for this parameter.

TAL METALS

Blanks

Aluminum, calcium, iron, magnesium, sodium, lead, zinc and chromium were found in laboratory, rinsate and field blanks. Positive results less than 5 times the highest blank concentrations are qualified as "U", undetected.

Matrix Spikes

Matrix spike recoveries for antimony were below the 75% quality control limit. Therefore, positive results are qualified "J", biased low, and detection limits are qualified "UJ", biased low.

C-49-0-3-138 Linda Steakley Page 2

TABLE 1 SUMMARY OF QUALIFIERS AFTER DATA VALIDATION ELLINGTON AIR FORCE BASE, CASE EAFB1, SDG EAFB1

<u>Analyte</u>	Soil Sam	ple No.	<u>Positive</u>	<u>Undetected</u>	<u>Bias</u>	Comment
Antimony	01-SB01B-A,	01-SB02-A		UJ	Low	1
Calcium	01-SB04A-A, 01-SB03B-A,		U		High	2
Chromium	01-SB04A-A, 01-SB01B-A, 01-SB03B-A,	01-SB03A-A	U		High	2
	01-SB01A-A		J		High	1
Magnesium	01-SB02-A		U		High	1
Sodium	ALL		U		High	2
Zinc	01-SB04B-A, 01-SB03B-A,		U		High	2
	01-SB04A-A, 01-SB03A-A	01-SB01A-A	J			4

- 1. Low matrix spike recovery.
- 2. Laboratory, rinsate and/or field blank contamination.
- 3. Relative percent difference (RPDs) for laboratory duplicates
- exceeded the 35% quality control limit for soils.

 Absolute difference for laboratory duplicate exceeds 2 times the CRDL quality control limit for soils.

DATA SUMMARY
TABLE A

Page

DATA SUMMARY FORM: I N O R G A N I C S

SOIL SAMPLES (mg/Kg)

Due to dilution, sample quantitation first is effected.
 See dilution total for committee.

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o į	Date Sampled	13114189											_			
3	Date Analyzed	NSMC											1			
CROL	ANALYTE	Field Blank							_				-			
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2	Arsenio						+		<u> </u>	\dagger	H		-	+	1	╀
\$	Bertum						-		-	\mid	-	\dagger	-	+	1	\downarrow
-	Beryflum									1		$\frac{1}{1}$	-	+	_	\downarrow
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CADL = Contract Required Detection Limit

*Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS

revised 12/86

7 Page

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ပ INORGAN DATA SUMMARY FORM:

SHO Name: Elling ton live Force Lace

Sampling Date(s):

Case #: £1231

SOIL SAMPLES

(mg/Kg) 58/h/181 - 58/2/R1

Due to dilution, sample quantitation that to affected.

See dilution table for specifics.

DI-FBC1-A 18 190 31418 5010 Bient HPLL 937 1.37 75.27 01-81303-19 2114189 118190 Ringrife [43.4] 0.147 D1-5602-19 181118 118190 18.18 83.8 0.50 7 3:527 5173 305 1430 1910 45.60 3.67 O1-58036-A BIETTE 131-141 118190 29.7 3:30 136.0 Thin 4010 1250 0.197 6'5 2.1 15 5 7907 ٠ 28 P1-56034-A 12113185 112190 191-18 83.3 5.780 74.4 उम्हा 3600 951 0.18] 5:51 7.6 320 2,2 18190 D1-513114-4 101-56018-A 34.8 960 10.662 [22.5] 15. 1030 20,00c 1015 1015 1017 3920 3 30 118190 12113189 181-191 80.0 2.4 97.9 10.837 080h 345cm 3460 D147 16.97 2239 9.9 12.3 400 8.3 424 10.1 12113196 12 190 OI-SECUPA DI-SECUPADI-ABOI-A Rinsolt 18.87 24.0 13.27 198 12:-14: 18190 22.9 3060 8527 913 2.10 3400 251 19-14 118190 85.6 1356 050 5.61 201 130 9CH 340 187 Date Sampled Sample No. Date Analyzed Location **Ollution Factor** X Solids ANALYTE Mengeness Chromben Magneshm Potassium Setenium Beryflum Celchum Alembrum Antimony Copper Anath *Lead Mickel 3 2 2 2 3 0 2 0 9 1000 8|-|-| 1000 2

CRDL * Contract Required Detection Limit

Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS

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20.1 29.0

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35 5.3

11.8

revised 12/88



TO:

LINDA STEAKLEY

C-49-0-3-137

FROM:

THOMAS JACKMAN

DATE: MARCH 26, 1990

CC: AMY HUBBARD

SUBJECT:

INORGANIC DATA VALIDATION-METALS

ELLINGTON AIR FORCE BASE

CASE NO. EAFB1 SDG EAFB3

SAMPLE NOS.

SOIL - 01-8801-AW

01-2201-AE

01-8801-AC

01-FD05-AE

NUS Laboratories analyzed 4 soil samples including 1 pair of field duplicates from Ellington Air Force Base for TAL Metals, Petroleum Hydrocarbons, pH and Percent Moisture under the following HAZWRAP Level C QA/QC criteria:

- Holding Times
- Interference Check Samples
- Matrix and Analytical Spike Results
- Laboratory and Field Blank Analyses
 - Initial and Continuing Calibration
- Laboratory and Field DuplicatesLaboratory Check Samples

 - Serial Dilutions
 - Detection Limits
- o Indicates that quality control criteria were not met for this parameter.

TAL METALS

Antimony, beryllium, cadmium, cobalt, copper, vanadium, zinc, and nickel were found in laboratory blanks. Positive results less than 5 times the highest blank concentrations are qualified as "U", undetected.

Matrix Spikes

Matrix spike recoveries for antimony and zinc were below the 30% quality control limit. Therefore, positive results are qualified "J", biased low and detection limits are qualified "R", unreliable.

Matrix spike recoveries for manganese and copper were below the 75% quality control limit. Therefore, positive results are qualified "J", biased low.

C-49-0-3-137 Linda Steakley Page 2

Matrix spike recoveries for arsenic exceeded the 125% quality control limit. Therefore, positive results are qualified "J", biased high.

Laboratory duplicates

The relative percent differences (RPDs) of laboratory duplicates for aluminum, barium and iron exceeded the 35% quality control limit for soil samples. Therefore, positive results not previously qualified because of blank contamination are qualified "J", estimated.

Field Duplicates

The RPDs of field duplicates for arsenic and calcium exceeded the 50% quality control limit for soil samples. Therefore, positive results for the duplicate pairs are qualified "J", estimated.

/bpk

C-49-0-3-137 Linda Steakley Page 3

1

TABLE 1 SUMMARY OF QUALIFIERS AFTER DATA VALIDATION ELLINGTON AIR FORCE BASE CASE NO. EAFB1, SDG EAFB3

<u>Analyte</u>	Soil Sample No.	<u>Positive</u>	<u>Undetected</u>	Bias Comment
Aluminum	ALL	J		2 (54.3)
Antimony	01-SS01-AC		R	Low 1 (25.4)
Arsenic	ALL 01-SS01-AC 01-SS01-AE,01-FD05-	J J AE J		5 High 3 (125.1) 4 (182.1)
Barium	ALL	J		2 (97.8)
Beryllium	ALL	U		High 6
Cadmium	ALL	U		High 6
Calcium	01-SS01-AE,01-FD05-A	AE J		4 (169.2)
Cobalt	ALL	U		High 6
Copper	ALL 01-SS01-AC	U J		High 6 1 (30.2)
Iron	01-SS01-AC	J		2 (47.0)
Manganese	01-SS01-AC	J		Low 1 (64.8)
Nickel	ALL	U		High 6
Vanadium	ALL	U		High 6
Zinc	01-SS01-AC 01-SS01-AE,01-FD05-	J AE U		Low 1 (6.7) High 6

Comments:

- 1. Low matrix spike recoveries.
- RPDs for laboratory duplicates exceeded 35% quality control limit for soils.
- 3. High matrix spike recoveries.4. RPDs for field duplicates exceeded the 50% quality control limit for soils.
- 5. Laboratory blank contamination.
- 6. Field duplicate pair results were less than 5 times the CRDL for soils.

DATA SUMMARY
TABLE A

Page

DATA SUMMARY FORM: I N O R G A N I C S

SHO Namo: Elling for the Forme Buc SUG EAFES SOIL SAMPLES (mg/Kg) Case #: £A£&L Sampling Date(s):

•Due to dilution, sample quantitation that is affected. See dilution table for specifics.

					į															
	-	N-3501-AW DI-3501-AC 101-5501-AC	AWI	11-3501	ACL	355-10	-पट	01-F005-4E	-AE										┞	
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<u>a</u>	ANALYTE							D. P 616	٠, ١											
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2	5	13.4		16.0		12.2		10.4												
2	Cobell	4.4	И	4.1	ΙY	4.2	K		М											
5	Copper	30.9	17	54.3	N	14.6		13.4							.a.; sa			·		
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-	Pred.	125		141		18.9		76.1												
9	Megneshm	2720		1480		200c		1860												
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1000	Sodium	[333]		(253)		Liasi		1.097												
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2	Vanedlan	129		12.9	Y	17.5	1	16.8												
•	Zho	150		180	2	42.0	1	15.0	1											
2	Cyanide										_									
บ	CRDL = Contract Required Detection Umit	1 Reauly	70	etection	5	=			reflon	*Action Level Exists	Exists		G.	SEE	NABBATIVE	TIVE	FOR CODE	ODE	DEFIN	DEFINITIONS

revised 12/88

APPENDIX F RISK ASSESSMENT DATA

TOXICITY PROFILES

TOXICITY PROFILES

ACETONE (Clement Associates, Inc., 1985)

Health Effects

Acetone has not been tested in a carcinogenicity bioassay but gave negative results in skin painting tests and was not mutagenic in the Ames assay. No studies on animals for teratogenicity or reproductive toxicity have been done, but acetone was negative in a chicken egg injection study for teratogenicity.

Acetone is generally regarded as having a low toxicity and therefore has not been extensively studied. Prolonged inhalation of high concentrations may produce irritation of the respiratory tract, coughing, headache, drowsiness, incoordination, and in severe cases, coma.

In animal studies, rats consuming doses of 18 mg/kg/day for 4 months showed reduced food consumption and growth. In behavioral studies, rats exposed to 14,200 mg/m³ acetone for 4 hours/day, 5 days/week for 2 weeks showed modified avoidance and escape behavior after one exposure, but no changes after subsequent exposures. At 37,800 mg/m³, altered responses were noted throughout the 2-week exposure period. No chronic health hazards have been associated with exposure to acetone.

Toxicity to Wildlife and Domestic Animals

The toxicity of acetone to aquatic organisms is low. The LC₅₀ value for sunfish was reported to be 14.2 g/liter, and the threshold concentration for immobilization of <u>Daphnia magna</u> was reported to be over 9 g/liter.

No information on the toxicity of acetone to terrestrial wildlife or domestic animals was available.

ARSENIC (Clement Associates, Inc., 1985)

Health Effects

Arsenic has been implicated in the production of skin cancer in humans. There is also extensive evidence that inhalation of arsenic compounds causes lung cancer in workers. Arsenic compounds cause chromosome damage in animals, and humans exposed to arsenic compounds have been reported to have an elevated incidence of chromosome aberrations. Arsenic compounds have been reported to be teratogenic, fetotoxic, and embryotoxic in several animal species, and an increased incidence of multiple malformations among children born to women occupationally exposed to arsenic has been reported. Arsenic compounds also cause noncancerous, possibly precancerous, skin changes in exposed individuals. Several cases of progressive polyneuropathy involving motor and sensory nerves and particularly affecting the extremities and myelinated long-axon neurons have been reported in individuals occupationally exposed to inorganic arsenic. Polyneuropathies have also been reported after the ingestion of arsenic-contaminated foods.

Toxicity to Wildlife and Domestic Animals

Various inorganic forms of arsenic appear to have similar levels of toxicity; they all seem to be much more toxic than organic forms. Acute toxicity to adult freshwater animals occurs at levels of arsenic trioxide as low as 812 µg/liter and at levels as low as 40 µg/liter in early life stages of aquatic organisms. Acute toxicity to saltwater fish occurs at levels around 15 mg/liter, while some invertebrates are affected at much lower levels (508 µg/liter). Arsenic toxicity does not appear to increase greatly with chronic exposure, and it does not seem that arsenic is bioconcentrated to a great degree.

Arsenic poisoning is a rare but not uncommon toxic syndrome among domestic animals. Arsenic causes hyperemia and edema of the gastrointestinal tract, hemorrhage of the cardiac serosal surfaces and peritoneum, and pulmonary congestion and edema; and it may cause liver necrosis. Arsenic toxicity to terrestrial wildlife was not reported in the literature reviewed.

BENZENE (Clement Associates, Inc., 1985)

Health Effects

Benzene is a recognized human carcinogen. Several epidemiological studies provided sufficient evidence of a causal relationship between benzene exposure and leukemia in humans. Benzene is a known inducer of aplastic anemia in humans, with a latent period of up to 10 years. It produces leukopenia and thrombocytopenia, which may progress to ancytopenia. Similar adverse effects on the blood-cell-producing system occur in animals exposed to benzene. In both humans and animals, benzene exposure is associated with chromosomal damage, although it is not mutagenic in microorganisms. Benzene was fetotoxic and caused embryo lethality in experimental animals.

Exposure to very high concentrations of benzene [about 20,000 ppm (66,000 mg/m³) in air] can be fatal within minutes. The prominent signs are central nervous system depression and convulsions, with death usually following as a consequence of cardiovascular collapse. Milder exposure can produce vertigo, drowsiness, headache, nausea, and eventually unconsciousness if exposure continues. Deaths from cardiac sensitization and cardiac arrhythmias have also been reported after exposure to unknown concentrations. Although most benzene hazards are associated with inhalation exposure, dermal absorption of liquid benzene may occur, and prolonged or repeated skin contact may produce blistering, erythema, and a dry, scaly dermatitis.

Toxicity to Wildlife and Domestic Animals

The EC₅₀ values for benzene in a variety of invertebrate and vertebrate freshwater aquatic species range from 5,300 μ g/liter to 386,000 μ g/liter. However, only values for the rainbow trout (5,300 μ g/liter) were obtained from a flow-through test and were based on measured concentrations. Results based on unmeasured concentrations in static tests are likely to underestimate toxicity for relatively volatile compounds like benzene. A chronic test with <u>Daphnia magna</u> was incomplete, with no adverse effects observed at test concentrations as high as 98,000 μ g/liter.

For saltwater species, acute values for one fish and five invertebrate species range from 10,900 µg/liter to 924,000 µg/liter. Freshwater and saltwater plant species that

have been studied exhibit toxic effects at benzene concentrations ranging from 20,000 µg/liter to 525,000 µg/liter.

2-BUTANONE (METHYL ETHYL KETONE [MEK]) (Clement Associates, Inc., 1985)

Health Effects

MEK has not been adequately tested for carcinogenicity and has produced only equivocal evidence of mutagenicity in a few bacterial assays. MEK has been reported to cause retarded fetal development and some teratogenic effects (acaudia, imperforate anus, and brachygnathia) at air concentrations of 9,000 mg/m³. MEK is of relatively low toxicity but at high doses it affects the nervous system and causes irritation of the eyes, nose, and skin. The oral LD₅₀ value for the rat was 2,750 mg/kg.

Although MEK is not strongly neurotoxic alone, it apparently strongly potentiates the neurotoxicity of n-hexane, and n-hexanone (methyl n-isobutyl ketone).

Toxicity to Wildlife and Domestic Animals

Only limited information was available on the toxicity of MEK to wildlife. LC_{50} concentrations for two freshwater fishes were around 5,600 µg/liter. MEK was toxic to brine shrimp at LC_{50} levels of 1,950 mg/liter.

No information on the toxicity of MEK to terrestrial wildlife or domestic animals was available.

BUTYLBENZYLPHTHALATE (BBP) (USEPA, September 1, 1989)

Health Effects

Butylbenzylphthalate (BBP) is reported to cause reductions in body weight and increases in liver weight in rats fed 1,000 to 1,400 mg/kg/day. Significant reductions in bone marrow cell count were also observed in rats fed 1,400 mg/kg/day. BBP is a Class C carcinogen, based on increases in mononuclear cell leukemia in female rats, however the response in male rats was inconclusive and there was no such response reported in mice.

Toxicity to Wildlife and Domestic Animals

No information on the toxicity of BBP to terrestrial wildlife or domestic animals was available.

CHLOROBENZENE (Clement Associates, Inc., 1985)

Health Effects

A study of the carcinogenicity of chlorobenzene was recently completed by the National Toxicology Program and preliminary results show that chlorobenzene caused neoplastic nodules in the liver of male rats but was not carcinogenic in female rats or in mice.

Occupational studies suggest that chronic exposure to monochlorobenzene vapor may cause blood dyscrasia, hyperlipidemia, and cardiac dysfunction in humans. Like many organic solvents, monochlorobenzene is a central nervous system depressant in overexposed humans, but no chronic neurotoxic effects have been reported. Animals exposed to chlorobenzene have exhibited liver and kidney damage and atrophy of the seminiferous tubules in the testes. The oral LD₅₀ value for rats was 2,910 mg/kg.

Toxicity to Wildlife and Domestic Animals

Chlorobenzene was acutely toxic to fish at levels greater than 25 mg/liter and to aquatic invertebrates at levels greater than 10 mg/liter. No chronic studies on the toxicity of chlorobenzene to aquatic life were found in the literature reviewed. Monochlorobenzene was shown to have a bioaccumulation factor of about 1,000 in freshwater species. No studies on terrestrial wildlife or domestic animals were reported in the literature reviewed.

4,4'-DDT (Clement Associates, Inc. ,1985)

Health Effects

DDT, DDE, and DDD have been shown to be carcinogenic to mice, primarily causing liver tumors, but also causing lung tumors and lymphomas. DDT does not appear to be mutagenic, but it has caused chromosomal damage. There is no evidence that DDT is a teratogen; but it a reproductive toxin, causing reduced fertility, reduced growth of offspring, and fetal mortality.

Chronic exposure to DDT causes a number of adverse effects, especially to the liver and central nervous system (CNS). DDT induces various microsomal enzymes and therefore probably affects the metabolism of steroid hormones and exogenous chemicals. Other effects on the liver include hypertrophy of the parenchymal cells and increased fat deposition. In the CNS, exposure to DDT causes behavioral effects such as decreased aggression and decreased conditional reflexes. Acute exposure to large doses or chronic exposure to lower doses causes seizures. The oral LD₅₀ is between 113 and 450 mg/kg for the rat and is generally higher for other animals.

DDT, DDD, and DDE are bioconcentrated and stored in the adipose tissues of most animals.

Toxicity to Wildlife and Domestic Animals

DDT has been extensively studied in freshwater invertebrates and fishes and is quite toxic to most species. The range of toxicities was 0.18 to 1,800 μ g/liter and the freshwater final acute value for DDT and its isomers was determined by EPA to be 1.1 μ g/liter. Saltwater species were somewhat more sensitive to DDT; the saltwater final acute value for the DDT isomers was 0.13 μ g/liter. Only one chronic toxicity test on aquatic species was reported. This test indicated that the acute-chronic ratio for DDT might be high (65 in the reported study), but the data were insufficient to allow calculation of a final acute-chronic ratio. DDT, DDD, and DDE are bioconcentrated by a factor of 10³ to 10⁵.

DDT, DDD, DDE and the other persistent organochlorine pesticides are primarily responsible for the great decrease in the reproductive capabilities and consequently in the populations of fish-eating birds, such as the bald eagle, brown pelican, and

osprey. DDT has also been shown to decrease the populations of numerous other species of waterbirds, raptors, and passerines significantly.

ETHYLBENZENE (Clement Associates, Inc., 1985)

Health Effects

Ethylbenzene has been selected by the National Toxicology Program to be tested for possible carcinogenicity, although negative results were obtained in mutagenicity assays in Salmonella typhimurium and Saccharomyces cerevisiae. There is recent animal evidence that ethylbenzene causes adverse reproductive effects. Ethylbenzene is a skin irritant, and its vapor is irritating to the eyes at a concentration of 200 ppm (870 mg/m³) and above. When experimental animals were exposed to ethylbenzene by inhalation, 7 hours/day for 6 months, adverse effects were produced at concentrations of 600 ppm (2,610 mg/m³) and above, but not at 400 ppm (1,740 mg/m³). At 600 ppm, rats and guinea pigs showed slight changes in liver weight, and monkeys and rabbits experienced histopathologic changes in the testes. Similar effects on the liver and kidney were observed in rats fed ethylbenzene at 4-8 and 680 mg/kg/day for 6 months.

Toxicity to Wildlife and Domestic Animals

Ethylbenzene was accurately toxic to freshwater species at levels greater than 32 mg/liter. No chronic toxicity was reported, but the highest test dose (440 µg/liter) was only one-hundredth of the 96-hour LC₅₀ for the particular species being tested. No studies on the bioaccumulation of ethylbenzene were reported in the information reviewed, but a bioconcentration factor of 95 was calculated using the log octanol/water partition coefficient. No information on the toxicity of ethylbenzene to domestic animals and terrestrial wildlife was found in the sources reviewed.

LEAD (Clement Associates, Inc., 1985)

Health Effects

There is evidence that several lead salts are carcinogenic in mice or rats, causing tumors of the kidneys after either oral or parenteral administration. Data

concerning the carcinogenicity of lead in humans are inconclusive. The available data are not sufficient to evaluate the carcinogenicity of organic lead compounds or metallic lead. There is equivocal evidence that exposure to lead causes genotoxicity in humans and animals. The available evidence indicates that lead presents a hazard to reproduction and exerts a toxic effect on conception, pregnancy, and the fetus in humans and experimental animals.

Many lead compounds are sufficiently soluble in body fluids to be toxic. Exposure of humans or experimental animals to lead can result in toxic effects in the brain and central nervous system, the peripheral nervous system, the kidneys, and the hematopoietic system. Chronic exposure to inorganic lead by ingestion or inhalation can cause lead encephalopathy, and severe cases can result in permanent brain damage. Lead poisoning may cause peripheral neuropathy in adults and children, and permanent learning disabilities that are clinically undetectable in children may be caused by exposure to relatively low levels. Short-term exposure to lead can cause reversible kidney damage, but prolonged exposure at high concentrations may result in progressive kidney damage and possibly kidney failure. Anemia, due to inhibition of hemoglobin synthesis and a reduction in the life span of circulating red blood cells, is an early manifestation of lead poisoning. Several studies with experimental animals suggest that lead may interfere with various aspects of the immune response.

Toxicity to Wildlife and Domestic Animals

Freshwater vertebrates and invertebrates are more sensitive to lead in soft water than in hard water. At a hardness of about 50 mg/liter CaCO₃, the median effect concentrations for nine families range from 140 mg/liter to 236,600 mg/liter. Chronic values for <u>Daphnia magna</u> and the rainbow trout are 12.26 and 83.08 mg/liter, respectively, at a hardness of about 50 mg/liter. Acute-chronic ratios calculated for three freshwater species ranged from 18 to 62. 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 about 500 mg/liter.

Acute values for twelve saltwater species range from 476 mg/liter for the common mussel to 27,000 mg/liter for the softshell clam. Chronic exposure to lead causes adverse effects in mysid shrimp at 37 mg/liter, but not at 17 mg/liter. The acute-chronic ratio for this species is 118. Reported bioconcentration factors range from

17.5 for the quahog clam to 2,570 for the blue mussel. Saltwater algae are adversely affected at concentrations as low as 15.8 mg/liter.

Although lead is known to occur in the tissue of many free-living wild animals, including birds, mammals, fishes, and invertebrates, reports of poisoning usually involve waterfowl. 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 soil. Many of these microorganisms play key roles in the decomposer food chain.

Cases of lead poisoning have been reported for a variety of domestic animals, including cattle, horses, dogs, and cats. Several types of anthropogenic sources are cited as the source of lead in these reports. Because of their curiosity and their indiscriminate eating habits, cattle experience the greatest incidence of lead toxicity among domestic animals.

MERCURY (Clement Associates, Inc., 1985)

Health Effects

When administered by intraperitoneal injection, metallic mercury produces implantation site sarcomas in rats. No other studies were found connecting mercury exposure with carcinogenic effects in animals or humans. Several mercury compounds exhibit a variety of genotoxic effects in eukaryotes. In general, organic mercury compounds are more toxic than inorganic compounds. Although brain damage due to prenatal exposure to methylmercury has occurred in human populations, no conclusive evidence is available to suggest that mercury causes anatomical defects in humans. Embryotoxicity and teratogenicity of methylmercury has been reported for a variety of experimental animals. Mercuric chloride is reported to be teratogenic in experimental animals. No conclusive results concerning the teratogenic effects of mercury vapor are available.

In humans, alkyl mercury compounds pass through the blood brain barrier and the placenta very rapidly, in contrast to inorganic mercury compounds. Major target organs are the central and peripheral nervous systems, and the kidney. Methylmercury is particularly hazardous because of the difficulty of eliminating it from the body. In experimental animals, organic mercury compounds can produce

toxic effects in the gastrointestinal tract, pancreas, liver, heart, and gonads, with involvement of the endocrine, immunocompetent, and central nervous systems.

Elemental mercury is not highly toxic as an acute poison. However, inhalation of high concentrations of mercury vapor can cause pneumonitis, bronchitis, chest pains, dyspnea, coughing, stomatitis, gingivitis, salivation, and diarrhea. Soluble mercuric salts are highly poisonous on ingestion, with oral LD₅₀ values of 20 to 60 mg/kg reported. Mercurous compounds are less toxic when administered orally. Acute exposure to mercury compounds at high concentrations causes a variety of gastrointentinal symptoms and severe anuria with uremia. Signs and symptoms associated with chronic exposure involve the central nervous system and include behavioral and neurological disturbances.

Toxicity to Wildlife and Domestic Animals

The toxicity of mercury compounds has been tested in a wide variety of aquatic organisms. Although methylmercury appears to be more toxic than inorganic mercuric salts, few acute or chronic toxicity tests have been conducted with it. Among freshwater species, the 96-hour LC₅₀ values for inorganic mercuric salts range from 0.02 µg/liter for crayfish to 2,000 µg/liter for caddisfly larvae. Acute values for methylmercuric compounds and other mercury compounds are only available for fishes. In rainbow trout, methylmercuric chloride is about ten times more toxic to rainbow trout than mercuric chloride, which is acutely toxic at about 300 µg/liter at 10°C. Methylmercury is the most chronically toxic of the tested compounds, with chronic values for Daphnia magna and brook trout of 1.00 and 0.52 µg/liter, respectively. The acute-chronic ratio for Daphnia magna is 3.2.

Mean acute values for saltwater species range from 3.5 to 1,680 μ g/liter. In general, molluscs and crustaceans are more sensitive than fish to the acute toxic effects of mercury. A life-cycle experiment with the mysid shrimp showed that inorganic mercury at a concentration of 1.6 μ g/liter significantly influences time of appearance of first brood, time of first spawn, and productivity. The acute-chronic ratio for the mysid shrimp is 2.9.

Chronic dietary exposure of chickens to mercuric chloride at growth inhibitory levels causes immune suppression, with a differential reduction effect on specific immunoglobulins.

METHYLENE CHLORIDE (Clement Associates, Inc., 1985)

Health Effects

Methylene chloride is currently under review by the National Toxicology Program. Preliminary results indicate that it produced an increased incidence of lung and liver tumors in mice and mammary tumors in females and male rats. In a chronic inhalation study, male rats exhibited an increased incidence of sarcomas in the ventral neck region. However, the authors suggested that the relevance and toxicological significance of this finding were uncertain in light of available toxicity data. Methylene chloride is reported to be mutagenic in bacterial test systems. It also has produced positive results in the Fischer rat embryo cell-transformation tests. However, it has been suggested that the observed cell-transforming capability may have been due to impurities in the test material. There is no conclusive evidence that methylene chloride can produce teratogenic effects.

In humans, direct contact with methylene chloride produces eye, respiratory passage, and skin irritation. Mild poisonings due to inhalation exposure produce somnolence, lassitude, numbness and tingling of the limbs, anorexia, and lightheadedness, followed by rapid and complete recovery. More severe poisonings generally involve correspondingly greater disturbances of the central and peripheral nervous systems. Methylene chloride also has acute toxic effects on the heart, including the induction of arrhythmia. Fatalities reportedly due to methylene chloride exposure have been attributed to cardiac injury and heart failure. Methylene chloride is metabolized to carbon monoxide in vivo, and levels of carboxyhemoglobin the blood are elevated after acute exposure. In experimental animals, methylene chloride is reported to cause kidney and liver damage, convulsions, and distal paresis. An oral LD₅₀ value of 2,136 mg/kg, and an inhalation LC₅₀ value of 88,000 mg/m³/30 minutes are reported for the rat.

Toxicity to Wildlife and Domestic Animals

Very little information concerning the toxicity of methylene chloride to domestic animals and wildlife exists. Acute values for the freshwater species <u>Daphnia magna</u>, the fathead minnow, and the bluegill are 224,000, 193,000 and 224,000 µg/liter, respectively. Acute values for the saltwater species, mysid shrimp and sheepshead

minnow, are 256,000 and 331,000 μ g/liter, respectively. No data concerning chronic toxicity are available. The 96-hour EC₅₀ values for both freshwater and saltwater algae are greater than the highest test concentration, 662,000 μ g/liter.

NAPHTHALENE (Clements Associates, Inc., 1985)

Health Effects

There are no epidemiological or case studies available suggesting that naphthalene is carcinogenic in humans. This compound is not generally considered to be carcinogenic in experimental animals. However, there is equivocal evidence suggesting weak carcinogenic activity in rats after subcutaneous injection. Naphthalene is reported to produce DNA damage in mice after intraperitoneal injection. Retarded cranial ossification and heart development are reported among offspring of rats injected intraperitoneally with naphthalene on days 1 to 15 of gestation.

Little information concerning acute and chronic toxic effects is available. Inhalation exposure to naphthalene may cause headache, loss of appetite, nausea, and kidney damage in humans and experimental animals. Acute hemolytic effects are reportedly caused by ingestion or inhalation or relatively large quantities of naphthalene. Optical neuritis, injuries to the cornea, and opacities of the lens also may result after inhalation exposure or ingestion. Naphthalene is a mild eye irritant in rabbits, and cataracts can be induced after oral administration. Application to the skin produces erythema and slight edema in rabbits. Somnolence and changes in motor activity are observed after ingestion of naphthalene by rats and mice. Oral LD₅₀ values of 1,250 mg/kg and 580 mg/kg are reported for the rat and the mouse, respectively.

Toxicity to Wildlife and Domestic Animals

The median effect concentrations for freshwater invertebrate species and three fish species are all reported to be greater than 2,300 μ g/liter. Acute values reported for saltwater polychaete, oyster, and shrimp species are all greater than 2,350 μ g/liter. A chronic value of 620 μ g/liter and an acute-chronic ratio of 11 is reported for the fathead minnow, a freshwater species. No chronic values are available for saltwater species. Freshwater algae appear to be less sensitive to the effects of naphthalene

than animal species. No information concerning saltwater plant species is available. The weighted average bioconcentration factors for the edible portion of all freshwater and estuarine aquatic organisms consumed by Americans is 10.5.

POLYNUCLEAR AROMATIC HYDROCARBONS (PAHs) (ATSDR, October 1989)

Health Effects

Much of the epidemiological work done on PAHs has centered on persons exposed to coke oven emissions. However, no studies were located regarding cancer in humans after either inhalational or oral exposure to PAHs. Reports of skin tumors in some individuals exposed to PAH mixtures lends support to their potential for carcinogenicity in humans. Animal inhalation studies with benzo(a)pyrene have reported respiratory tract tumors, and other studies have demonstrated the ability of several PAHs to induce skin tumors. Minor hepatic effects have been observed in animals following oral exposure, and kidney microsomal carboxylesterase activity was moderately induced in rats at doses of 50 to 150 mg/kg for 4 days. The major target organs in animals appears to be the hematopoietic and lymphoid systems.

Toxicity to Wildlife and Domestic Animals

No information on the toxicity of PAHs to terrestrial wildlife or domestic animals was available.

STYRENE (EPA, September 30, 1985)

Health Effects

Most long-term bioassays reported excessive mortality in test animals and equivocal results for tumor formation. There are inadequate data to indicate that styrene is a human carcinogen (Class C); however, an increased incidence of lymphatic and hematopoietic tissue tumors have been observed. The acute toxicity of styrene is low; an acute oral LD₅₀ of 5,000 mg/kg was reported for rats. Styrene was found to be fatal in rats at doses of 8,000 mg/kg. At levels of 400 to 667 mg/kg/day, 5 days/week for 6 months, decreased growth rates and increased liver and kidney weights were observed.

Toxicity to Wildlife and Domestic Animals

Dogs fed 400 to 600 mg/kg/day for 560 days showed minimal histopathologic effects on the liver and hematologic effects. No information on the toxicity of styrene to aquatic life or to wildlife were available.

XYLENES (Clement Associates, Inc., 1985)

Health Effects

The National Toxicology Program (NTP) tested xylene for carcinogenicity by administering it orally to rats and mice. Xylene does not appear to be carcinogenic in rats. Results have not been reported for mice. Xylene was not found to be mutagenic or teratogenic in a battery of short-term assays, but has caused fetotoxicity in rats and mice. Acute exposure to rather high levels of xylene affects the central nervous system and irritates the mucous membranes. There is limited evidence of effects on other organ systems, but it was not possible to attribute these effects solely to xylene as other solvents were present. The oral LD₅₀ value of xylene in rats is 5,000 mg/kg.

Toxicity to Wildlife and Domestic Animals

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. LC₅₀ values for other freshwater fish were around 30 mg/liter in a static system, which probably underestimated toxicity. Only a few studies have been done on the toxicity of xylene to saltwater species. These indicated that the m- and o-xylene isomers probably have similar toxicities and are probably less toxic than p-xylene, and that saltwater species are generally more susceptible than freshwater species to the detrimental effects of xylene (LC₅₀ = 10 mg/liter for m- and o-xylene and LC₅₀ = 2 mg/liter for p-xylene). However, it should be stressed that these generalizations are based on limited data.

No information on the toxicity of xylenes to terrestrial wildlife and domestic animals was available. However, because of the low acute toxicity of xylenes it is unlikely that they would be toxic to wild of domestic birds or animals.

ZINC (Clement Associates, Inc., 1985)

Health Effects

Testicular tumors have been produced in rats and chickens when zinc salts are injected intratesticularly, but not when other routes of administration are used. Zinc may be indirectly important with regard to cancer since its presence seems to be necessary for the growth of tumors. Laboratory studies suggest that although zinc-deficient animals may be more susceptible to chemical induction of cancer, tumor growth is slower in these animals. There is no evidence that zinc deficiency has any etiological role in human cancer. There are no data available to suggest that zinc is mutagenic or teratogenic in animals or humans.

Zinc is an essential trace element that is involved in enzyme functions, protein synthesis, and carbohydrate metabolism. Ingestion of excessive amounts of zinc may cause fever, vomiting, stomach cramps, and diarrhea. Fumes of freshly formed zinc oxide can penetrate deep into the alveoli and cause metal fume fever. Zinc oxide dust does not produce this disorder. Contact with zinc chloride can cause skin and eye irritation. Inhalation of mists or fumes may irritate the respiratory and gastrointestinal tracts. Zinc in excess of 0.25 percent in the diet of rats causes growth retardation, hypochromic anemia, and defective mineralization of bone. No zinc toxicity is observed at dietary levels below 0.2′ percent.

Studies with animals and humans indicate that metabolic changes may occur due to the interaction of zinc and other metals in the diet. Exposure to cadmium can cause changes in the distribution of zinc, with increases in the liver and kidneys, organs where cadmium also accumulates. Excessive intake of zinc may cause copper deficiencies and result in anemia. Interaction of zinc with iron or lead may also lead to changes that are not produced when the metals are ingested individually.

Toxicity to Wildlife and Domestic Animals

Zinc produces acute toxicity in freshwater organisms over a range of concentrations from 90 to 58,100 μ g/liter and appears to be less toxic in harder water. Acute toxicity is similar for freshwater fish and invertebrates. Chronic toxicity values range from 47 to 852 μ g/liter and appear to be relatively unaffected by hardness. A final acute-

chronic ratio for freshwater species of 3.0 has been reported. Although most freshwater plants appear to be insensitive to zinc, one species, the alga <u>Selenastrum capricornutum</u>, exhibited toxic effects at concentrations from 30 to 700 µg/liter. Reported acute toxicity values range from 2,730 to 83,000 µg/liter for saltwater fish and from 166 to 55,000 µg/liter for invertebrate saltwater species. Zinc produces chronic toxicity in the mysid shrimp at 166 µg/liter. The final acute-chronic ratio for saltwater species is 3.0. Toxic effects are observed in saltwater plant species at zinc concentrations of 50 to 25,000 µg/liter. Bioconcentration factors of edible portions of aquatic organisms range from 43 for the soft-shell clam to 16,700 for the oyster.

Zinc poisoning has occurred in cattle. In one outbreak, poisoning was caused by food accidentally contaminated with zinc at a concentration of 20 g/kg. An estimated intake of 140 g of zinc per cow per day for about 2 days was reported. The exposed cows exhibited severe enteritis, and some died or had to be slaughtered. Postmortem findings showed severe pulmonary emphysema with changes in the myocardium, kidneys, and liver. Zinc concentrations in the liver were extremely high. Based on relatively limited data, some researchers have speculated that exposure to excessive amounts of zinc may constitute a hazard to horses. Laboratory studies and findings in foals living near lead-zinc smelters suggest that excessive exposure to zinc may produce bone changes, joint afflictions, and lameness. In pigs given dietary zinc at concentrations greater than 1,000 mg/kg, decreased food intake and weight gain were observed. At dietary levels greater than 2,000 mg/kg, deaths occurred as soon as 2 weeks after exposure. Severe gastrointestinal changes and brain damage, both of which were accompanied by hemorrhages, were observed, as well as changes in the joints. High concentrations of zinc were found in the liver.

RISK ASSESSMENT CALCULATIONS

GROUND-WATER EXPOSURES POL STORAGE AREA

NUS CORPORATION AND SUBSIDIARIES

STANDARD CALCULATION SHEET

CLIENT:	FILE NO.:	BY:	PAGE OF
Ellington AFB	363M	AEH	
Subject! Ingestion of Water		CHECKED BY:	DATE: 5/15/90

Purpose: To estimate exposures to contaminants in durinking water

Assumptions: A 70 kg adult ingests 2 L/day

A 35 kg adolescent ingests 1.5 L/day

A 10 kg Child ingests 1.0 L/day

Relevant Equations:

where. (= contaminant concentration in groundwater (mg/L)

IR = ingestion rate (L/day)

EF = exposure frequency (days/yr)

ED = exposure duration (yr)

BW = body weight (kg)

LT - lifetime (yr)

365 = conversion factor (days lyr)

Sample Calculation:

for xylenes in groundwater at a concentration of 23 mg/L

Adults:

Adolescents:

for carcinogens, the above calculation would include a factor of $\left(\frac{70\,\mathrm{yr}}{70\,\mathrm{yr}}\right)$, or 1.

NUS CORPORATION AND SUBSIDIARIES

STANDARD CALCULATION SHEET

CHENT: Ellington AFB	FILE NO.: 363M	BY: ARH	PAGE OF 4
Exposures to Volati	les During Showering	CHECKED BY:	DATE: 5/15/90

<u>Purpose</u>: This model will be used to estimate inhalational expusures from volatiles and semivolatiles in groundwater during showering.

Relevant Equations:

where: S= volatile organic chemical generation rate (µg/m³/min)

1R= inhalation rate (L/min)

BW= body weight (kg)

Ds = shower duration (min)

De: total aurution in shower area (min)

Ra = air exchange rate (min ")

EF = exposure frequency (days)

ED = exposure duration (yr)

LT = lifetime (yr)

The following supplementary calculations are also needed!

where: Coud= contaminant concentration leaving water droplet (µg/L)
FR = shower flow rate (L/min)
SV - shower room air volume (m³)

Cwd: (wo [1-exp (-Kar ts /60d)]

where: Cwo = (ontaminant concentration in water (µg/L)

Kay = adjusted overall mass transfer coefficient (cm/hr)

ts = Shower droplet drop time (sec)*
d : shower araplet diameter (mm)*

CLIENT: APB	FILE NO.:	BY: ARH	PAGE 20F4
Subject: Exposures to Volatile	s During Showering	CHECKED BY:	DATE: 5/15/90

* Units cancel as follows: I so the term that accounts for available mass transfer surface area:

where: 14 = overall mass transfer coefficient (cm/hr)

T, = calibration water temperature (°K) of Ki

Ts = shower water temperature (oK)

m, : water viscosity at T, (cp)

Ms = water viscosity at To (cp)

where: Ilp = liquid film mass transfer welficient (cm/hr)

Kg = gas phase mass transfer coefficient (cm/hr)

T = temperature for which Henry's law constant is stimated (ok)

R = Ideal Gas (onstant (atm-m3/mol *K)

H = Henry; lew unstant (atm-n3/mol)

The following values are used as viput parameters:

BW= 70 kg

Ds = 15 min

De: 20 min

Ra = 8.3×10-3 min (1/2 volume hr)

FR: 10 L/min

SV= 12 m3

a = 1 mm

2586 ts=

T3 = 318°16 (45°C)

M, = 0.982

ms = 0.616

T= 293°K

R= 8.2x0-5 atm-m3/moloK

Ke= 20 cm /44 based on CO2

Mg = 3000cm VI8 based on H20

NUS CORPORATION AND SUBSIDIARIES

STANDARD CALCULATION

CLIENT:	FILE NO.:	BY:	PAGE 3 OF4
Ellington AFB	363M	AEN	
Exposures to Volatiles	During Showering	CHECKED BY: \$\fullet(5-22-90)	DATE: 5/15/90

Reference: Foster and Chrostowski, 1987.

Sample Calculation

Nonculuinogen; an average annual dose:

For ethylbenzene

Molecular weight (MW) = 106.16

Henry's Law (enstant (H) = 6.6 × 10⁻³ atm -m³/mol

$$K_{L} = \left[\frac{1}{12.87 \, \text{cm}} + \frac{(8.2 \times 10^{-5} \, \text{atm} - \text{m}^{3} / \text{mol} - ^{\circ}\text{k})(293^{\circ}\text{k})}{(6.6 \times 10^{-3} \, \text{atm} - \text{m}^{3} / \text{mof})(1235.31 \, \text{cm})} \right]^{-1}$$

CLIENT: Ellington AFB	FILE NO.: 363M	BY: ACH	PAGE 4 OF 4
Exposures to Volatiles	During Showering	CHECKED BY	DATE: 5/15/90

$$S = \left(\frac{2.5 \, \mu \text{g}}{\text{k}}\right) \left(\frac{1}{12 \, \text{min}}\right) \left(\frac{1}{12 \, \text{m}^3}\right) = 2.08 \, \mu \text{g/m}^3 / \text{min}$$

Dose-
$$\frac{(2.08 \, \mu g)}{m^3 - (14 \, L)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{8.3 \times 10^{-3} min^{-1}} = \frac{(70 \, kg)(8.3 \times 10^{-3} min^{-1})(10^6)}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{8.3 \times 10^{-3} min^{-1}} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min))}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min)}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min)}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min)}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min)}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min)}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min)}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min)}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min)}{(15 \, min)} = \frac{(15 \, min) + exp((-8.3 \times 10^{-3} min^{-1})(20 min)}{(15 \, min)} =$$

A time weighted average annual dose for a circinogen would be multiplied by a factor of (70 yr), or 1.

NUS CORPORATION AND SUBSIDIARIES

STANDARD CALCULATION SHEET

CLIENT: Ellington AFB	FILE NO.: 363M	BY: AEH	PAGE OF 2
Dermal Absorption I	During Showering	CHECKED BY: (5-22-90)	DATE: 5/15/90

Purpose: To estimate dermal exposures during showering bathing

Assumption: Everyone bathes/showers every day

Dermal permeability constant of water is 8 × 10-4 cm/hr; dlso for dissolved contaminants

Exposed Skin surface area = $19,400 \text{ cm}^2$ - adults (70kg) $14,900 \text{ cm}^2$ - adolescents (35kg) 7280 cm^2 - children (15 kg)

Exposure time = = min /day (0.25 hr/day)

Relevant Equations.

for noncurinogens) an average annual dose DEX = C x AV x PC x ET x EF BW = 103 x 365

where: C= contaminant concentration in grouniwater (mg/L)

AV = available shin surface area (cm²)

PC = dermal permeability constant of water (cn/hr)

ET = exposure time (0.25 hr/day)

EF = exposure frequency (hr/day)

BW = body weight (kg)

103 = conversion factor (cm³/L)

365 = conversion factor (day/yr)

for carcinogens; a time-weighted average annual dose

Dex = CxAVx PC x ET x EF x ED

BW x LT x 103 x 365

where: ED = exposure amakin (yr)
LT = lifetime (yr)

NUS CORPORATION AND SUBSIDIARIES

STANDARD CALCULATION

CLIENT: Ellington AFB	FILE NO.: 363M	BY: ACH	PAGE 20F2
Dermal Absorption	During Showering	CHECKED BY: (5-22-90)	DATE: 5/15/90

Sample Calculations!
Noncarcinogen; an average annual dose:

for ethylbenzene at a concentration of 6 mg/L (site 2)

DEX = 5.1 × 10-7 mg/kg-day V

Carcinogen; a time-weighted average annual close:

for benzola) anthracencat a concentration of 2.4×10-4 mg/L (Site 1):

DEX= 1.3 x 10-8 mg/kg-day/

9151 ASSESSMENT SPREADSHEET - ETPOSIFES IHPOHGM HOUSEHOLD VISE OF GROINIRMATER

517E NAME: ELLIMETON AFP C'15 > LDCA'12M: HOUSTON: 1E1AS DATE: 85/15/9P HAZARB INDICES AND INCREMENTAL CANCER RIJES ARE CALCULATED BY ON THE FOLLOWING SPPEADSHEETS. THREE ETFOSURE FOUTES ARE CONSIDERD: INGESTION OF GROUNDWATER, INHALATION OF VOLATILES DURING SHOWFRING/RATHING. AND DERNAL CONTACT WHILE SHOWERING/DATHING. ASSUNPTIONS ARE OUTLINED RELOW.

EIPOSUME SCEMARIO NUMBER I MAIIMUM GROUMDMAIER CONCENTRAIIONS LADULTI References: Epa, december 198º

	FDSTER	FDSTER AND CHPOSTOWS11. 1987	
INGEST LON:	: 131	[ET = (C x (P x EF x ED)/(8M x LT x 365) INHALATION:	181 - 15 x 18 x EF x ED)/188 x LT x Pa x 1E6)·(05 + E1P1-Ra x B1)/Ra . ETP1-Ra x 18 41 44 40.
	WHE RE:	WHERE: C = GROUNDWAIER CONCEMIRATION ING(L) IR = INGESTION RATE (LITERS DAT) EF = ETPOSURE FREQUENCY (DAYS/YEAP) ED = ETPOSURE DUPATION (YEARS: RM = BORY WEIGHT YE) LT = LIFETHE YEARS)	WHERE: S = VOLATILE DPGANIC CHEMICAL GEMPATIUM FAIT (11G/CIBIC METGRANIA) IR = IMMALATION RAID (11TRS/MIN) Bs = SHOWER DURATION (MIN) Ra = ATR ETCHANGE RATE (1/MIN) Ot = 1074, DURATION IN SHOWER RCOM (MIN) BW = BODY WEIGHT (186)
DERNAL CONTACT:	0£1 a	DERNAL CONTACT: DEX = If x PC : Av x ET > FF x ED > 18W x LT > 1800 x 3.65.	SV = SHOWER RODM AIR VOLUME (atti) R = 10EAL GAS LAM CONSTANT AIM-WILL MALL).
	WHE RE:	WARRE: C = SADUNDWAIRR CONCENTRATION HG-L) PC = THE PERMEABILIT CONSTANT OF WARREN (CH-HR) AN = THE STIM SURFACE AREA AVAILABLE FOR CONTACT (CM11.) ET = ENDSOURE FROUEMY (DATS.//EAD) ED = EPROSURE FROUEMY (DATS.//EAD) ED = EPROSURE FROUEMY (DATS.//EAD) EM = RORY WEIGHT (FR.) LT = LTFETIME (TEARS)	
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INGESTION:

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*IS> ASEESSMENT SPREADSMEET - HOUSEHOLD USE OF GROUNDWATEP IPAGE FOUR ELLINGION AFD - 511E 2 EVPOSURE SCENARIO NUMBER 1 - MATTHUM CROUNDWATER CONCENTRALIEMS - GEUR T CALCULATE INCREMENTAL CANCER PLS):

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ASSEBSMENT SPREADSHEET ETPOSUPES THROUGH HC'SE4OLO-USE OF GROUMDWATER

SITE MAME: ELLINGTON AFP SITE ?
LOCALION: HOUSTON, PEAS
DATE: 05/15/9P

HALARO INDICES AND INCREMENTAL LAWER RISKS ARE CALCULAIED BY ON INE FOLLOWING SPPERDSHEETS. INREE EXPOSURE POUTES ARE CONSIDERED: INGESTION OF GROUNDWATER. IMMALATION OF VOLATILES DURING SHOWERING-RATHINS, AND DEPRAL CONTACT WHILE SHOWERING-BATHINS. ASSUMPTIONS ARE DUTLINED PELOW.

EIPOSURE SCENARIO MUMPER 2 - MAIIMIM GROUNDWAIER CONCENTRALIONS 170011H1

REFERENCES:	EPA, DI	EPA, DECEMBER 1989 FOSIEM AND CHROSIONSFI. 1987		
INGESTION:	= 131	1ET = (C x 1P v EF x ED v 1BW x LT x 365) (WHALAIION:		IET : (S.n. IR. Ef n. EDI/IBM n. I. n. n. n. lebinids + EIP(-Ra. n. D1/Ra EIP(Ra. n. (DsD111/Ra)
	#HERE:	WHERE: C = GROUNDWATER CONCENTRATION (MG.L) IP = IMBESTION RAIE (LITERS/DA); EF = EAPOSUME FREQUENCY (DAYS/YEAR) ED = EIPOSUME DURATION (YEARS); RW = RODY WEIGHT (YG) LT = LIFETINE YYEARS)	MHE RE S.	
DERMAL CONTACT:	DE 1 =	DERMAL CONTACT: DEX = IC x PC > Av x ET x EF x ED) (FM x LT x 1200 x 55)		SU - SHOWER PORM ATR VOLUME (+418.)) R - IDEAL GAS LAW CONSTANT (4 RM REF. MOV. 1)
	WHERE:	WHERE: C = GROUNDWATER CONCENTRATION ING(1) PC = THE PERMEABLLTI CONSTANT OF WATER ((M-NF) AV = THE SYTH SUBFACE AREA AVAILABLE FOR CONTATINITY: ET = ETROSUBE THE (HESTGAL) EF = ETROSUBE THE (HESTGAL) ED = ETROSUBE DURATION ITEAS) PM = PONY WEISHT 116)	ā.	

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** STEP ASSESSMENT SPREADSHEET ** HRUSEHRIR USE OF GFRUNGWATER ** FAGE THOS E: LINGTON AFR ** SITE 2 EXFOSURE STEWARD NUMBER 2 ** MAITH'N FRUNGWATER CONSTRUCT ** COLINY CALCULATE RESES.

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4159 ASSESSMENT SPREADCHEET - HOUSEHOLD USE DE GRUUNDWAILEP FRAGE THREE ELLENGTON AFR - SITE 2 ELLSNGTON AFR - SITE 2 ETFOSUME SCEMARIO NUMBER 2 MATIMUM EFDUNDMATER (ONLEHTEATIONS -1-OHTH, CALCULATE MAZARD INDICES.

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ELLINGTON AFR - 5115 2 HOUSTON, 181A5 R5-15-9R SITE NAME: LOCATION:

-40,0AP INDICES AND INCREMENTAL CANCER PLSES ARE CALCULATED BY ON THE FOLLOWING SFFERDSHEETS. THREE E1POSUKE ROUTES ARE CONSIDEKED: INGESTION OF GROUNDWATER. INMALATION OF VOLATILES DURING SHOWERING-PRAINING, AND DEPMAL CONTACT WHILE SHOWERING-BAINING. ASSUMPTIONS ARE CUTLINED PELOW.

EXPOSURE SCENARIO MIMBER ³ mailmim Groumowaite (Oncentraliums (HILD) MEFERENCES: EPA, DECEMBER 1980

PEPERE WLES:	EPA. DECEMBER 1980 FOSTER AND CHROSTOWSII. 1987	581. 1987				
INGESTION:	164 - 10 - 1831	EX = (C + F - EF x ED) / (8W y LT x 165)	IMMALATION:		Es : 15 x 1R x EF x ED1/18W x LT x Pa x 1E51-705 + EIR! Ra x Dt1-8a - EIR(Ra x 105-Dt1)/Paj	:
	WHERE: C = GPOUNDWATER CC IP = INGESTION PARE EP = EXPOSUPE DUPAT ED = EXPOSUPE DUPAT PW = PODY WE LBHT IN	WHERE: C = GROUNDWATER CONCENTRATION (HE L) IR = INGESTION PARE (LITES-DAY) EF = EXPOSUPE FREDUENCY (DAYS-YEAR) ED = EXPOSUPE DUPATION (NEAPS) PN = PODY WEIGHT (NS) LT = LIFELINE (YEARS)		MHEFE:	S = VOLATILE DEGANIC (HEMERAL GENERALION WATE THE CURIC METERMIN) DE = SMOMER DURATION RATE LITTEPE MIN) Rs = AIP ETCHANGE RATE (L'MIN) Rt = 191-L DURATION IN SMOMER KANN MIN) WH = 191-L DURATION IN SMOMER KANN MIN)	
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GROUND-WATER EXPOSURES (LEACHING SCENARIO)

FORMER BASE LANDFILL

STANDARD CALCULATION SHEET

CLIENT: FILE NO.:
Ellington AFB 363M AEH PAGE | OF |
SUBJECT:
Leaching of Contaminants from Soil CHECKED, BX:

Leaching of Contaminants from Soil CHECKED, BX:

STATE:

5/18/90

Purpose: To evaluate effects of intaminated soil in groundwater

Assumptions: Infiltrating precipitation leaches chemicals from soil at a rate proportional to their solubility and their concentration

Equation: Clearhate = 2,21×10-3 (50) 5 0.373

where S = solubility (ppm)
(soil = contam. (mentration in soil (ppm)

(USEPA, November 13,1986) "Organic Leachate Model"

Sample Calculation

for benzola) pyrene in soil at a concentration of 2 mg/kg: (site 1)

(leachate = $(221 \times 10^{-3})(2)^{0.678}(0.0038)^{0.373}$ (leachate = 4.42×10^{-4} mg/L /

CLIENT: Ellination AFB	FILE NO.: 363M	BY: AEH	PAGE OF 2
CUD ISCT.	ute in Saturated For	CHECKED BY:	5/18/90

Purpose: To evaluate ailution effects as leachate mixes with groundwater

Assumptions: Leachate is generated according to the Organic Leachate Model (USEPA, November 13, 1986)

Dilunion occurs as ieachate enters the saturated zone.

Infiltration rate is ~5 miles /yr (~12 cm/yr)

Daray Groundwater Velocity is 2700 cm/yr

This effect occurs over the entire length of the site perpendicular to groundwater flow (Sike 1 = 365 m; Sike Z = 150 m)

Mixing zone is the entire saturated thickness, ~ 38 m

Relevant Equation:

where: Cleachate = concentration generated by OLM
q = recharge rate (cm/yr)
L = length of site perpendicular to groundwater
flow direction (m)
Vd = Dancy groundwater velocity (cm/yr)
m = effective aquifer thickness for mixing (m)

STANDARD CALCULATION

CLIENT:	FILE NO.:	BY:	J. 1227
Ellington AFB SUBJECT:	363M	I AEH	PAGE 2 OF 2
Dilution of Leachate	in Saturated Zone	CHECKED BY: (5-22-90)	DATE: 5/18/90

Sample Calculation

for berzo(a) pyrene in leachate at a concentration of 442 x 10-4 mg/L (Site 1):

$$\frac{C_0 = (4.42 \times 10^{-4} \frac{\text{mg}}{\text{L}})(12 \frac{\text{cm}}{\text{yr}})(365 \text{m})}{(5300 \frac{\text{cm}}{\text{yr}})(4.5 \text{m})} = 8.1 \times 10^{-5} \frac{\text{mg/L}}{\text{L}}$$

RISE ASSESSMENT SPREADSHEET - EXPOSURES IMMOUGH HOUSEHOUD USE OF GROIMPANTIL

511E MAME: ELLIMSTON AFB SITE 1 LOCATION: MOUSTON, 1EAS DATE: 85/16/90 MAZARB INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY DN THE FOLLOWING "PREADSHEETS. THREE E1POSUME ROUTES ARE CONSIDERED: INDESTION OF GROUNDWATER. INVALATION OF SHOWERING. BY DEFINING. ASSUMPTIONS ARE DUTLINED PELON.

EIPOSURE SCENARIO MUNRER 1 - MAIIMUM SOIL CONCEMIKATIONS LADULTS)

	MEFERENCES:	EPA. D FOSTER	PECENDER 198	89 1085KT, 1987			•		
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RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GPOUNDMATER IPAGE TWO)
ELLINGTON AFD - SITE L
EXPOSURE SCENARIO MUNER L - MATIMUM SOIL CONCENTRATIONS (ADULTS)
CALCULATE BOSES:

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RIST ASSESSMENT SPREADSHEET HOUSEHOLD USE OF GROUNDWATER PAGE THREET ELLINGTON AFB - SITE 1 EXPOSURE SCENARIO WINNER 1 MATIMUM SDIT CUNCENTRATIONS ADUITS) CACULATE MAZARD INDICES.

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RISE ASSESSMENT SPREADSMEET - HOUSEHOLD USE OF GROUNDWATER IPAGE FOUR ELLINGTON AFD - SIFE I EXPOSURE SCENARIO NUMBER 1 - MALINIM SOLI CONCENTRATIONS (ADVILTS) CALCUL'TE INCREMENTAL CANCER RISE:

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ASSESSMENT SPREADSWEET EIPOSUMES THROUGH HALVEFHOLD LISE OF GROUNDART.

ELLINGION AFP SITE | MOUSTON, TEXAS #5/15.98 SITE NAME: LDCATION: DATE:

HATARD TROTCES AND INCREMENTAL CANTER RISSS ARE LALFTLATED BY ON THE FOLLOWING FREADWRETS, THATE ETGSINE FOLIES AND CONSIDERED.
INDESTION OF GROUNDWATER. INHALATION OF VOLATITES PUBLING SHOWERING TO STAME CONTINUE.
ASSUMPTIONS ARE DUTLINED RELOW.

PEFERENCES:	EPA, DE FOSTER	EPA, DECEMBER 1980 FOSTER AND CHROSTOMENT, 1397			
IMGE 5110M;	19	59, a 11 × MB > 35 × EE > 131	JAHAY GT (TIN)	U	TELL 15 F TRATES FEDILEM FLAT PRATEGIALES ESPICEA EDITINA ESTIMATE (05.0011/Pa)
	E	WHERE: [= SFOUNDWATER CONCENTRATION (MG 1) EP = WAGESTION PARE .LITERS/DAT) EF = EXPOSINE FREDUENIC 1DAYS/FRAN ED = EXPOSINE DURATION (MEAPS) RM = RODY WEISHT 196. [1 = LIFETINE (MEARS)		3 d H H H	5 - VOLATITE OPGANIE (HEMITAL GENERALION GATE LUG-CHRIC METERMIN) B. = SHOWER DIRATION (LITERS-MIN) B. = SHOWER DIRATION (MIN) FA = AIR ETCHANGE RATE II WIN) DE = OTAL DIRATION IN SHOWER RICON (MIN) BIN = PROTY WEIGHT INE)
RHAL CONTACT:	DE 1 =	DERMAL CONTACT: DEF = (C x PC x G x 57 x FF x EDI-/PN x i i - 1988 351	Ĭ\$Ŷ.		SV - SHURKH FIRM ATM VULUMF ##1.) P - (PEAL 5AS) (AM CONSTANT ATM-MAIL WILL)
	HERE:	NHERE: C = GROUNDWATER CONFEMIRATION (1861) PC = THE PERREAPHITY CONSTANT OF WATER (1844) AV = THE SITH SHRACE AREA AVAILARLE FOR CONTACT (1911).) FT = EPPSYINE THE (1864-1941)	HF) TAET (EM11.)	ŋR6ANIC	OFGANIC LEAFHAIF MODEL: C leachate = 2.21e-3 & C soil##8.678 & Schudilt*##8.773
		EF = ETPOSORE FREQUENCY DAYS/YEAR) ED = ETPOSORE DURATION (YEARS) RM = ROAN WEIGHT (SA)		1144 AGE MODEL	1300
		LT = LIFETIME (YEAPS)			

ENTER INPUT PARAMETERS:

			Annual Intilitation (carr) Length of the Wasse Deposit Farallel to vivindwater flow (e) Nathress of the Saluraten fore twi Darry Groundwater Velorit (rassear)
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1MGE 51 10M:	6 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	INHALATION:	

RISK ASSESSMENT SPREADSNEET - HOUSEHOLD USE OF GPOINDWATER (PAGE 140)
ELLINGTON AF B - SITE 1
EIPOSUME SCENARIO NUMBER 2 HALIMUM SOIL CONCENTRATIONS (7001H)
CALCULATE DOSES:

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Ethylbenzene		152	•	166.16	6.6e-3	1.6317e1	-	-	-
lylenes		18,	•	186.16	4.33e-3	1.6918e1	-	-	-
Styrene		98	•	184.14	2.2Be-3	1.54Bet	•	-	•
Chlorobenzene		3 5	•	112.56	3.58e 3	1.5373e1	-	-	-
Methylene chloride		828	•	84.94	2.8%e-3	1.6955el	***	-	•
Buty benzy phthalate	62.	2.9	2.688e 4	.112	9.36.6	3,169e-1	1.118e-5	1.2716-7	1.110e-8
Be nzolalanthracene	2.39	. 1057	1.054e-4	228.28	16-6	4.594e-2	4,518e-6	7.4798-9	4.488e-9
Benzo(b) fluor anthene	99:	*10.	1.238e-4	252.3	1.22e-5	5, 183e 1	5.272e-6	9.6224-8	5.2379-9
Benzoik I fluor anthene	1.83		8.859e 5	252.3	3.87e-5	1.4785eB	3.458e-6	1.798e-7	3.4358-9
Benzolal pyrene	7	8 J. 10	9.1238-5	151	4.96-7	2.147e-2	3.481e-6	2.6946-9	3.438e-9
Indeno(1,2,7-cd)pyrene	£.	. 88853	2.318e 5	2,6.3	8-4%6.9	2.913e-7	9.935e-7	1.04e-10	9.87e-18
Habhthalene	81.	31.7	4.6860.4	128.7	1.96.1	9.9792PB	1.9746 5	6.044e 6	1.9616-8
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RISK ASSESSMENI SPREADSHEET - MOUSEMOLD USE OF GROUNDWATEM IPAGE THEET ELLINGTON AFD - STIE 1 Ellington afd - Stie 1 Elposume scenaald number 2 - Matimin soll foncempations itolium

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### 1.452-6	vibenzviphthalate	1.119e-5	1.2718 7	9.		5 4998 5	-	\$ 405m.5	
Section Sect	zo(a)anthracene	4.522e-6	7.4798-9				•	•	
1.187e - 1.79e	20(b) fluor anthene	\$.277e-6	9.622e-8			. 152	•	•	
2.5.cd levrene 9.495 b. 1.06 c	zo(b)fluoranthene	3.461e b	1.798e 7			•	• •	• -	
2.3-cd byvrene 9.99%-7 1.86=10 1.976=-7 2.86%-6 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-7 7.18%-9 40 1.196-1 7.18%	zo(a)pyrene	3.485e b	2.694p-9						
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RISF ASSESSMENT SPREADSHEET - ETPOSURES THROUGH HOUSEHOLD USE OF GROUNDWATER

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517E WAME: ELLINGTON AFB - 517E !
LDCA11DN: HOUSTON, TEXAS
DATE: #55/16/9#

MAIAMB INDICES AND INCREMENTAL CANCER RISES ARE CALCULATED BY ON THE FOLLOWING SPHEADSHEETS. THREE ETPOSURE ROUTES ARE CONSIDERED: INGESTION OF GROUNDWATER, IMMALATION OF VOLATILES DIRING SHOWERING/BAINING. AND DERHAL CONTACT WHILE SHOWERING/BAINING. ASSUMPTIONS ARE OUTLINED BELOW.

EIPOSURE SCEMARIO WUMBER 3 - MAXIMUM SOIL CONCENIRATIONS ICHILO:

REFERENCES:	EPA, BECEMBER 1989 FUSIER AND CHRUSION	EPA. BECEMBER 1989 FOSIER AND EMPOSIONSEL. 1987		
INGEST LON:	1 3) 1 131	IET = (C t R x EF t E01/18M x LT x 365) MHAI A 1 DN		183 = 18 x IR x EF x ED)/18W x LT x Ra x 1Ebix16s + EIP(-Ra x Dt)/Ra - EIP(Ra x (Dq-Dt))/Ra)
		UMER: C = SROUMDWATEN CONCEMPATION (MG/L) IR = NMGESTION RATE (LITERS/DAY) EF = EIPOSUME FREQUENCY (DAYS/YEAR) ED = EIFOSUME DURATION (YEARS) RM = BODY WEIGHT (FA	MHE PE :	
RMAL CONTACT:	DERMAL CONTACT: DET = (E x PC x AV r ET x	PC x AV x ET x EF x EDI/(BM x LT - 1088 v 365)	_	S.Y.F. SHORER BOOM ALM VOLUME (#817.) R = 10EAL GAS LAW CONSTANT, ATH MEET-MO; **!
	# 13 : 343HH # 12 : 0 : #	MMERE: C = GROUNDWATER CONCENTRATION (MG/L) PC = TWE PERMEABILITY CONSTANT OF WATER (CH+HP)		OPGANIC LEACHATE MODEL:
	* 13	AV = THE SKIM SUBFACE AREA AVAILABLE FOR CONTACT (CHEEZ). ET = EXPOSURE TIME (HRS/DAY).	CHERZS.	C leachate = 2.11e-3 # C soil##6.678 # Solubility##8.375
	* 43	EF = EXPOSURE FREDUENCY (DAYS'YEAR) ED = EXPOSURE DURATION (YEARS)	* 1	LINFASE MODEI
	# L	84 = 8087 WEIGHT (76) [T = LIFETIME (YEARS)		C aouster = C Seachate & O & L / M / Vd

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annen.	CONVERSION FACTOR =					Annual Infittration (carri	Length of the Maste Dep	Thickness of the Saturated Jone (a)	Darry Broundmater Velocity (revess')		
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RISK MSSESSMEN! SPREADSWEET - HOUSEHOLD USE OF GROUNDWATER (PAGE IND) ELLIMGTOM MFD - SITE 1 ElPOSUME SCEMMATO WUMBER 3 HATIMUM SOIL COMCENTRATIONS (CHILD) CALCULATE DOSES:

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RISE ASSESSMENT SPREADSHEET HOUSTHOLD USE OF GROUMBALER (PAGE THEFF) ELLINGTON NGB - STIE 1 ETPOSUME SCENNALD NUMBER T. MATINUM SOLL TONCENTRATIONS (FHIET) CALCULATE NATAMB INDICES:

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GROUND-WATER EXPOSURES (LEACHING SCENARIO)

POL STORAGE AREA

PIST ASSESSMENT SPREADSHEET - ETPOSUMES THMOUGH HOUSEHOLD USE OF GROWINGHATES

ELLINGTON AFD - 511E 2 HOUSTON, 1ETAS 85/16/90 SITE MANE: LOCATION:

MATARD INDICES AND INCREMENTAL CANGER RISES ARE CALCULATED BY ON THE FOLLOWING SEMENSHEETS. THREE EXPOSURE ROUTES ARE CONSIDERED: INDESTION OF SADDINGWATER, INVALATION OF VOLATILES DURING SHOWFRING, AND DEFINAL CONTACT WHILE SHOWERING/BATHING. ASSUMPTIONS ARE DUTLINED RELOW.

EIPOSUME SCENARIO MUMBER 1 MAIIMUM SOIL CONCEMIRATIONS (ABULT)

MEFERENCES:	EPA. DE FOSTER	EPA, BECENBER 1989 FOSTER AND CHROSTOWS11, 1987		
INGESTION:	: 53	ER * 1C = 1R x EF x ED///BW x LT x 3631 IMHALATION:		[1 = [5 x [R x EF x ED] / [BW x [T x Ra x [E6] x 105 + EIP[Ra x E1] / Ra - EXP[Ra x [Ds-Dt] / Ra)
	# # #	WARR: C = GROUMBWATER CONCENTRATION (MG/L) 18 = IMGESTION RATE (LITERS/DAY) EF = EIPOSUME FREQUENCY (BAYS/YEAR) ED = EIPOSUME DAMATION (YEARS) PM = ROBY WEIGHT (KS) LT = LIFETIME (YEARS)	MHEPE:	: S = VOLATILE DREANTE CHEMICAL BEWERATION RAIE IUG/CUBIC METEN/MIN) IR = INMALATION RATE (LITERS/MIN) Bs = SARDNER DURATION (MIN) Rs = AIR ECCHANGE RATE (L/MIN) Dt = TOTAL DHRATION (MIN) BM = BODD WEIGHT (MIN) CC = COTAL DHRATION (MIN) DA = COTAL DHRATION (MIN) DA = COTAL DHRATION (MIN) DA = COTAL DHRATION (MIN) DA = COTAL DHRATION (MIN)
MAL CONTACT:	- 130	DERMAL CONTACT: DEX = (C x PC × AV x ET x EF x E01/(BN x LT v 1989 · 165)		P - 10EA, GAS LAW CONSTANT (ATM MISS/MOL. F.)
	## ## ##	WHERE: C = GROUNDWATER CONCENTRATION 146/L) PC = THE PERMEABILITY CONSTANT OF MATER (H.HP)		DAGANIC LEACHATE MOPEL:
		AV * THE STIM SURFACE AREA AVAILABLE FOR CONTACT TEMBEL. ET * EXPOSURE TIME (HMS/DAY)		C leachate = 2.21e-3 t C soils18.678 t Solubilat+88.373
		EF = EIPOSLME FREDUEMCY (DAYS/YEAR) EB = EIPOSLME DURATIOM /YEAFS)	NIN!)	LINFAGE MODEL
		PW = BODY WEIGHT (FG)		Claquiter = Cleachate 8 G 1 L / M / Vd

INGEST FON:	APULT EXPOSURE			DEFMAL CONTACT.	YOUTH EXPOSURE	SURE	
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RISH ASSESSMENT SPREADSMEET - MOUSEMOLD USE OF GROUNDWALER (PAGE TWO) ELLINGTOM AFD - SITE 2 Etposume scenario number i Matimim soil (DMCENTRATIONS (ADM/T) CALCULATE DOSES:

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137 1,171 2 1,61,15 1,537	13 152 124 187 125 187 1265 188 1265 188 1265 188 127 1884 hate hate 6,1 878 1884 hate hate 6,1 878 1884 hate hate 70 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate hate 88 1884 hate		6.66.3		7.469.7	1 480.4	4.354-7
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PISE ASSESSMENT SPREADSMEET - MOUSEMOLD USE OF GEOUNDMATER (PAGE THREE) ELLINGTON AFD - SITE 2 ELPOSAME SCENATO MANDER 1 - MATIMUM SOIL CONCENTRATIONS (ADULT) CALCULATE MAZAMD INDICES:

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9158 ASSESSMENT SPREADSMEET ETPOSUPES I PODUĞH HOUSEHOLD 115E OF GROUNDMATE

ELLINGTON AFR - 511E 2 MOUSTON, 1E1AS 85/16/98 SITE MANE: LOCATION: BATE:

ETPOSURE SCENARIO NUMBER 2 - MATIMUM SOJI CONCENIRATIONS PROPURA

REFERENCES:		EPA, DECEMBER 1980 FUSIER AND CHROSIONSNI, 1987					
IMBESTION:	151 = 1C.E.	IC x 1R x EF x ED)/19W x	* [1 * 365]	INHALATION:	151 - 151	18 x EF x E01/(84 +	* Ra x 1Ebix
	13 13 14 15 15 15 15 15 15 15 15 15 15 15 15 15	C = GROUNDWATER COMCENIRATION ING/ FF = EMPESITON RATE (LITERE/OBY) ED = EMPOSUME FREQUENCY (DAYS/YEAR) ED = EMPOSUME OURATION (YEARS) EMPOSUME (HTG)	KNIRATION ING/L) LITERS/DAY) CY (DAYS/YEAR) N (YEARS)		2 E S S S S S S S S S S S S S S S S S S	5 = VOLATILE DREAMIC CHEMICAL SEMERATION BE = 1MMALATION RATE ILITERS/RIVINGS = SHOWER DURATION HINN RA = ATR ETCHANGE RATE (I.MIN DI = TOTAL DURATION IN SHOWER ROOM HING-RATE CONTINUE HARBENDY WEIGHT (TEX	5 = YOLATILE OPGANIC CHEMICAL BEMERATION FATE HIS YOUR CHERYNIN) bs = SHOWER DURATION HIN) Ra = ATR ETCHANGE RATE (1.MIN) bt = TOTAL DURATION IN SHOWER PROP HILY: cv = SHOWER ROBATE ATR (1.MIN) cv = SHOWER ROBATE ATR (1.MIN)
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	= Jd :38344	C = GROUNDWATER CONCENTRATION (MS/L) PC = THE PERMEARILITY CONSTANT OF MATE	ENTRATION (MG/L) CONSTANT OF WATER (EMMP) ABER AVAILABLE FOR CONTACT (FMT).	י האבן האראון.	OPGANIC LEACHAIE MODEL:	HATE MOREL: Parhate = 2,216-5 % [EACHATE MODEL: C learhate = 2.21e-5 % C coll31% 628 % Shistilt ** 866.77
		ET = EIPOSURE INFE SON CAREER PROPERTY (EAR) EF = EIPOSURE FREQUENCY (EAR) FF = EIPOSURE FREQUENCY (EAR)	Davi (DAYS//EAR)		LIMMASE MODEL		
		EN = EXPUSORE UNFRICATION (F) PM = PODY WEIGHT (KG) LT = LTFE13ME (YEARS)				C squifer = C leachate 4.0 % L / M / VS	93 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2
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PIST ASSESSMENT SPREADSHEET HOUSEHOLD USE OF GROUNDWATER (PAGE 140) ELLINGTON AFB - SITE 2 EXPOSUME SEEMAND NUMBER 2 - MAITH M SPIL CONCENTRATIONS (YOUTH) CALCULATE BOSES,

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RISK ASSESSMENI SPREADSMET - HOUSEHOLD USE OF GROUNDWATER FFAGE THREE.
ELLINGTON AFD - SITE 2
ERPOSUME SCEWARIG MARBER 2 NATIMUM SDIL CONCENTRATIONS FFOUTH.
CALCULATE MAZARE INDICES.

CHENICAL	1MG·DERM DOSE	IMHALATION DOSE	REFERENCE DOSE ENG.	REFERENCE DOSE 1NH.	HAZARD [ND IMG. 'DFPM	HAZAFO (MD. TNH.	MP MP MP MP MP MP MP MP MP MP MP MP MP M
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Styrene	3.1346-6	1.3594.8	701		1.367e-7	•	1.5678-7
Chlorobenzene	1.2778-6	5.512e 7	~ »;	~ •	b. 16be 3	1.1870	1.7198-4
Methylane chloride	1.3776-3	6.182e 4	5 9è	1-46	2.2286 2	6.869€ 4	2,289e-2
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41SR ASSESSMENT SPREADSHEE! . EIPOSURES THROUGH HOUSEHOLD USE OF GHOUNDWATER

ELLINGTON AFB - SITE 2 MOUSTON, TETAS 85/16/98 SITE NAME: LOCATION: DATE:

HAJARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPERDSHEETS. THREE EXPOSURE BOUTES ARE CONSIDERED: INGESTION OF GROUNDWATER. INMALATION OF VOLATILES DURING SHOWERING/BATHING. AND DEPHAL CONTACT WHILE SHOWERING/BATHING. ASSUMPTIONS ARE OUTLINED RELOW.

EXPOSUME SCENARIO NUMBER 3 - MAXIMUM SOIL CONCENTRATIONS (CHILD)

MEP EMEMILES:	FOSTER	FOSTER AND CHROSTOWSFI. 1987			
INGESTION:	151	IEX = (C x IR x EF x ED)/(80 x L1 x 365)	INHALAT 10N:	131	1Ef : (5 x 18 x Ef x Eb) (80 x LT x Pa x 1E6 \x (05 + ETP) - Pa x Dt)/Ra - EXP(Ra x (05-Dt))/Ra)
	#P.E.F.E.E.E.E.E.E.E.E.E.E.E.E.E.E.E.E.E.	C = GROUNDWATER CONCENTRATION (MG/L) IR = WMGESTION RATE (LITERS/DAY) EF = EIPOSUME FREDUSMCY (DAYS/YEAR) ED = EIPOSUME PURATION (YEARS) RM = BODY WEIGHT (MG) LT = LIFETIME (YEARS)		3.5 3.5 3.6 3.6 3.6 3.6 3.6 3.6 3.6 3.6 3.6 3.6	S = VOLATILE OPGANIC CHEMECAL GENERATION PATE (116/CURIC METER/MIN) Bs = INMALATION RAIE (LITERS/MIN) Bs = AIR EXCHANGE RATE 11/AIN) Bs = TORL DURATION IN SHOWER REOM IMIN) Bu = BODY WEIGHT (ES)
ERMAL CONTACT:	. E30	DERMAL CONTACT: DEX = 1C x PC x AV x ET x EF x ED)//80 x LT x 1980 x 7551	159 4		R = IPEAL GAS LAW CONSTANT (ATH-PUTS MOIL *)
	WHERE:	WHERE: C = GROUNDWATER CONCENTRATION (MG/L) PC = THE PERMEABILITY CONSTANT OF WATER (CM/HP.	J.B.	ORGANIC	ORGANIC LEACHAIF MODEL:
		AV = THE STIM SURFACE AREA AVAILARLE FOR CON ET = EXPOSURE TIME (HFS/DAY)	NTACT (CM102)		[leachate * 2.21e-3 t C soil018.678 t Solubilit*08.373
		EF = EXPOSUME FREQUENCY (DAYS: YEAR) ED = EXPOSUME DUPATION (YEARS)		LINFAGE MODEL	MODFL
		84 = 8087 WEIGHT (#61 LT = LIFETIME (MEAPS)			E aduster * C leachate 1 0 1 L / N / Vd

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JSURE	CONVERSION FACIOR :					Annual Infiltration (ca/yr)	Length of the Waste Debo	Thickness of the Saturated Zone (a)	Barcy Groundwater Velocity (cm/vear)		
CHILD ETPOSURE	99 - 7 2 8 8 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7					13	156	3.5	3688		
BEPMAL CONTACT:	P () () () () () () () () () (,	I INVAGE MOREL:		.; 0	::	÷	144		
	 <u>*</u>		-	r.,	243	118	.982	.616	293	2	4 /4
	CONVERSION FACTOR =		;; 9	19:	ä	18:	#I:	H2:	Ë	£8:	111
CHILD EXPOSURE	1 35.5 M/A 10 M/A 10 M/A	CHILD ETPOSURE	-	=	:	₹	.000	13	A/M	. 660082	
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RISK ASSESSMENT : PREADSMEET - HOUSEHOLD LYSE OF SPOUNDWATER LPAGE 1401

(J.H.)	
I SOIL CONCENIRATIONS ICHILD	
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MUMBER	
EIPOSUAE SCENARIO MUMBER	
E LPOSUME	CALCULATE BOSES:

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2.297 5 184.14 2.38-5 1.434861 1.295-6
2.966 3 112.56 3.580 3 1.0375cl 2.965c 6 1 1.0375cl 2.965c 7 1.0475cl 2.965c 7 1.0475cl 2.965c 7 1.0475cl 2.965c 7 1.0475cl 2.965c 7 1.0475cl 2.965c 7 1.0475cl 2.965c 7 1.0475cl 2.965c 7 1.0475cl 2.965c 7 1.0475cl 2.965c 7 1.0475cl 2.965c
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RIST ASSESSMENT SPREADSMEET HOUSEHOLD USE OF GROUNDWATER IPAGE THEEE ELLINGIUM AFB - SITE 2 ETPOSURE SCENARIO NUMBER ! MATIMIM SOIL FONCENTRATIONS FEHILP CARCURATE MATARD INDICES.

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CMEMICAL	Acetone 2-Butanone	Denzene	E Chy I den zene Evilenea	Styrene	Chlorobenzene	Methylene chloride	B uty ! benzy ! ghthalate	Benzo(a) anthracene	Benzolb) fluor anthene	Benzoik) fluor anthene	Benzalalayrene	Indenoil, 2, 3-cd to rene	Maghthalene		Argenic .	Mercury	1,000			TOTAL HAZARD INDET

FUGITIVE DUST EMISSIONS
FORMER BASE LANDFILL

STANDARD CALCULATION

CLIENT: Ellington AFB	FILE NO.: 363M	BY: AEH	PAGE OF6
Fugitive Dust E	mission	CHECKED BY: SHH (5-22-96)	DATE: 5/18/90

<u>Purpose</u>: To estimate exposures resulting from fugitive dust emissions from surface / near-surface soils

Assumptions: Receptors of concern are located ~ 300m from either of the 2 sites (at base boundary).

> For Site 1, assume maximum contaminant concentrations (cast. Lf samples) are similar over entire eastern portion of the (andfill (18600m²)

for Site 2, assume inaximum contaminant concentrations in 0-2' samples are similar over entire site (without any concrete) (11600m²)

Assume 20 days/month as frequency of disturbance (days with wind and no rain)

Assume 50 % regetative cover

Receptors are exposed 24 holday to clust both mide and cutside homes. Exposure occurs le days/wk (312 days/yr)

Relevant Equations! (Cownerd et al., 1984)

$$E_{10} = \frac{0.83 + P(U+)(1-V)}{(PE)^2}$$

where E10 = emission rate of respirable particulates (mg/m²-hr) f = frequency of disturbance (month-1) U+= fastest wind speed (m/sec) P(U+)= erosion potential (g/m=) V = fraction of area covered by vegetation

PE = Thorn-thwaite's precipitation/evaporation index

NUS 166A REVISED 0285

STANDARD CALCULATION SHEET

CLIENT: Ellington	AFB	FILE NO.:	03M BY: AEH	
Subject! Fugilie	Dust	Emissions	CHECKED B	(5-22-90) DATE: 5/18/90

Intermediate Equations:

where Ut = erosion threshold wind speed at a height of 7 m (m/sec)

$$U_{t} = \frac{U_{*t}}{Q_{*}^{4}} \ln \left(\frac{Z}{Z_{0}} \right)$$

where Unt = friction velocity (m/sec)

Z = height above surface (cm)

Zo = roughness height (cm)

Determine Emissión Rates:

where Rio = emission rate of contaminant as PMio (gisec)

A = mass fraction of contaminant in

PMio emissions

A = source extent (m²)

Determine Oispersion:

f= = unscaled concentration from App. D.

STANDARD CALCULATION

CLIENT: Ellington	AFB	FILE NO.: 363M	BY: AEH	PAGE 3 OF 6
SUBJECT: Fugitive	Dust Emis	rigit	CHECKED BY: (5-22-90)	DATE: 18/90

Determine Doses:

where: C= contaminant concentration (12) (mg/m3) IR= inhalation rate (m3/hr) ET = exposure time (hr/day) EF= expusure trequency (days/y/) 20= expusure duranin (yr) ABS = absorption fraction ABS = 0.125 for respiratory tract-deposition 0.625 for gastrointestinal tract-deposition BW = body weight (kg) LT = lifetime (yr)

365 = conversion factor (days/yr)

sample calculations:

assuming particle size of c.5 mm, from Fig 3-4, Uxt = 48 cm/sec

$$U_t = \frac{0.48 \, \text{m}}{\text{sec}} \, \ln \left(\frac{700 \, \text{cm}}{1 \, \text{cm}} \right)$$

Ut = 7.86 m/secv

from Table 4-1, Ut = 23.7 m/sec for Port Arthur, TX

STANDARD CALCULATION SHEET

CLIENT:	FILE NO.:	BY:	PAGE 4 OF 6
Ellington AFB	363 M	AEM	
Subject: The Dust En	าเรรเต่าง	CHECKED BY:	DATE: 5/18/90

$$E_{10} = 0.83 \left(\frac{20}{\text{month}}\right) \left(\frac{106.1 \text{ g/m}}{10.5}\right) \left(\frac{83}{50}\right)^{2}$$

So,
$$\left(\frac{320 \text{ mg}}{\text{m}^2 - \text{h}}\right) \left(\frac{\text{h}}{3600 \text{ sec}}\right) \left(\frac{9}{10^3 \text{ mg}}\right) = 8.89 \times 10^{-5} \text{ g/m}^2 - \text{sec}$$

for naporthalene at a concentration of our my/kg(Gite 1)

STANDARD CALCULATION SHEET

CLIENT: Ellington AFB	FILE NO.: 363 M	BY: AEH	PAGE 5 OF 6
Bugitive Dust Emis	sims	CHECKED BY: (5-22-90)	DATE: 5/8/90

for QI in glsec, lio in ug/m3

Atotal dose (ingestion and inhulation) for a youth (35kg)

IEX = 6.07 × 10-10 mg/kg-day /

Must now account for absorption in lungs (0.125) and GI tract (0.625):

Total Dose = 4.07 x10-15 mg (0.125 + 0.625) = 455 x 10 10 mg/1ce-clay

To calculate Hazard Grotient

CLIENT: Ellination	AFB	FILE NO.: 363M	BY: AEH	PAGE 60F6
SUBJECT:	Dust G	nissions	CHECKED BY: (5-22-90)	DATE: 5/18/90

for caucinogen, calculate a lifetime duse /risk:

benzo(a) pyrene at uncentration of 2 mg/4g (Sik1)

$$R_{10} = \left(\frac{2 \text{ mg}}{\text{kg}}\right) \left(\frac{g}{10^3 \text{mg}}\right) \left(\frac{\text{kg}}{10^3 \text{g}}\right) \left(\frac{8.\hat{7}9 \times 10^{-5} \text{g}}{\text{m}^2 \cdot \text{sec}}\right) \left(\frac{18600 \text{ m}^2}{18600 \text{ m}^2}\right) = 3.31 \times 10^{-6} \text{ g}$$

$$\chi = (1.474)(1.82 \times 10^{-5} \text{ g/sec}) = 2.68 \times 10^{-5} \text{ µg/m}^3 \text{/}$$

for adult:

Accounting for absorption in lungs (0.125) + GI tract (0.625):

PIST ASSESSMENT SPPEADSMEET - INHALATION OF FUSITIVE DUST

ELLINGION AFB - SITE 1 HOUSTON, TEXAS 05/16/90 SITE NAME: LOCATION: PATE:

MATARB INDICES AND INCREMENTAL CANCER RISTS ARE CALCULATED BY THIS SPREADSHETT. ELPOSURE THROUGH THANLATION OF FUGITIVE DUST IS CONSIDERED.

EIPOSURE SCENARIO MURBER I - MAIIRIM SURFACE SOII CONCENIPATIONS

NEFERENCES: COMMERN. ET AL., 1984

RELEVANT EQUATIONS:	E18 = 0.631FtP(U+)111-4)/PE/501112				11 : 131	4 x {1 x {f x {E0}		161 = (4 x 18 x 61 x 65 x 60) / (8 x 11 x 365)
	U1 = U11n17/201/0.4		₹.	(EVENTS/MONTH)	WHE RE: I	- THE DOWNWIND	WHERE: I THE DOWNWIND AIR CONCENTRATION (MG/CU M)	(M6/CU M)
		 >	۵.	(DECIMAL FRACTION)	2	= THE INHALATIO	IR = THE INHALATION RATE (CU M/HR)	
	P(U+) = 6.71(U+ - UT)	.	23.7	(M/SEC)	Ξ	ET = THE ETPOSURE TIME (HRS/DAY)	TIME (HRS/DAY)	
		. 3d	18	(DIMENSION ESS)	12.	= THE ETFOSUPE	EF = THE EIFOSUPE FREQUENCY IDAYS/YEAR)	983
	FIE = ALPHATEISTA	: [a	7.861296	(J)5/H)	63	ED = THE EXPOSURE DURATION (YEARS)	DURATION (YEARS)	
		" 4	1868	(S0 M)	35	= THE RECEPTOR	BW = THE RECEPTOR BODY WELGTH (KG)	
	1 = 08Fi	 8	.182	(DIMEMSIONLESS)	=	= THE RECEPTOR	LT = THE RECEPTOR LIFETINE (YEARS)	
		14	1.4.	(116/6/CU M/SEC)	511	= A CONVERSION	TAS = A CONVERSION FACTOR (DAYS/YEAR)	
	0 = R16/PR							
					1R1 (YOUTH):	= ,	ED:	1.
					IR2 (ADULT):	.83	::	#
					:13	5 2	AF1: 1	.125
					FF:	312	AF 2: 8	.625
					BW1 (TOUSTH):	£ :		
					PWZ (ADULT):	.		# THE ARSORPTION FRACTIONS ACCOUNT FOR DEPOS

INTERNEDIATE CALCULATIONS:

I THE ARSORPTION FRACTIONS ACCOUNT FOR DEPOSITION IN THE GASTROINTESTINAL VERSUS THE RESPIRATORY TRACT

PIU+1 = 106,1193 E18 = 8.879e-5

101AL 101AL 101AL 101AL 101AL 101AL DOSE (MG/KG/DAY) DOSE (MG/KG/DAY) VOUTH ADULT TIME-WEIGHTED 9,446 18 3,6466 9 5,826 9 5,826 9 5,826 18 3,236 18 3,236 18 5,826 18 5,186 18 5,186 18 5,186 18 5,186 18 7,922e-9 6,868e-9 6,23be-9 6,72e-9 1,12e-9 6,87e-18 1,32c-7 4,75ie-7 6,41e-18 6,41e-18 3,1879.6 3,1838.5 2,488.5 2,474.5 2,578.5 1,378.7 4,3778.7 4,3778.7 4,3778.7 2,5418.6 2,5418.5 2,5418.5 2,5418.5 2,5418.5 1 (06/113) P18 16'51 ALPHA (MASS FRACTION) RISK ASSESSMENI SPREADSMEET - "NAALATION OF FUGITIVE DUST 1PAGE 140)
ELLINGTON AFD - SITE 1
EXPOSURE SCENARIO NUMBER 1 - MAITHUM SUPFACE SOIL CONCENTRATIONS
CALCULATE DOSES: 2.39e.5 2.33e.6 1.8e.6 1.87e.6 9.3e.7 1.9e.7 1.9e.7 1.3e.5 1.9e.7 1.9e.5 1.9e.7 1.9e.7 290 2350 1800 1850 2880 2880 190 180 190 190 190 190 (94/98) 3 Aretone
2-Butanone
Benzene
Ethribanzene
Irlenes
Strene
Chlorobenzene
Methriene chloride
Mutribenzylahthalate
Benzola) iluoranthene
Benzola) fluoranthene
Benzola i syrene
Indenof1.2,3-cd pyrene
Indenof1.2,3-cd pyrene
Indenof1.2,3-cd pyrene
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Indenof1.2,3-cd pyrene CHEMICAL

7.646e-9 7.646e-9 5.856e-9 6.587e-9 6.587e-9 7.86e-18 7.56e-11 7.55e-11 7.55e-11 7.55e-1 4.587e-7 6.18e-18

RISE ASSESSMENT SPREADSHEET - INHALATION OF FUGITIVE DUST (PAGE THREE)
ELLINGTOM AFD - SITE I
ETPOSIME SCENARIO NUMBER 1 - NATHUM SURFACE SOIL COMCENTRATIONS
CALCULATE NAZARD INDICES AND CANCER RISES.

E 5011 CONCENTRATIONS	
501	
SURFAC	1515:
MAIIAM	CANCER
<u>.</u>	1
MARKS.	INDICES AND CANCER RISKS
RE SCENARIO NUMBER 1	HA ZARĐ
EPPOSINE	CALCULATE MAZARD 1

	3500	BOSE	POSE	PFD (INHAL)	PFD (INSES)	CSF (INGES)	(SF (INHAL)	HAZARD INDEX	HAZARD INDEX	CANCER RISK
E#31.2	¥001	ADIN 1	LINE - WEIGHTED	(MS/FG/DAY)	ING/FS/DAY)	EFE-DAY/MEE	(FG DAY/MG)	4001H	Abut 1	ADUL T
Acetone	-	-	-		-			•	•	
2-Butanone	-	-	•	6 46	· ~				•	
Pen 2 pre	-	-	•			2.96.2	7.94.7	•	• •	-
Ethylbenzene	-	-	•				•	•	-	•
Ivlenes	-	-	•	- i d	268			-	•	-
Styrene	-	-	-		341			-	•	-
Calorobeazeae	-	-	•	ر م <u>ح</u>	78.5			_	-	-
Methylene Chloride	•	-	•	9e 1	2 a9	1 40 1	l . je ?	•	-	_
BELY BEALT BATBALATE	7.78e-18	9.44-18	9,446-18		74 1			1.855e 9	2.948e 9	-
Benzo(a) anthracene	7.922e-9	7.646e-9	7.646e-9			1.5e 1	8.70 2	•	-	7.95e-18
Pento(b) fluor anthene	6.868e-9	5.836e-9	5.856e-9			9.2e 1	1.90.1	-	-	3.7268-9
Dento(R) flagranthene	6.236e-9	6.019e-9	6.819*-9			7.6e 1	-	-	-	3.16Be-9
Denzo(a) syrene	6.742e-9	6.587e-9	6.587e-9			1.15e1	6.1e	-	-	5.1736-8
Indenati, 2, 3-cd) pyrene	3.135e-9	3.826e-9	3.826e-9			76-1	- 41	-	-	f. f.ke-10
Haphthalene	6.07e-10	5.86e-18	5.85e-18		(e.)			9.481e B	9.158e B	-
1041.7	3.37e-11	3.25e-11	3.25e-11		\$e-4	3.4e 1		4.214e B	4.867e B	8. The 12
Argenic	1.892e-7	1.854e-7	1.854e-7		16-3		- 0	6.826e.5	6.388e.5	A. 588e-7
Lead	4.753e-7	4.5878-7	4.587e-7		1. fe - 3			2.122e-4	2.84Rp-4	30000
Mercury	6.41e-18	6.19e-18	6.18e-18		, e			1.1.60	1.288.4	
Zinc Zinc	6.868e-7	5.856e-7	5.856e-7		Ze-1			1.8958-6	5 4878. I	•
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TOTAL								2.838e-4	2.739e-4	7.187e-7

91SK ASSESSMENT SPREADSMEET - IMMALATION OF FUGITIVE DUST

SITE MANG: ELLINGION AFB - SITE I LOCATION: HOUSION, IERAS DATE: 05/16/90 MAZARD INDICES AND INCREMENTAL CANCER PISES ARE CALCULATED RY INIS SPAFARSHETI. Elposiare thatough inhalation of fugitive dust is considered.

EIPOSUME SCENARIO MUMBER 1A - MAIIMUM SUPFACE SOIL COMCENIPATIONS ICHILDI

REFERENCES: COMMERD, ET AL., 1984

PELEVANT EDUATIONS: ELO = 0.83454P(U+)14(1-V)/PE/58)142

IDECTIAL FRACTION (M/SEC) (DIMENSION, ESS) (GINENSION, ESS) (GINENSION, ESS) (DIMENSION, ESS) (UG/G/CU M/SEC) (EVENTS/MONTH) 83 7.851295 18688 .192 P1U+) = 6.78(U+ - 191) Ul = Ulln(7/201/8.4 AID = ALPHASEIBSA

IEX = (I x IF x E1 x EF x ED)/(PW x LT x 365)

G = R18/PR

P(U+) = 186.1193

INTERMEDIATE CALCULATIONS:

I THE GASTADIN FRACTIONS ACCOUNT FOR DEPOSITION IN THE GASTROINTESTINAL VERSUS THE RESPIRATORY TRACT

78 76 .125

181 (CH1LD):
182 (ADULT):
ET:
EF:
EM: (CH1LD):
PM2 (ADULT):

RISE ASSESSMENT SPREADSHEET - INHALATION OF FUGITIVE DUST IPAGE TWO)
ELLIWGTON AFD - SITE 1
ETPOSURE SCENARIO WUMBER IA - MATIMUM SURFACE SOIL CONCENTRATIONS (CHILP)
CALCULATE DOSES;

101AL

1014

1914

CHEMICAL	1944901 3	ALPHA (MASS FRECTION)	F18 (6/5)	1 106/83)	DOSE (M6785/DAT)	DOSE (MGZBGZDAY) POSE (MGZRGZDAY) DOSE (MGZRGZDAY) CHILO APHLY	DOSE (MG/VC/DAY) TIME METGHTED
Acetone		•	•	-	•	6 52	-
2-Butanone		-	•	•	-	•	-
Peazene		•	•	•	-	-	-
Ethylbenzene		•	•	•	•	•	-
Irlenes		•	•	-	•	•	-
Styrene		•	•	-	•	-	•
Chlorobenzene		-	•	-	•	•	-
Methylene chloride		•	•	•	-	•	-
Puty benzy phthalate	962	7.9e-7	1. 189e 7	1.879€ 6	9.55e-18	9.44e 18	9.44e-18
Benzo(a) anthracene	2350	2.35e-6	3.881e-5	3.143e-5	7.7388-9	7.546e-9	7.646e-9
Denzoib) fluor anthene	1880	1.8e-6	2 9770 6	2.487e-5	5.927E 9	5.856# 9	5.856e-9
Benza(k)fluoranthene	1850	1.85e-6	3.855e 6	2,4746-5	6.6916.9	6.619.9	6.819e-9
Benzola) pyrene	2688	2e b	4 4 4 5 1	2.6758-5	6.585e-9	6.5878.9	6.587e-9
Indenot1,2.3-cd)pyrene	938	9.3e-7	1.5%6-6	1.2448-5	3.862p-9	3. 1.26e 9	3.826e-9
Nabhthalene	18	1.9e-7	2,9110.7	2.4878-6	5.97e-10	5.8ke 18	5.85e-16
100+*	=	8 2	1.5518 9	1.3376-7	3.29e 11	3.25e 11	3.25e 11
Arsenic	32488	3.24p 5	S alsa s	4,3736.4	1.867e 7	1.8.4.	1.0540.7
Lead	14:00	1.416 4	3.30	1.896e-3	4.64 e-7	1 4/6 1	4.587e 7
Mercury	198	1.9e /	1.36	2.5418-6	6.760-18	6.190-18	6.18e-18
Zinc	186688	1.8e 4	7, 377p. 4	2.487e-3	3.027p-7	£.3566.7	5.8558.7
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RISF ASSESSMENT SPREADSHEET - INHALATION OF FUGITIVE DUST FFASE THREE ELINGTON AFB - SITE I EVENT SHE STERNATO WINDER TA - RATHUM SURFACE SOIL CONCENTRATIONS (CHILE) CALCULATE MARAND INDICES AND CANCER RISPS:

CHEMICAL	CHILD	DOSE Adul 1	DOSE - NETENTED	PFD (INHEL) ING·FG·DAY)	FFD (INGES)	(SF (INGES)	CSF (INHAL)	HAZARD INDEX CHILD	HAZARD INDEX ADULT	CANCER RISK
Aretone	•	•	•							
	•	P	•		<u> </u>			•	•	-
2-Butanone	-	-	•	ر هن	ر و			•	-	-
Den I ene	-	-	•			, go ,	1.00.	•	•	
Ethribenzene	•	•	•					•	•	• •
Irlenes	-	•	•	<u>۔</u> و	8				•	
Strrene	•	•	•		761			•	•	
Chlarabenzene	-	•	•	, d.	76-7			•	•	
Hethylene chloride	-	•	•	1 ab	(2 e)	1.50 1	1.70 1	•	• •	•
D utylbenzylphthalate	9.3%-10	9.44e-18	9.44e-18			,		7 984 9	0.488.0	•
Benzolalanthracene	7,738e-9	7.6458-9	7.6466-9			1.05	, ,,	•	- 101.7	• •
Benzolb) flygranthene	5.9276-9	8.85AP-9	5 P 4 B 0					•	b (7.736-18
Benza(t) fluoranthene	A 8918.0	0.40					- ar.	.	-	3.7266-9
Rep 10 (a) par repe	6.4969.4	0.41.0	6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			1.66-1		•	•	3.16Be-9
Adams (1.) Total and a	2000	0.38/87	, a			1.150		-	•	5.173e-8
Indendite. S-Colpyrene	3.852e-7	3. P.25e-9	6.0720			 .°,	1 41	•	æ	4.15e-18
Rado Carles	5.93e-18	3.86e-10	5.8ke-18		fe-3			9.261e B	9.150e-8	-
100-1-	3.29e-11	3.25e-11	7,25e 11)e +	4	. (e 1	4.116e B	4.067e-8	8.38p-17
Arsenit	1.8678-7	1.0548-7	1.856		14-3		7	5.658P-5	6. 488e. 5	A \$880-7
pear	4.643e-7	4.597e-7	6,587e.7		- te 3			2 873e 4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Hereury	6.25e-10	6.18e-18	5.18e-19		-			1 10 to A	1 288 4	. •
linc	5.9276-7	5.8560.7	5 6c4p 7		7.00			4 4 50	9 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	• 4
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TOTAL								2.772e-4	2, 396 4	7.1876-7
										3177

FUGITIVE DUST EMISSIONS POL STORAGE AREA

OISK ASSESSMENT SPREADSMEET - INHALATION OF FINGLITVE DUST

ELLINGTON AFP SITE 2 HOUSTON, TEXAS Byld-19 SITE MANE: LOCATION:

HAZARD INBICES AND INCREMENTAL CANCER RISTS ARE CALCULATED BY THIS SPREADSHEET. Exposupe through inhalation of fugitive dust is considered.

EXPOSURE SCENARIO MUMBER 1 - MAJINUM SURFACE SOIL CONCENTRATIONS

MEFERENCES: COMMEPO, ET AL., 1984 RELEVANT EQUATIONS:

I THE BASORPTION FRACTIONS ACCOUNT FOR DEPOSITION IN THE GASTPOINTESTINAL VERSUS THE RESPIRATORF TRACT I THE DOMINING AIP CONCENTRATION (MG/CU M)

IP INE ENDEUGE TIME (HES/DAY)

ET IHE ENDSIDEE THE (HES/DAY)

EF IHE ENDSIDEE DIRACK (DAYS/REAP)

ED IHE EFOSIDEE DURATION (VEAPS)

PW INE RECEPTOR BODY WEIGH (FB)

LT IHE RECEPTOR (LIFETIME (1965)

LT IHE RECEPTOR (LIFETIME (1965)

LT IHE RECEPTOR (LIFETIME (1965)) 78 70 125 .125 LEX + IX . IR x ET x EF x EDIVIDM + LT x 365> **建聚基基的** 181 (1001):
182 (ADULT):
ET:
EF:
841 (10014):
PM2 (ADULT): HKF P.E.: (E"ENTS/MONTH) (DECTMAL FRACTION) (DIMENSION(ESS) (DIMENSIONLESS) (UG/G/CU M/SEC) (335/16) (80 %) 28 1.5.7 93 93 93 93 93 1.62 1.424 E18 × B.B31Fapfib+1211-91'PE-58)382 P(U+) = 6.74(U+ - UT) UT = Utln(7/20).8.4 RIG = ALPHATEIGIA 84/8/8 = 0 t = 01F₁

INTERMEDIATE CALCULATIONS:

P(U+) = 196.1193 E18 = 8.879e-5

107AL 107AL 101AL 101AL 101AL 1005E (MG/FG/DAY) DOSE (MG/FG/DAY) DOSE (MG/FG/DAY) POSE (MG/FG/DAY) POSE (MG/FG/DAY) 2.885e-6 5.428e-7 1.581e-6 1.752e-6 2.882e-6 # (1)G'H31 2.575e-1 4.221e 9 1.854e 7 2.163e 7 2.472e 7 FIP (5'S) ALFHA IMASS FEACTION! *IST ASSESSMENT SPREADSMEET - IMMALATION OF FUGITIVE DUST IPAGE TWO! ELLINGTON AFP - SITE 2 EXPOSURE SCENARIO NUMBER 1 - MATIMUM SUPFACE SOIL CONCENTRATIONS CALCULATE DOSES: 2.5e 2 6.1e 8 1.8e 3 2.1e-7 2.4e-7 (31,90)] 25 mm = 27 mm Bessis) sathrater Bessis) fluoranthere Bessis) fluoranthere Pessis) syrene ladeno(1,2,3-cd) ovrene Haphthalene Chlorobenzene Nethvlene chloride Butribenzylphtholate 2-Butanone Benzene Ethylbenzene Iylenes CHEMICAL Acetone

5.87e-18 8.32e-11 3.65e-18 4.26e-18 4.87e-18

5.87e 18 8.32e 11 3.65e 18 4.25e 18

5.25e 18 B.62e 11 3.78e-18 1.41e-18 5.85e 18

5-2

PISE ASSESSMENT SPREADSNEET - IMMALATION OF FUGITIVE DUST (PAGE THREE) ELLINGTON AFD - SITE 2
EIPOSUPE SCENARIO NUMBER 1 - MAITHIM SUPFACE SOIL CONCEMPATIONS CALCULATE MAJAND INDICES AND CANCEP PISTS;

CHEMICAL	4007H	005E Aru ?	DOSE 11ME-WETGHTED	ING 15 DAY	HG'FG'DAY)	ING DAY (MG)	(SF (INHAL)	HAZARD IMDEI YOUTH	HAZARD INDET ADULT	ADULT
Acetone	5.25e-10	5.8 ⁷ e-18	91.6.6		<u>-</u>			9 9 8 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	5.178e 9	-
2-Butanone	8.62e-11	8.326-11	9.12e 11	9e 2	5e 2			1.1978-9	1.1556-9	-
Denzene	3.78e-19	1.656-18	3.6%-10			2.90.2	2.96.2	•	-	7.946-12
Ethylbenzene	4.41e-10	4.26e-18	4.26e-18		-			2. 759e-9	2.6630-9	-
Ir lenes	5. PSe- 11	4.87e 18	4.8.4 1.8.4	- 9	ge2			3,15e-10	3.84e-18	•
Styrene	-	•	•		3e1			-	•	•
Chlorobenzene	-	•	•	, a,				•	•	•
Methylene chloride	-	•	•	- a'o	, ie	, ,,,	1.36	•	•	•
Butylbenzylphthalate	-	-	•		1 42			•	•	•
Penzola Lanthracene	-	•	•			١. ٩٠ : ١	8.7e ?	•	-	•
Benzo(b) f] nor anthene	-	-	•			9.20 1	1.96.1	-	-	•
Jenza(t) fluoranthene	-		•			7.50-1	-		•	-
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915K ASSESSMENT SPREADSMEET - INHALATION OF FUGITIVE DUST

ELLINGTON AFB - SITE 7 MOUSTON, TEXAS 85/16/98 SITE NAME: LOCATION: DATE:

MAJAND INDICES AND INCREMENTAL CANCER RISES ARE CALCULATED BY THIS SPREADSHEET. Ethosure through inhalation of fugitive dust is considered.

EIPOSURE SCENARIO MUMBER IA MATÍMUM SUBFACE SOIL CONCENTRATIONS ICHILDI References: commend. et al., 1984 RELEVANT EQUATIONS:

(D)/(8# x L1 x 365)	THE COMMENSAGE OF THE PROPERTY	19 : THE INHALATION PATE (CU M/HR)	FF = THE EXPOSURE FPEDUENCY (DAYS/YEAP)	PM = (ME RECEPTOR BODY METGH (FG)	155 = A CHWVERSION FACTOR (DAYS/YEAR)
	WHERE I HE COMMUNICATION	19 : 10E ENRALGTION PATE (CU M/HB)	3405043 341 = 43	Par = THE RECEPTOR	755 # A CHAVERSION
	LEVENTS MONTH!	(DECIMAL FRACTION) (M/SEC)	IDINENSION(ESS) (M/SEC)	(SO M) (DIMEMSTONLESS)	(335/H N3/9/9A)
	*	s: v.	84. .851295	11580	1.4.7
	: +		. FG 		L
E18 = 0.838F4P4U+101E-V17PE/501412	UI = Ustaf7'201'8.4	PIU+) = 6.781U+ - UF}	RIO = ALPHATEIGEA	1 = 01F;	84.414 z 8

INTERMEDIATE CALCULATIONS:

I THE BASORPTION FRACTIONS ACCOUNT FOR DEPOSITION IN The Gastrointestinal Versus the pespiratory tract

78 76 .125 .625

FD: LT: AF1: # AF2: #

IR1 (EH1ED):
IR2 (ADJIT):
E7:
EF:
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PWZ (ADDIT):

Pill+) = 186,1193 Et@ = 8.879e-5

5-4

RISE ASSESSMENT SPREADSMEET - INHALATION OF FUGITIVE DUST 1PAGE 1401
ELLINGTON AFD - 51TE 2
EXPOSIME SCENARIO NUMBER IA - MAXIMUM SUPFACE SOIL CONTENTRATIONS (CHILD)

MARKE	- HAITHUM SUPFACE SOI	IN - MAILINGS SUPPRICE SOIL CONTENTABLIONS (CHILD)					
CALCULATE BOSES:					101AL	1914	101AL
					DOSE (M6/FG/DAY)	PYSE (MS:16 GAY)	-
CHENICAL	C (06/16)	ALPHA (MASS FRACTION)	(5.9) 81 4	1 (16/81)	Q TIHO	CHILD APIET	TINE -WEJGHTED
Acetone	258	2.5e 7	(a) (s) (2.8858.6	5.13e 10	5.8'e 10	5.87e 18
2-Butanone	=	4.1e.8	4 223e B	3.428e 7	8.42e-11	8.37e 11	8.32e-11
Denzene	96 1	1.8e-7	1.8546.7	1.501e-6	3.78e-19	3.65e 10	3.65e-10
Ethy benzene	882	2.16-7	2.15%	1.7570-6	4. 31e 10	4.26e-18	4.26e 10
Irlenes	240	2.4e-7	2.47.E	2.882e-6	11-979-1	4.87e 18	4.87e-18
Styrene		-	•	-	•	•	-
Chloroben zene		-	-	-	-	-	-
Methylene chloride		•	-	-	•	•	-
Outy benzy phthalate		-	-	-	•	-	•
Benzolalanthracene		•	•		•	•	•
Denzolb) fluor anthene		-	-	-	•	-	-
Denzalk) fluor anthene		•	•	•	•	•	40
Denzo(a)orrene		•	-	-	•	•	•
Indeso(1,2,3-cd)ovrene		-	-	•	•	•	-
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PISE ASSESSMENT SPREABSHEET - INNALATION OF FUGITIVE DUST IPAGE INFEET ELLINGTON AFP - SITE 2 ETPOSUME SCEMMATO NUMBER IA - MATIMIM SURFACE SOIL CONCENTRATIONS ICHTEDS CALCULATE MATARD INDICES AND CANCEP RISFS:

State Stat	CHEMICAL		Anin 1	13140134-3411	1960 79. 78.	1740		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		TANK AURIUM	
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Color	Benzene	3.7Be-18	3.6%-10	3.65e-18			7.90.7	7.90.7	-	•	7 940-17
178-11 1	Ethy benzene	4. Ste-14	4.26e-18	4.240-18				•	9.050.0	2 4474.9	•
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DERMAL CONTACT WITH SOIL FORMER BASE LANDFILL

STANDARD CALCULATION

CLIENT:	AFB	FILE NO.: 363M	BY: AEH	PAGE OF Z
SUBJECT: Dermal	Contact wi	th Soil	CHECKED BY: (5-22-90)	DATE: 5/15/90

Purpose: To evaluate exposures resulting from casual contact with soil

Assumptions: Base personnel come in contact with contaminated soil 12 times /yr, for 40 yr

Exposed surface area = 2948 cm²

Soil adherence factor = 1.45 mg/cm²

Absorption is as follows. volatiles - 0.10 semi volatiles =0.05 Perticides = 0.0 metalo = 0

Body weight = 70 kg lifetime = 70 yr

Relevant Equations

An average annual dose, for noncarcinogens:

where C= contaminant concentration in soil (mg/kg)

AV = available skin area for contact (in /duy)

AF = soil adherence factor (mg/cm2)

ABS - Absorption factor (decimal fraction)

EF = exposure frequency (day /yr)

BW= body weight (kg)
365 - (mversion factor (days/yr)

10" = conversion factor (mg/kg)

STANDARD CALCULATION SHEET

CLIENT: Ellington AFB	FILE NO.: 363M	BY: AEH	PAGE 2 OF 2
Dermal Contact with	h Soil	CHECKED BY: SJH (5-22-90)	DATE: 5/15/90

Determine a time-weighted average lifetime dose, for carainogens:

Sample Calculations!

Noncarcinogen:

for naphthalene at a concentration of 180 mg/kg:

Carcinogens:

for benzene at a concentration of 180 mg/kg:

DEX= 2.06 x 10 9 mg/kg-day /

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ELLINGTON AFP STIE : HPUSTON, TETAS PSITS/OP SITE NAME: FOCULTUM:

ETFÜGIGE SCENABIO WIMPER 1 - MALIMIM FONTAMINANT CONCENTRATIONS 14 SIJSFAFF SATI

BELEVANT EPUANTONS: PETT IT - SA AF - APS - FF + EPI-IPW + AT + ET - 151-

ADUL 1: ASSUMPTIBINS: = CONCENTRATION IN SOIL ING (16)

= EXPOSED SUPFACE APEA OF SYTH (SO EM-DAY); S.

- APHERENCE FACTOR ING. SO CHI. Ą

-ARS = ABSOMPTION FRACTION: INCLINAL FGALTIONS

VOCS: Phas-Festicides: PCPs:

EFT = YOUTH EXPOSINE FREDIENCY (DATS YEAR)
EFT = ADULT EFPOSINE FREDIENCY (DAYS) LEAP);
ED = ADULT EFPOSINE (URBATION YEARS);
BWI = BODY WEIGHT ADULESTEN YE.;
RWI = PODY WEIGHT ADULT YE.;
AT = AVERAGING THE (DELYS YEAR);
IT = (FFETINE YEAPS);

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* ED AND LT ARE USER FOR CAFTINGGENTE PISK CALCULATION ONLY. (MT) USED IN CONVERSION FACTORS: 2.889e 9 DOSEsduit = (CF1)0(C)01ABS)

PISP ASSESSMENT SPPEADSMEET - DIPECT DEFMAL CONTACT MITH SOIL IPAGE TWO-ELLINGTON AFD - STYE I EXPOSUPE SCEMANIO WUMBER I - MATHWIM CONTAMINANT CONCENTRATIONS IN SURFACE FOLL CALCULATE POSES:

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INCIDENTAL INGESTION OF SOIL FORMER BASE LANDFILL

STANDARD CALCULATION
SHEET

CLIENT: Ellination AFB	FILE NO.: 363M	BY: AEH	PAGE OF Z
SUBJECT: Incidental Ingesti	on of Soil	CHECKED BY: (5-22-90)	DATE: 5/15/90

Purpose: To evaluate exposures resulting from incidental ingestion of soil

Assumptions: Base personnel come in contact with contaminated soil 12 time /yr for 40 years

A person ingests 10 mg soil per event

100% of ingested contaminant is absorbed in gastrointes-

Relevant Equations:

An average annual dese, for noncarcinogens:

where: C = Contaminant concentration in soil (my/kg)

IR = migration rate (mg / event)

ABS = absorption factor (decimal fraction)

EF = exposure frequency (events/yr)

bw = body weight (kg)

365 = conversion factor (days/yr)

Determine a time-weighted average lifetime close for carcinogens:

NUS CORPORATION AND SUBSIDIARIES STANDARD CALCULATION

Ellington AFB	FILE NO.: 363M	BY: AEH	PAGE 2 OF 2
subject! Incidental Ingestion	n of soil	CHECKED BY: 22-90)	DATE: 5/15/90
			•

Sample calculations:

Noncarcin ogen: for naphthalene at concentration of 180 mg/kg (Site 1):

IEX = 5.45 x 10-10 mg /kg - day /

Carcinogen:

for benzene at concentration of 180 mg/kg (Site 2);

1EX = 4. (3x10-10 mg/kg-day /

RISF ASSESSMENT SPREADSHEET . INCIDENTAL INGESTION OF SUL

S. Marie

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ELLINGTON AFO - SITE ! HOUSTON, TEIAS PS/15/90 SITE NAME: LOCATION: PATE:

HALAND INDICES AND INCREMENTAL CANCER RISTS ARE CALCULATED RY THIS SPREADSHEET. EIPOSUMES THANDNEM PICA INGESTION ARE CONSIDERED. ASSUMPTIONS ARE DUTLINED BELOM.

EIPOSIME SCEMMAIO MUNBER 1 - MAINUM SURFACE SOIL CONCENTRATIONS REFERENCE: EPA. BECENBER 1980

PELEVANS EQUALION: SET = 15 x SR x EF x ED1/(PM x 11 x 365 x 1E6)

C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/*G)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSUME FREQUENCY (EVENTS/YEAP)
EB = EXPOSUME DURATION (YEARS)
BW = BODY WEIGHT (FG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

VQUTH: 22222 **####**

DETERMINE CONVERSION FACTORS:

YOUTH:

: 4.697e-9 (AVS ANNUAL DOSE)

8 TAVE ANNIJAL POSE!

RISE ASSESSMENT SPREADSMEET - INCIDENTAL INGESTION OF SOIL (PAGE TWD)
ELLINGTON AFD - SITE 1
EXPOSUME SCENARIO NUMBER 1 - NATIHUM SURFACE SOIL CONCENTRATIONS
CALCULATE BOSES:

		F1-601	ADUL 1	TIME - WE IGHTED	940	153
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enzene.		•	•	•		2.9€ 2
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laphthalene	81.	•	8. Che-18	4.83e-10	£6.3	
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ercury	.19	•	8.92e-18	5.10e-18	7e •	
inc	186	•	8.454e-7	4.831e-7	20.1	
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AISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL IPAGE THREE) ELLINGTON AFB - SITE 1 ETPOSUME SCENARIO NUMBER 1 - MAITHUM SURFACE SOIL CONCENTRATIONS DETERMINE HAZAMD HOUGES AND CANCER RISE;

CHENICAL	HAZARD INDET ADOLESCENT	HAZARD INCES ADJI I	CANCER RISK LIFETINE
Acetone	-	•	-
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	•		
Utarene	• •	• ••	• •
Chlarobenzene	-	-	-
Rethviene chloride	•	•	•
buty i benzy i phthalate	-	5.818× 9	•
Denzotalanthracene	•	•	9.466-18
Benzo(b) fluoranthene	•	•	1,4442-9
Benzoth I fluoranthene	•	•	3,7736-9
Bearof a lavrene	•		8.1719-8
Internal (.2. 3-cd) syrene		•	4.999-1
Zanty by 1808	•	C 97.1	-
		G: 62.02.0	9.13-12
	•	1.532	•
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7.1.1.0	. •	2 475p k	•
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	-	6. 279.4	7.14ffe-6

INCIDENTAL INGESTION OF SOIL POL STORAGE AREA

915K ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

1. M. A.

ELLINGTON AFB - SITE 2 HOUSTON, TEXAS 05/15/98 SITE NAME: LOCATION: DATE:

HAZARD INDICES AND INCREMENTAL CANCER RISYS ARE CALCULATED RY THIS SPREADSHEET. Elposupes thandush pica ingestion are considered. Assumptions are dutiling below.

EXPOSURE SCENARIO NUMBER 1 - MAXINUM NEAR-SURFACE CONCENTRATIONS

EPA, DECEMBER 1989 REFERENCE; RELEVANT EDUATION: IET = IC x IR x EF x EDI/IBM x LT x 365 x 1E6)

C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/VG)
1R = 501L INSESTION RATE (MG/VENT)
EF = EIPOSUME FREQUENCY (EVENTS/YEAP)
ED = EIPOSUME DURATION (YEARS)
PM = 800Y WEIGHT (VG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

DETERMINE CONVERSION FACTORS:

4.697e-9 IAVE ANNUAL DOSE!

5

YOUTH: 3

B LAVE GAMILAL DOSE!

9-1

RISK ASSESSMENT SPREADSMEET – INCIDENTAL INGESTON OF SOLL FPAGE TWO-Ellington ato - Site 2 Eiposupee scenario number 1 - Matimum mear suprace concentrations Calculate doses.

100 100	Comparison Com	CACLULATE DOSES:			•	4	•	
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22.3-cd pyrene 22.3-cd pyrene 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2.3cd pyrene 2.4.3-cd pyrene 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Benzolk) fluoranthene			-	•		7.68-1
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		Arsenic		•	•	-	16.3	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOLL IPAGE THREET ELLINGTON AFD - 517E 2 EXPOSUME SCENARIO NUMBER 1 - MAILMYN NEAR SUPFACE CONTENTRATIONS DETERMINE MAJARD INDICES AND CANCER RISK:

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RETARDATION FACTORS

STANDARD CALCULATION SHEET

CLIENT: Eilington AFB	FILE NO.:	BY: AGH	PAGE OF 3
SUBJECT: Contaminant To	avel times	CHECKED BY: (5-22-90)	DATE: 5/21/90

Purpose: To determine contaminant travel times to a hypothetical receptor well ~ I mile downgradient of either site

Approach:
1. Determine interstitial pore relocity of groundwater

Vi = interstitial pore relocity of groundwater (ft/day)

K = regarantic (moduching (ft/day)

I = hydraulic gradient (ft/ft)

n = effective porosity (dimensionless)

2. Determini retardation factors

B = retardation factor (demensioners)
B = seil bulk density (g/cm³)

n = porosity

for = fractional organic curpors content (g organism/g soil)
150 = soil/sediment adsorption coefficient

(mg/g org.carbon/mg/cm3 H2O)

Determine contaminant velocity:

Vc = (ortaninant velocity (fr/day)

4. Determine contaminant travel time:

tc = travel time (days) X = aistance to well (feet)

STANDARD CALCULATION SHEET

CLIENT: Ellington AFB	FILE NO.: 363M	BY: AEH	PAGE 2 OF 3
SUBJECT: Constaminant Travel	Times	CHECKED BY:	5/21/90

Sample Calculations:

Figure 12 = 5300 m/y/

5300 m/y/

5300 m/y/

$$\frac{yr}{y} | \frac{in}{365 \text{ day}} | \frac{fE}{254 \text{ cm}} | \frac{fE}{12 \text{ in}} = 0.48 \text{ ft/day}$$

Assume for = 0.01

Assume foc = 0.01
$$p = 2.7 \text{ g/cm}^3$$
 $n = 0.35$

Chemical Koc	(ug/g org curbon/ug/L)
acetone	9.2
2-butanone	17
benzine	45
ethylbenique	1100
Kylenes	248
styrene	417
chlorobenzine	330
methylene Ehloride	&. &
butglenyelphthalate	170,000
benzo(a) anthracene	200,000
banzalis/fluoranthene	550,00 0
benzola) pyrene	\$5000
indens (1,2,3-cd) pyrene	1.6410 6
reptthelene	940
4,4'-005	3.5x106
benzo	

STANDARD CALCULATION SHEET

CLIENT: Ellington AFB	FILE NO.: 363M	BY: AEH	PAGE 3 OF 3
SUBJECT:		CHECKED BY: (5-22-90)	DATE: 5/21/90

acetone:

$$R = 1 + \frac{2.7 \, \text{g/cm}^3}{0.35} \left(\frac{0.01 \, \text{g}}{9} \right) \left(\frac{9.2 \, \mu \text{g}}{\mu \text{g} \, / \, \text{cm}^3} \right) = 1.7 \, \sqrt{\frac{1}{100}}$$

similarly:

similarly:		
Chemical	R	Contaminant Velouty (felday) *
acetone	1.7	6.28
2-butanone	23	0.21
benzine	6.0	80.0
ethylbenzens	86	5.6×10-3
kylenes	20	2.4×10-2
styrene	33	1.4×10-2
Chloroben zene	26	1,8x10-2
methylene Ellor, de	1.7	0.28
butylbenzylphthalate	13100	3.7×10 ⁻⁵
benzo(a)anthracene	15400	3.1×10-5
banzo(b) fluor anthere	42460	1.1×10-5
benzola) syrene	42400	1.1 × 10-5
inadio(1,2,3-cd) pyrene	123,000	3.9 × 10 6
nophthalene	74	4.5×10-3
44'-DDT	301,000	1.6 × 10 -6

^{*} contaminant relicity: Vi/R

The distance to a receptor well is ~ 1 mile (5280 ft) tacetone = 5280 ft / 6.28 ft /day = 18,857 days

> 52 yr. 1

APPENDIX G

REGULATORY AGENCY CORRESPONDENCE REGARDING ELLINGTON FIELD (ANG) SITE INVESTIGATION

- MINUTES FOR REGULATORY REVIEW MEETING
- NGB REQUEST FOR COMMENTS

MEETING MINUTES DRAFT SITE INVESTIGATION REPORT REGULATORY REVIEW MEETING 147TH FIGHTER INTERCEFTOR GROUP TEXAS AIR NATIONAL GUARD ELLINGTON FIELD HOUSTON, TEXAS

DATE OF MEETING: October 3, 1990

PLACE OF MEETING: Ellington Field, Houston, Texas

Persons attending:

Name	Affiliation	Telephone
Bob Allen	Harris County Poll. Cont.	(713) 920-2831
Larry Basilio	NUS Corporation	(713) 492-1888
Steve Fleming	HAZWRAP	(615) 435-3254
Shanon Goldberg	HAZWRAP	(615) 435-3310
Maj. Sheila F. Hooten	147 CES, Ellington	(713) 929-2781
Amy Hubbard	NUS Corporation	(412) 788-1080
Paul R. Nelson	City of Houston (Utilities)	(713) 525-9855
Col. Tom Shellshear	147 FIG/DCS	(713) 929-2403
Linda Steakley	NUS Corporation	(713) 492-1888
Don Williams	NGB/DEVR	(301) 981-8159

Morning Meeting/Site Tour

On Wednesday, October 3, 1990, a meeting was held among ANG, HAZWRAP, NUS and regulatory agency personnel. Mr. Williams, of the NGB, provided a brief overview of the purpose of the meeting, which was to review comments received from regulatory agency personnel and to discuss the scope of work for determining the extent of contamination at the POL site. Ms. L. Steakley, of NUS Corporation, was introduced. Ms. Steakley summarized the results and recommendations of the Site Investigation (SI) and reviewed the proposed Remedial Investigation (RI) work to be performed at the POL site. A discussion ensued concerning the recommendation to prepare a Decision Document (DD) proposing no further action at the landfill, as well as proper abandonment of existing ground-water monitor wells. The fate of one UST remaining at the landfill was also discussed.

An RI of the POL site was proposed to further investigate the extent of contamination discovered during the SI. Items outlined were:

- The schedule for remediation activities
- The criteria under which the site would be remediated
- Community Relations Plan (CRP)
- The role of regulatory agency review of documents

A DD will be written for the Fuel System Repair Shop (FSRS) and the Former Base Landfill by NUS.

NUS' management of disposal of containerized materials generated during the SI was discussed.

A site tour of the POL site was conducted by Major S. Hooten. Major Hooten answered questions concerning the historical account of activities at the site.

Afternoon Meeting

In the afternoon session, representatives of ANG, HAZWRAP, and NUS met to discuss, in general terms, the scope of work necessary to define the extent of contamination at the POL site. After significant open discussion and brainstorming about how to most appropriately define the extent of contamination at the POL site, the eight tasks indicated below were tentatively agreed upon. These tasks were developed assuming the site will be remediated in accordance with the UST program cleanup guidelines instead of the CERCLA/IRP criteria. Refer to Attachment 1. POL Site Map, for the general location of proposed wells and borings.

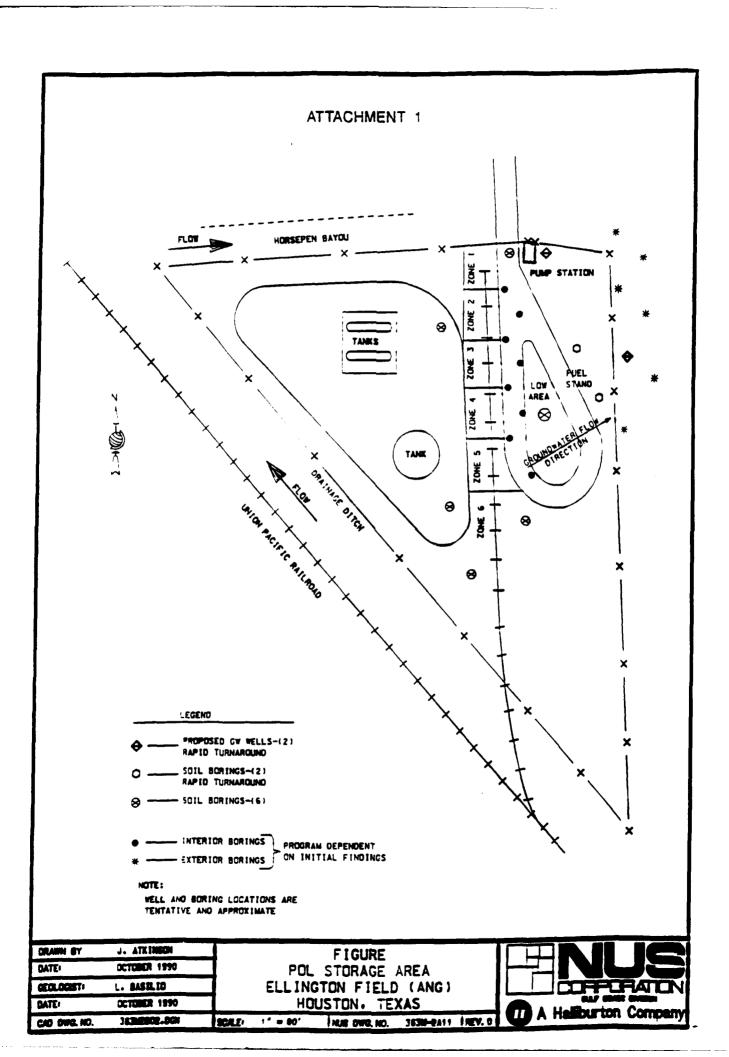
- Place two monitor wells on the eastern edge of the POL to determine if offsite migration has
 occurred.
- 2. Two soil borings will be placed near the east fuel standpipes.
- 3. One soil boring will be placed in the center of the former cul-de-sac.
- 4. Five soil borings will be placed around the rail track to determine the extent of contamination on the north, west, and south boundaries, which occurred during tank car loading and unloading operations.
- 5. Up to three soil samples will be collected from each boring. One at the top of ground water and up to two more, based on field evidence of contamination.
- Soil samples will be analyzed for TPH. If concentrations are less than 100 ppm, BTEX will also be run on that sample.
- 7. Monitor well and east fuel stand borings sample analysis will be done on 24-hour or 48-hour turnaround, if possible.
- 8. If perimeter samples (indicated by * on Attachment 1) are clean, then the RI will continue with interior borings to define extent of rail track contamination. If perimeter samples indicate contamination, another meeting will be held to determine further action.

The following items were also outlined:

- Deliverables to be attached to the final SI report
 Distribution of meeting minutes
 Draft RI work plan schedule

Submitted by:

Linda G. Steakley NUS Corporation





DEPARTMENTS OF THE ARMY AND THE AIR FORCE

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NUS CORPORATION HOUSTON, TEXAS

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Ms. Susan Bredehoeft
Texas Water Commission
5144 East Sam Houston Parkway North
Houston, Texas 77015

Dear Ms. Bredehoeft

A regulatory review meeting was held at the 147th Fighter Interceptor Group, Ellington Field, Houston on October 3, 1990 to receive comments on the Site Investigation Report and to scope additional activities necessary for remedial investigation at the POL storage area. Representatives from your office, the Texas Air Control Board, Texas Department of Health, and the Harris County Pollution Control Department were invited to attend. Minutes of the meeting are attached for your use.

The purpose of this letter is to summarize proposed actions for the disposition of each site prior to finalizing the SI report.

Results of soil and groundwater sampling and a preliminary risk assessment at the Former Base Landfill concluded that no significant risks to human health exist as a result of minor contamination at this site. A no further action Decision Document will be prepared for site closure. In addition, the monitoring wells will be abandoned according to TWC procedures and a deed restriction will be recorded. Master plan documents will clearly indicate future use of this site as open space.

Results of soil sampling at the POL Storage Area indicated total petroleum hydrocarbon (TPH) contamination in soils of concentrations which exceed TWC clean closure criteria. The extent of contamination is not known. No contaminants were detected in groundwater that exceed Maximum Contaminant Levels or Drinking Water Health Advisories. A preliminary risk assessment concluded that no significant risks to human health exist at this site. The NGB will continue investigation of soils and remediate, if necessary, according to cleanup criteria stated in the "Guidance Manual for LPST Cleanups in Texas, Texas Water Commission, Petroleum Storage Tank Division, January 1990". Results of findings from additional field work will be evaluated to determine whether cleanup will be required.

The Preliminary Assessment (Records Search) identified a third site near the Fuel System Repair Shop. Additional information has been obtained regarding the spill incident to provide sufficient rationale to close out the site via Decision Document.

During the conduct of field work, several drums of SI derived waste were stored pending results of sample analyses. These wastes will be managed in accordance with SI report Section 2.1.8.

Please coordinate your review with a representative from the Petroleum Storage Tank Division and provide us with your written comments as soon as possible so that we can finalize the SI report.

If you have any questions, please call Mr. Don Williams, NGB Project Manager, at (301) 981-8159.

Sincerely

RONALD M. WATSON, Chief Environmental Division

cc: Mr. Steve Fleming/HAZWRAP

Ms. Linda Steakely/NUS Houston

Maj Sheila Hooten/147FIG/DE

Mr. Bob Allen/Harris County