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FINAL

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT

CORRECTIVE ACTION PLAN

HOLLOMAN AIR FORCE BASE, NEW MEXICO

SITE SS-17, BX SERVICE STATION

CONTRACT NUMBER DACW45-90-D-0007
WALK, HAYDEL & ASSOCIATES JOB NO. 5362.54

SEPTEMBER 1992

UNDER CONTRACT WITH:
OMAHA DISTRICT, CORPS OF ENGINEERS
215 NORTH 17TH STREET
OMAHA, NEBRASKA 68102-4978

FOR:
HEADQUARTERS, TACTICAL AIR COMMAND
HQTAC/DEVR
LANGLEY AIR FORCE BASE, VIRGINIA 23665

PREPARED BY:

WALK, HAYDEL & ASSOCIATES, INC.
PROJECT MANAGERS - ENGINEERS - CONSTRUCTION MANAGERS

9-1-1992

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CORRECTIVE ACTION PLAN

HOLLOMAN AIR FORCE BASE, NEW MEXICO
SITE SS-17, BX SERVICE STATION

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WH&A Job No. 5362.54
September 1992

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ACRONYMS

AFB	Air Force Base
BETX	Benzene, Ethylbenzene, Toluene and Xylene
CAP	Corrective Action Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DOD	Department of Defense
FID	Flame Ionization Detector
FRP	fiberglass reinforced plastic
IRP	Installation Restoration Program
LEL	Lower Explosive Limit
NM	New Mexico
NMED	New Mexico Environment Department
PID	photoionization detector
ppb	parts per billion
ppm	parts per million
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
U.S.	United States
USACE	U.S. Army Corps of Engineers
USTs	Underground Storage Tanks
VOCs	Volatile Organic Compounds
Walk, Haydel	Walk, Haydel & Associates, Inc.

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This Corrective Action Plan (CAP) for Site SS-17, the BX Service Station, at Holloman Air Force Base (AFB), New Mexico (NM) has been prepared by Walk, Haydel & Associates, Inc. (Walk, Haydel) for the United States (U.S.) Army Corps of Engineers. It includes a performance evaluation of the gasoline removal system currently in operation at the site, recommendations for system improvement, results of a field investigation performed in June 1991 which included the drilling and sampling of borings and air monitoring, a comparative study of selected soil remediation technologies used to develop remedial action alternatives and recommendation of a preferred remedial action alternative.

The gasoline removal system currently in operation consists of four recovery trenches. Trench Nos. 1 and 2, located in the area of greatest product thickness, have accounted for the vast majority of product removed, while Trench Nos. 3 and 4, located on the edge of the plume, have not recovered as much free product due to the smaller amounts of mobile free product in these areas. Recovery rates have decreased with operation time. In May 1988, prior to the current system start-up, it was estimated that 30,000 gallons of mobile product was on the water table at Site SS-17. Since system start-up (October 16, 1989) to January 12, 1992, approximately 28,800 gallons of gasoline have been removed. Current product thickness measurements indicate a significant decrease in mobile product thickness (possibly due in part to groundwater elevation fluctuations). In general, it appears that the recovery system has been effective in controlling the migration of the gasoline plume and that the quantity of mobile free product remaining has decreased significantly.

Recommendations for system improvement can be made only after additional information concerning recovery performance and further characterization of the site are complete. The following work should be performed and results evaluated before recommendations for system improvements can be made:

1) performance of weekly field bail-out tests,

2) installation of borings and monitoring wells around well TH-15 (a suspected new source area), and

3) engineering review of site data.

In addition to the above work, discharge from the Holloman AFB wastewater treatment plant should be sampled and analyzed for fuel constituents to determine the impact of Site SS-17 recovery system water discharge on the quality of treated water.

Field investigations performed in June 1991 indicated typical fuel constituents in soil and groundwater. Air monitoring was conducted at four vacant residences, 11 sewer manholes, the Car Wash Grit Chamber and a sanitary sewer lift station. Within residences, organic vapor readings were below 5 ppm. Had vapors been detected above 5 ppm, BETX (Benzene, Ethylbenzene, Toluene and Xylene) monitoring (using a field Gas Chromatograph) would have been performed to identify and quantify the compounds causing the elevated readings. No explosive vapors were detected. With regard to the sewer manholes, the Car Wash Grit Chamber and sanitary sewer lift station, the highest BETX constituents were detected in the Car Wash Grit Chamber followed by three manholes near Trench No. 1. BETX was detected at the grit chamber at concentrations ranging from <1 ppb to 37 ppb xylene; no explosive vapors were detected. The highest levels of explosive vapors were recorded in manhole MH-92 (south of the Service Station) at 35% of the Lower Explosive Limit (LEL). BETX concentrations at the lift station ranged from <1 ppb to <3 ppb xylenes; no explosive vapors were detected. Based upon this June 1991 investigation, it can be concluded that SS-17 soils are not a source of potentially harmful vapors in utilities, basements or other surface or subsurface structures. One vapor reading within the sewer lines, however, exceeded the criteria of 30% LEL.

Where highly contaminated soils are present, the New Mexico UST Regulations require the owner or operator to either: (1) excavate the soils or (2) where highly contaminated soils remain beyond the depth or horizontal extent of practicable excavation, soils may be treated in-place. Remedial action alternatives were developed to eliminate highly contaminated soils assumed to be present at the site. Highly contaminated soils may be

present due to fuel leaking from underground storage tanks (USTs) and lines. These alternatives were developed based upon a comparative study of selected remediation technologies and their applicability to Site SS-17. Five alternatives were identified:

1) **Alternative 1 - No Action** - The no action alternative would not produce results required by NM UST Regulations. Potentially highly contaminated soils would remain in place. The no action alternative is included for comparative purposes only.

2) **Alternative 2 - Limited Action** - Based upon information obtained from the August 12, 1991 conference with the NM UST Bureau (see Appendix E), if groundwater monitoring is conducted for eight consecutive quarters without detecting free product in any site monitoring well, the site is considered to be clean and no remediation of soil is necessary. Although the Bureau's guidance is not specified in the NM UST Regulations, this criterion for a clean site is considered a remedial alternative. It is a passive remedial alternative with no active remediation of highly contaminated soils.

3) **Alternative 3 - Excavation** - Highly contaminated soil would be excavated and disposed of at an approved off-base facility or treated on-base. This alternative would be implemented after trench operations cease to recover free product. This alternative assumes practical volumes of highly contaminated soil remain after cessation of trench operations. Should this not be the case, an alternate means of remediation would be needed.

4) **Alternative 4 - Soil Venting** - This alternative could be implemented while the trench recovery systems are operating to remove free product. Air would be drawn from (and possible injected into) the vadose zone (above the depressed groundwater table) to reduce the presence of fuel materials in soils to a level that is not classified as highly contaminated. After free product is removed, the groundwater table would be raised and then lowered. Residuals which have adhered to soils by this raising and lowering

of the groundwater table would then be removed by reactivation of the soil venting system. This process of raising and lowering the groundwater, followed by reactivation of the soil venting system, could be repeated until recovered vapors stabilize.

5) **Alternative 5 - Soil Flushing** - A horizontal piping system would be established over the area believed to contain highly contaminated soils and water with surfactants would be allowed to percolate into the soil. This alternative would be implemented while the trench recovery system is operating to remove free product. Introduced water with washed constituents and groundwater would be captured by the trench recovery system and recovered water could be routed to the sanitary sewer system. Pretreatment of recovered water may be required before discharge to the sanitary sewer system.

Each alternative was evaluated based upon implementation, impact on base operations, fire/explosion risk and cost. A comparison was made to determine the preferred alternative.

Alternative 4, Soil Venting, has been chosen as the preferred remedial alternative for Site SS-17. This alternative could be implemented under current conditions with the gasoline removal system in operation. Estimated cost to perform this alternative is $350,000. By installing a venting system, two systems (venting and gasoline recovery) would be concurrently remediating Site SS-17 to comply with NM UST Regulations which require that no floating product be present on the water table and no highly contaminated soils remain in the ground.

Components of the preferred alternative are as follows:

1) Define area to be remediated - Drill borings to determine area to be remediated. Collect soil samples for enumeration studies and soil gas levels.

2) Field vapor permeability test - Perform pilot test to determine the vapor permeability, influence of an extraction well (or trench) and gasoline constituent concentration of extracted vapors.

3) Engineered design of venting system - Design will be based upon results of component 2 to determine the number, location, configuration and size of venting wells in addition to air flow extraction (and possible injection) rates, and trench pumping rates to maintain an adequately depressed groundwater table.

4) Installation and operation of system - Installation of the system, start up and operation of the system and periodic monitoring of discharged air.

5) Confirmation borings - Drilling and sampling of approximately twelve borings in the remediated area to confirm that the soils are no longer in a highly contaminated state.

1.0 INTRODUCTION

1.0 INTRODUCTION

1.1 Purpose and Organization of Report

The purpose of this Corrective Action Plan (CAP) is to identify, analyze, and recommend a means to remediate "highly contaminated" soil which may be present at Site SS-17, the BX Service Station, at Holloman Air Force Base (AFB), New Mexico (NM). This report presents background information on Site SS-17, including an updated records search; discusses the gasoline recovery trench system currently operating at Site SS-17; summarizes the CAP field investigation and resulting analytical data; presents applicable Underground Storage Tank (UST) regulations; identifies soil remediation technologies; evaluates remediation alternatives; and describes the preferred remediation alternative.

This CAP has been prepared by Walk, Haydel & Associates, Inc. (Walk, Haydel) for the United States (U.S.) Army Corps of Engineers under Contract No. DACW45-90-D-0007. Appendix A contains a copy of the Scope of Services.

1.2 Background Information

1.2.1 Site Description

Holloman AFB is located on approximately 50,700 acres in the west central section of Otero County in south central New Mexico (Figure 1-1). Holloman AFB is accessible from the north and south by United States (U.S.) Highway 54 and from the east and west by U.S. Highway 70. The base lies within the Tularosa Basin, which is bounded by the San Andres Mountains to the west and the Sacramento Mountains to the east.

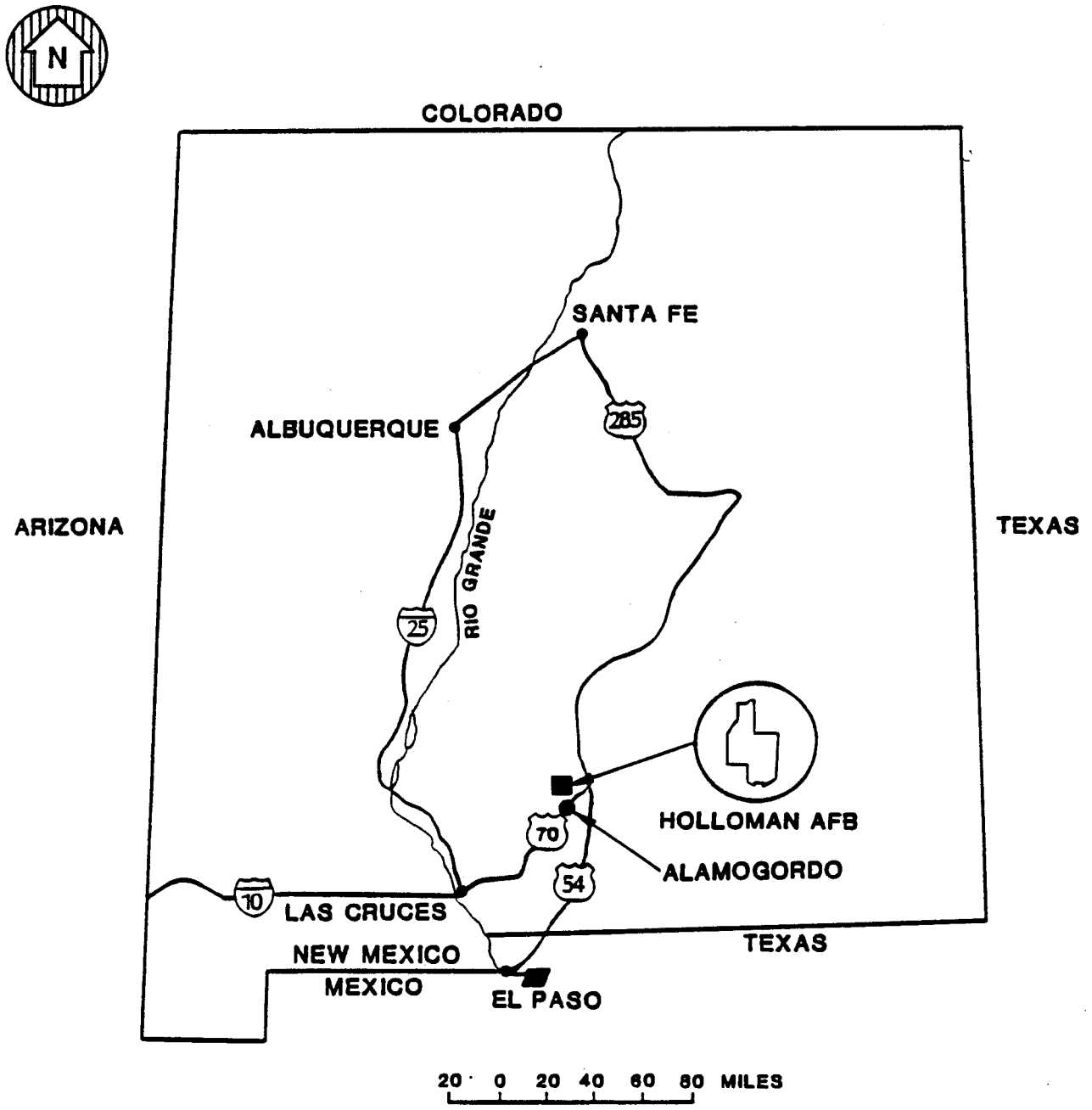


FIGURE 1-1

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

HOLLOMAN AFB LOCATION MAP

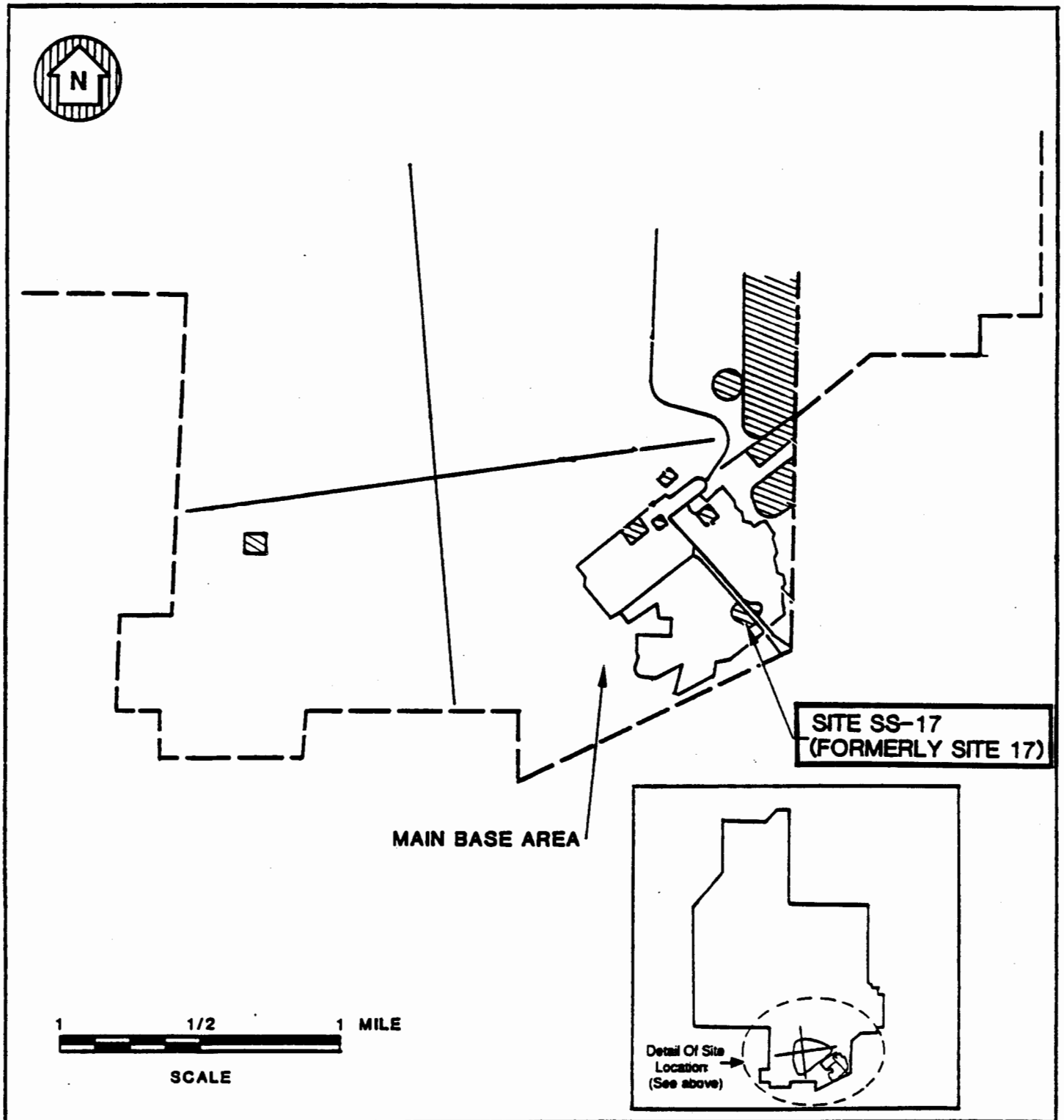
Site SS-17, the BX Service Station, is located on First Street in the main portion of the base, approximately 1,500 feet from the main gate (see Figures 1-2 and 1-3). Site SS-17 includes a service station, convenience store, and car wash. Five USTs (4 - 10,000 gallon, and 1 - 5000 gallon) were removed from the site and disposed in February 1992. They were replaced with three above ground storage tanks - 6000 gallons each). Refer to Figure 1-4 for their location.

The service station has been in its present location since the early 1950's. The Base Hospital is located approximately 420 feet to the northeast, an elementary school is located approximately 600 feet to the northwest, and base residential housing is located approximately 200 feet to the southwest.

1.2.2 Site History and Previous Investigations

The following paragraphs describe the history of Site SS-17 and previous investigations. A summary of the site history is included in Table 1-1 and estimations of gallons of gasoline released and recovered are included in Table 1-2.

January 1981 discrepancies in gasoline storage tank inventories prompted an investigation of Site SS-17. It was believed that the highly corrosive nature of the groundwater underlying Holloman AFB (high total dissolved solids, chlorides, and sulfates) had corroded underground fuel lines (installed in the early 60's), causing them to leak. Subsequent excavation of the area around the tanks verified that fuel had leaked from these lines. Initial estimates of the total volume of the spill ranged from 100,000 to 150,000 gallons. The underground fuel lines were replaced with fiberglass lines to reduce the potential for future leakage. A tank pressure testing program



LEGEND

BASE BOUNDARY

ROAD

FIGURE 1-2

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

LOCATION OF SS-17

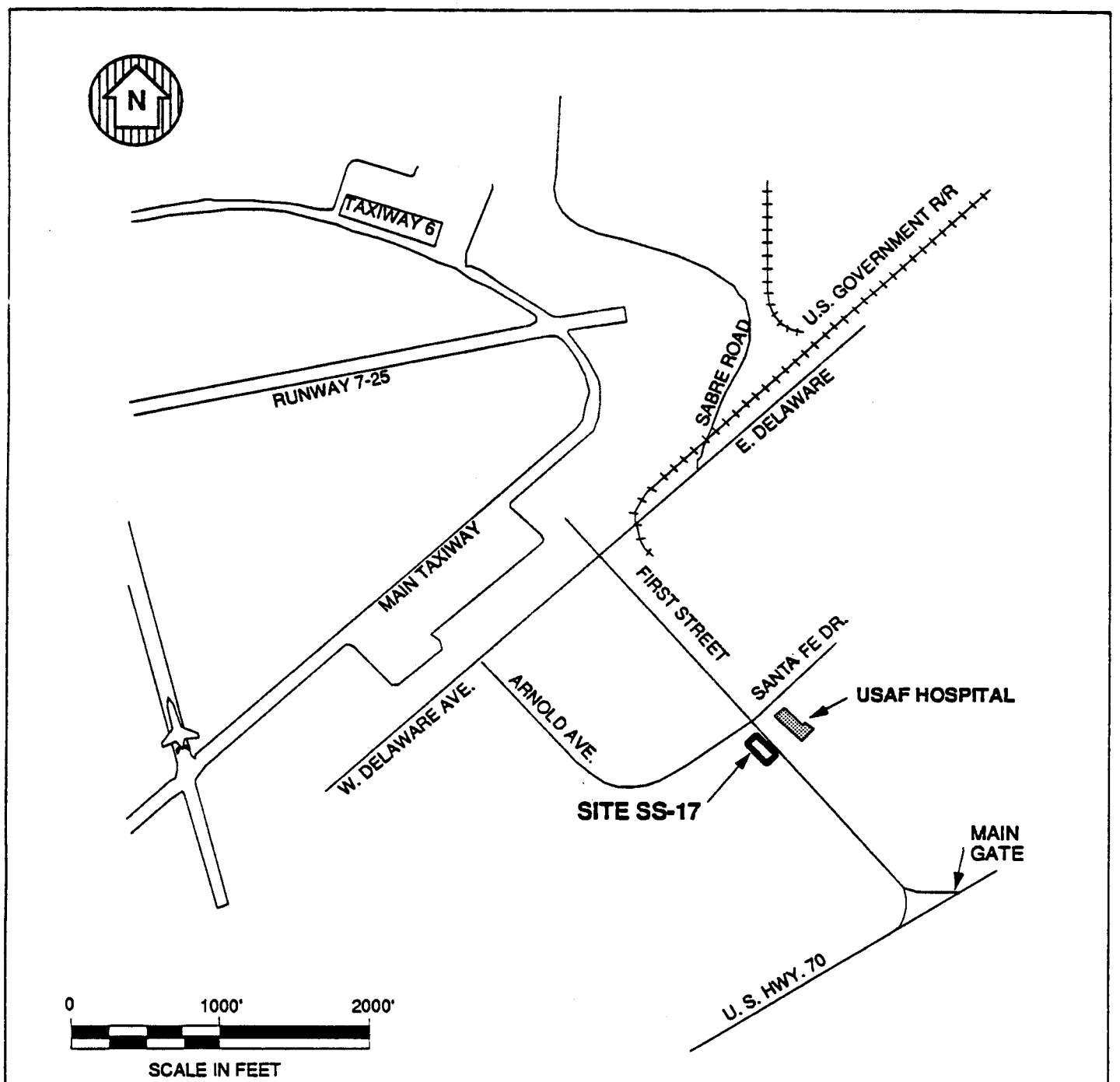


FIGURE 1-3

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

LOCATION OF SITE SS-17
IN REFERENCE TO MAIN GATE

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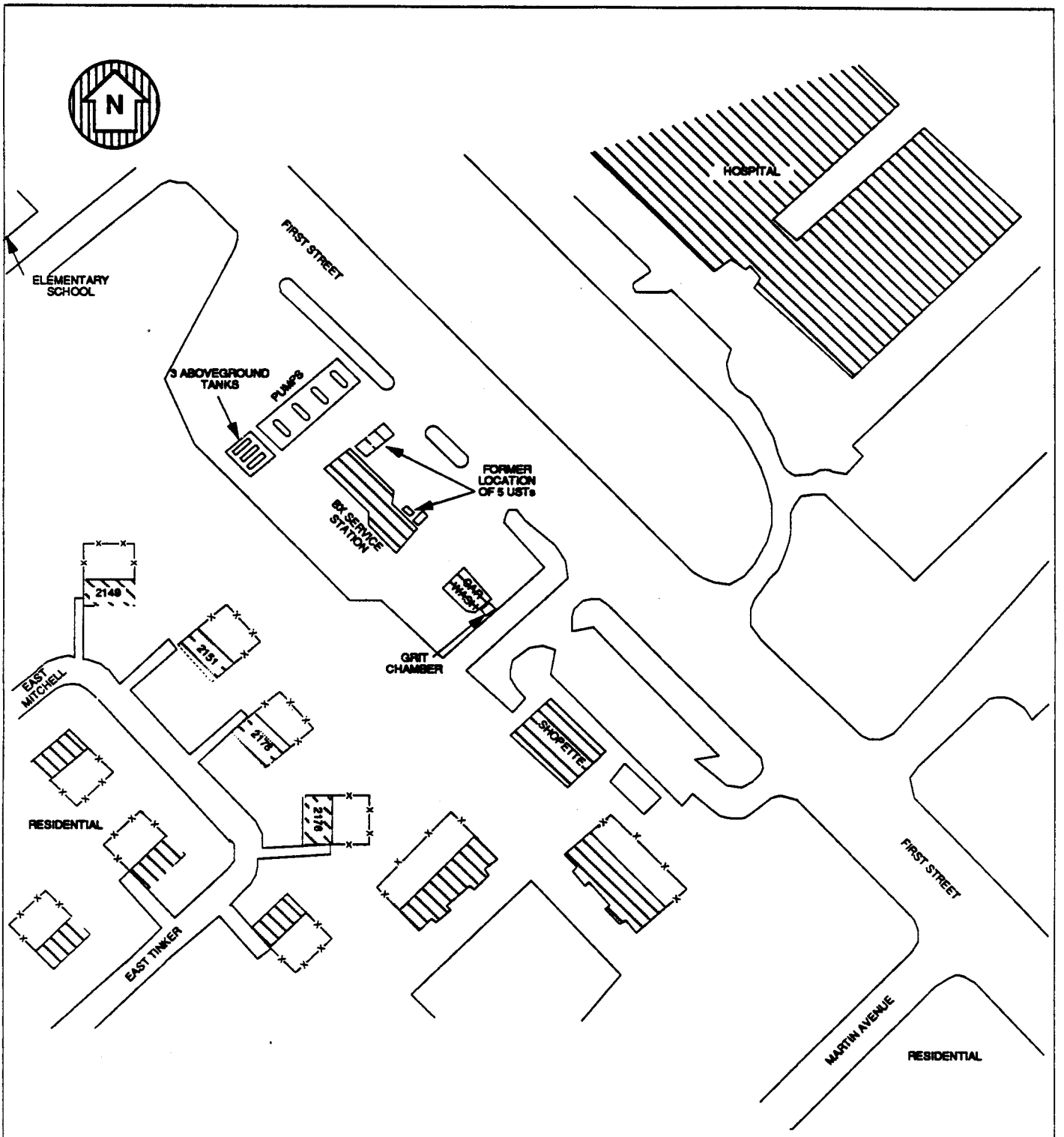

FIGURE 1-4

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

SITE SS-17,
BX SERVICE STATION

NOTE: DRAWING NOT TO SCALE

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TABLE 1-1

SITE SS-17

SUMMARY OF SITE HISTORY

DATE	
1/81	Discrepancies in inventories prompt investigation; leaking lines confirmed and replaced; estimated 100,000 to 150,000 gallons of gasoline have leaked.
2/81	Test borings drilled and monitoring wells installed; up to 4 feet of gasoline in wells; 2 recovery wells installed and estimated 275 gallons of gasoline removed. Operation of recovery wells discontinued due to lack of recovery.
83	Phase I performed by CH_2M HILL; concluded that the BX Service Station is the site of highest potential for environmental impact.
84	Phase II performed by Dames & Moore; 17 wells installed and 12 test holes drilled; estimated 71,000 gallons of gasoline remained.
1/87	Recovery resumed incorporating 3 recovery wells and 2 trenches. From January to December 1987, recovered approximately 14,500 gallons of gasoline.
88	Walk, Haydel Technical Report issued; estimated 30,000 gallons of gasoline remained; recommended 2 additional trenches, modification of 2 existing trenches and cessation of recovery wells.
89	Implemented recommendations; recovery resumed in October 1989.
4/90	Walk, Haydel visited site to determine water levels and product thickness; issues Addendum to Technical Report with recommendations. From October 16, 1989 to April 15, 1990, 11,900 gallons of gasoline were recovered.
4/91	Walk, Haydel records search.
6/91	Walk, Haydel CAP field work. From April 16, 1990 to August 25, 1991, 16,800 gallons of gasoline were recovered.
2/91	From August 25, 1991 to January 12, 1992, 99 gallons of gasoline have been recovered.

TABLE 1-2

SITE SS-17

GALLONS OF GASOLINE RELEASED AND RECOVERED

Date	Estimation of Release	Estimation Remaining	Recovered	Recovered to Date (cumulative)
1/81	100,000-150,000	100,000-150,000	-	-
2/81	-	-	275	275
84	-	71,000	-	275
1/87-12/87	-	-	14,500	14,775
88	-	30,000	-	14,775
10/16/89-4/15/90	-	-	11,900	26,675
4/16/90-8/25/91	-	-	16,800	43,475
8/26/91-1/12/92	-	-	99	43,574

was implemented and the underground fuel storage system reported to be in satisfactory condition.

In February 1981, test borings were drilled around the station to assess the extent of gasoline contamination. Gasoline thicknesses up to 4 feet were found in monitoring wells at depths of 6 to 10 feet below the ground surface. Two recovery wells were installed in the area of maximum gasoline thickness and 5,500 gallons of liquid were removed. Analysis indicated that the removed liquid was 95 percent water. Recovery operations were discontinued until a new system was implemented in 1987.

In 1983, a Phase I evaluation (performed by CH_2M Hill) under the Installation Restoration Program (IRP) identified the BX Service Station as the site at Holloman AFB with the highest potential for environmental impact. A Phase II evaluation performed by Dames & Moore in 1984 included the installation of 17 monitoring wells and 12 test holes in the suspected area of the gasoline plume. Product was detected in 21 of the 29 borings at thickness levels ranging from trace amounts to 2.3 feet. The Phase II report estimated that about 71,000 gallons of gasoline remained.

In January 1987, recovery operations were resumed using three recovery wells and two recovery trenches. Based on information provided by base personnel, approximately 14,500 gallons of gasoline were recovered during the period from January to December 1987. The recovery operation was subsequently stopped in December 1987 in order to determine natural groundwater flow patterns without the influence of pumping.

In 1988, a comprehensive technical report was prepared by Walk, Haydel to better define the extent and volume of contamination, to

review the effectiveness of the present recovery system, and to recommend a conceptual design for improvements to the existing recovery system. In the 1988 report, it was estimated that about 30,000 gallons of gasoline remained. The Technical Report recommended the installation of two additional recovery trenches, the modification of two existing recovery trenches, and the cessation of operation of existing recovery wells. The recommendations were implemented in 1989 and recovery began in October 1989.

Walk, Haydel representatives visited the site in April, 1990 to inspect the trenches and associated systems and to determine the water level and product thickness in various monitoring wells throughout the site. Walk, Haydel recommended the following to improve system performance: 1) deepen Trench No. 3; 2) perform additional monitoring; 3) perform a tank tightness test, modify reporting forms, monitoring procedures, and operation and maintenance; 4) perform an elevation survey; and 5) further monitor the sewer system. Holloman AFB modified Trench No. 3, and has continued monitoring the wells and sewer system.

A records search and subsequent field investigation were conducted in the Spring and Summer of 1991 to support the CAP. Both the records search and field investigation are discussed in subsequent sections of this report.

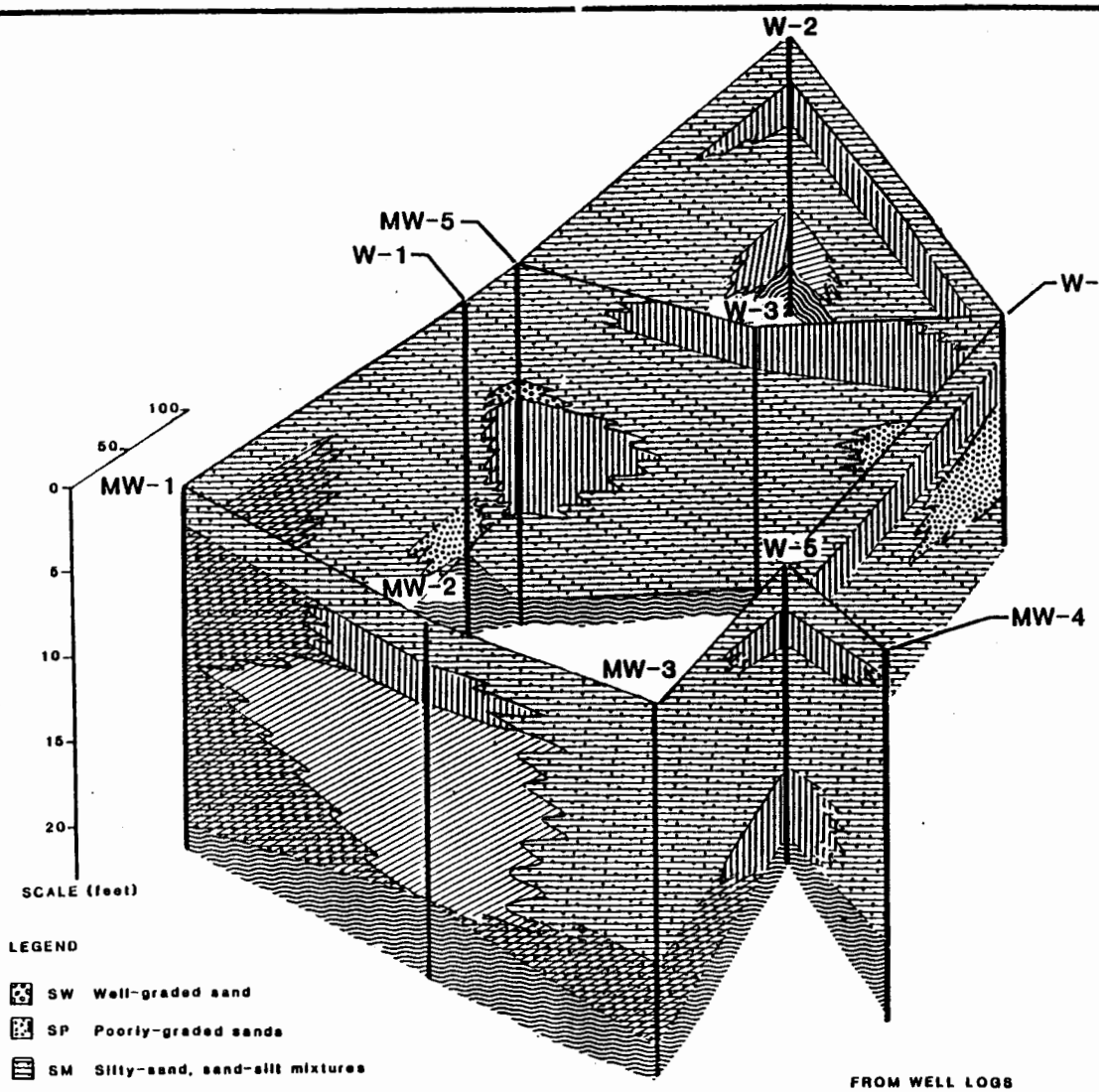
1.2.3 Site Geohydrology

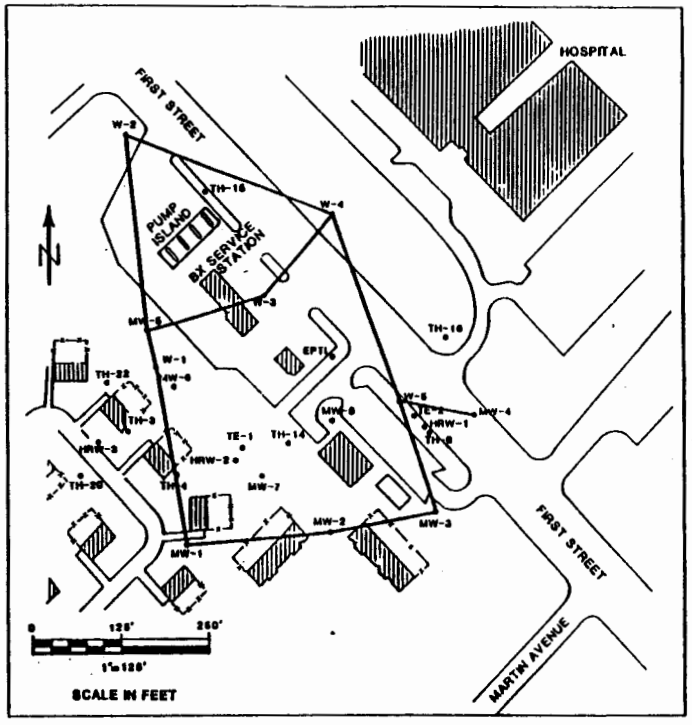
Surficial soils in the vicinity of Holloman AFB are generally thin, well drained soils composed of fine silts and sands formed from gypsiferous sediments of eolian or alluvial origin. A few feet below the surface, occasional white calcareous layers up to one inch thick

and lenses of gypsum-cemented sandstone up to one foot thick in sediments have been encountered.

The ground surface in the vicinity of Site SS-17 is covered with concrete or asphalt over roughly 30 to 40 percent of the area and another 10 to 15 percent is covered with coarse gravel. Borings performed at Site SS-17 indicate that the soils in this area consist primarily of silty-sand, sand-silt mixtures (SM) down to depths of approximately 15 to 20 feet below grade with strata of clayey sand, sand clay mixtures (SC), and inorganic silts and very fine sands (ML) commonly present. Also present within the SM matrix are smaller less continuous lenses of poorly-graded sands (SP) and well-graded sands (SW). Below this upper zone is a layer of red, lean, inorganic clays (Cl) which appears to be fairly continuous across the subject area. However, the thickness of this zone cannot be determined with existing data since site borings have not fully penetrated this layer. A fence diagram of the generalized soil profile in the area of the BX Service Station is provided as Figure 1-5. The average soil porosity is estimated to be approximately 10 percent based on laboratory tests by El Paso Testing Laboratories.

The groundwater at Holloman AFB contains high concentrations of dissolved minerals (>10,000 mg/l TDS). The water table at Site SS-17 has been observed to vary from approximately 5 to 10 feet below grade. Typically, depths to the water table are greatest near the operating recovery trenches (particularly Trench Nos. 1 and 2) due to the drawdown associated with gasoline recovery. The overall hydraulic gradient in the vicinity of the site is to the south-southeast. However, the gradient near the operational trenches is significantly influenced such that the gradient is towards the trenches. Hydraulic gradients observed at the site away from the operating trenches or





LEGEND

- SW Well-graded sand
- SP Poorly-graded sands
- SM Silty-sand, sand-silt mixtures
- SC Clayey sand, sand clay mixtures
- ML Inorganic silts and very fine sands
- CL Inorganic clays

FROM WELL LOGS

W-1 through W-5 (DAMES AND MOORE, 1987)

MW-1 through MW-5 (WALK, HAYDEL & ASSOCIATES, INC., 1988)

FIGURE 1-5

DRAWN	DJC	WALK, HAYDEL & ASSOCIATES, INC. NEW ORLEANS MOBILE BATON ROUGE
DATE		
CHK'D		HOLLOMAN AIR FORCE BASE
DATE		
APPR'D		GENERALIZED SOIL PROFILE BX SERVICE STATION
DATE		

NO.	DATE	BY	DESCRIPTION	CHK'D	SCALE	JOB NO.	CONTRACT NO.	REV.
			REVISIONS			88-3781	DACA45-88-C-0043	0

when the trenches were not operating were found to vary from 0.002 to 0.009 ft./ft.

The hydraulic conductivity at the site has been estimated by performing slug tests on nine site wells (MW-1 through MW-9). The slug tests yielded results ranging from 6×10^{-4} cm/sec at MW-1 to 2×10^{-5} cm/sec at MW-3. Based on the slug test results, the overall site hydraulic conductivity is estimated to be approximately 8×10^{-5} cm/sec. This estimate is in reasonable agreement with the hydraulic conductivity estimates obtained from pump tests during the Phase II investigation. The average hydraulic conductivity estimate from the Phase II investigation is 5.6×10^{-5} cm/sec.

1.2.4 Records Search

A records and literature search for Site SS-17 was conducted in April 1991 by Walk, Haydel. The search consisted of interviews, obtaining drawings of the site, identification and tracing of utility lines, and confirming the location of five USTs. Personnel from various Holloman AFB departments, including Engineering, Environmental, Plumbing, Housing and Bioenvironmental, were interviewed concerning Site SS-17. The interviews provided the following information:

- One, unconfirmed, explosive incident occurred in the summer of 1984 or 1985 in the sewer system at Site SS-17;

- Water and sewer lines at and near Site SS-17 are constructed of polyvinyl chloride (PVC) pipe. The water lines occur approximately 18 inches below grade and the sewer lines approximately 4 feet below grade;

- Confirmation that four base houses (Building Nos. 2149, 2151, 2178, and 2176) next to Site SS-17 have been evacuated due to petroleum odors.

Historical utility and design drawings of Site SS-17 and its vicinity were obtained. The drawings were compared and verified in the field. The field observations confirmed the location and size of the five USTs and associated piping. Field observation also confirmed the location of utility lines in the vicinity.

END OF SECTION 1.0

2.0 GASOLINE RECOVERY TRENCH SYSTEM

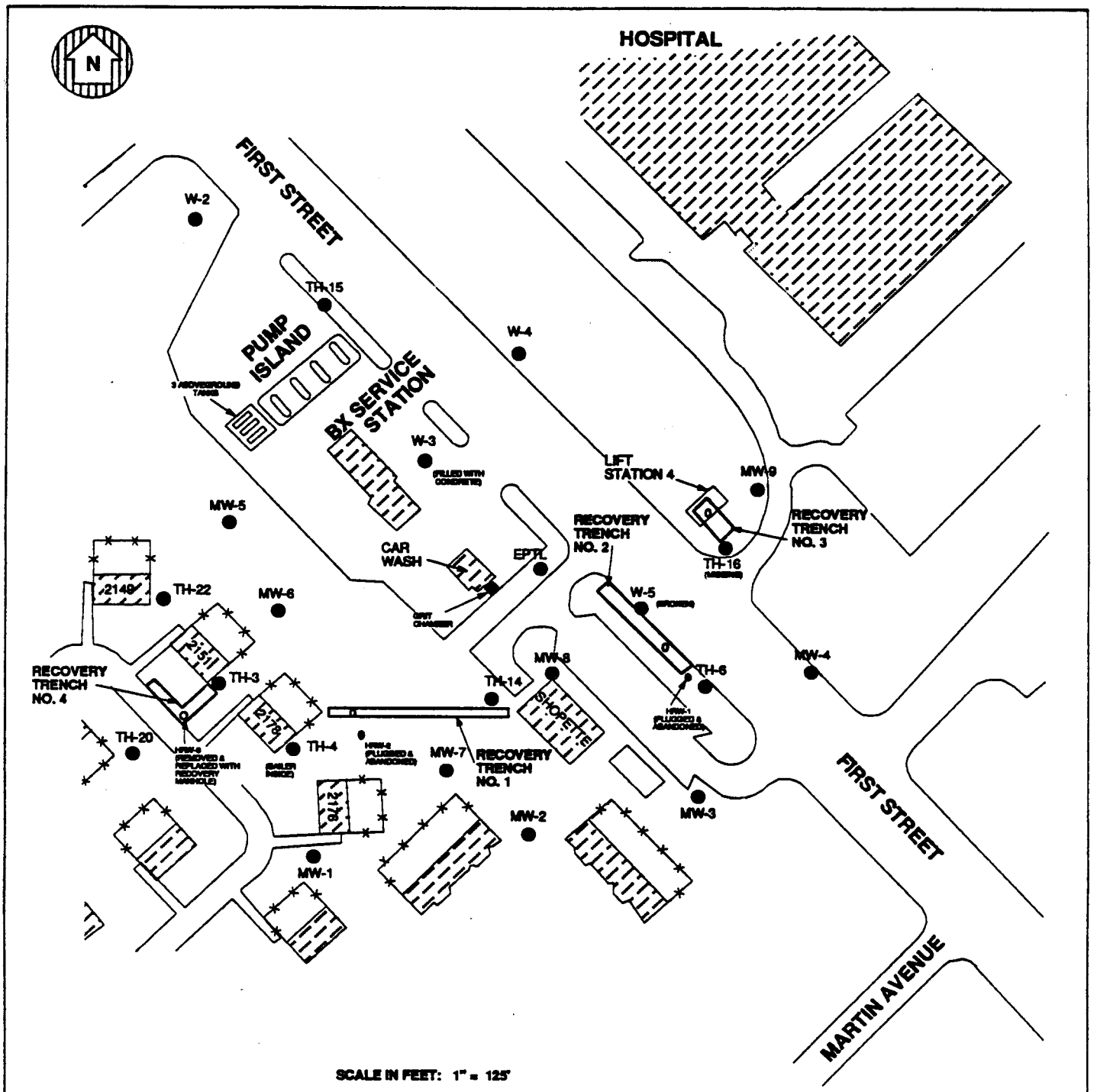
2.0 GASOLINE RECOVERY TRENCH SYSTEM

2.1 Description of Current System

Operation of the current recovery trench system (inclusive of modifications recommended in Walk, Haydel's November 1988 Technical Report on Site 17) commenced on October 16, 1989. The gasoline recovery trenches are located generally south, hydraulically down gradient, of the BX Service Station in areas that were determined to have the greatest product thickness. Figure 2-1 shows the location of all four trenches and their relationship to the BX Service Station and the site monitoring wells. The trenches are three feet wide and of various lengths: Trench No. 1 is 120 feet long, Trench No. 2 is 70 feet long, Trench No. 3 is 40 feet long and Trench No. 4 is 85 feet long. Trench Nos. 1, 2 and 3 are straight while Trench No. 4 is constructed with a 90° angle.

Figure 2-2 is a typical recovery trench cross-section. Each trench is filled with a porous gravel layer. The gravel layer is positioned to intercept floating product and the water table. Fluid infiltrating the trench migrates to the bottom of the gravel layer and into a four inch perforated pipe. Gravity flow in the perforated pipe then transfers the gasoline and water to a collection sump located near the center of the trench. Inside the sump are two pumps, a submersible water table depression pump for pumping collected groundwater and a floating filter scavenger pump for skimming the gasoline off the top of the water.

Separate discharge systems are provided for the removal of fluids. Water from Trench Nos. 1, 2, and 4 is pumped through buried PVC pipes to a grit chamber located near the BX Service Station car wash. This grit chamber discharges to the sanitary sewer. Water from Trench No. 3 is pumped into sewer lift Station No. 4. Gasoline removed from Trench Nos. 1, 2, and 4 is



LEGEND:

- ● MONITORING WELL, TEST HOLE OR RECOVERY WELL
- o RECOVERY MANHOLE
- EPTL EL PASO TESTING LABORATORY MONITORING WELL
- HRW HYDROCARBON RECOVERY WELL

FIGURE 2-1 env-119g

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

SITE SS-17,
LOCATION OF RECOVERY TRENCHES AND MONITORING WELLS

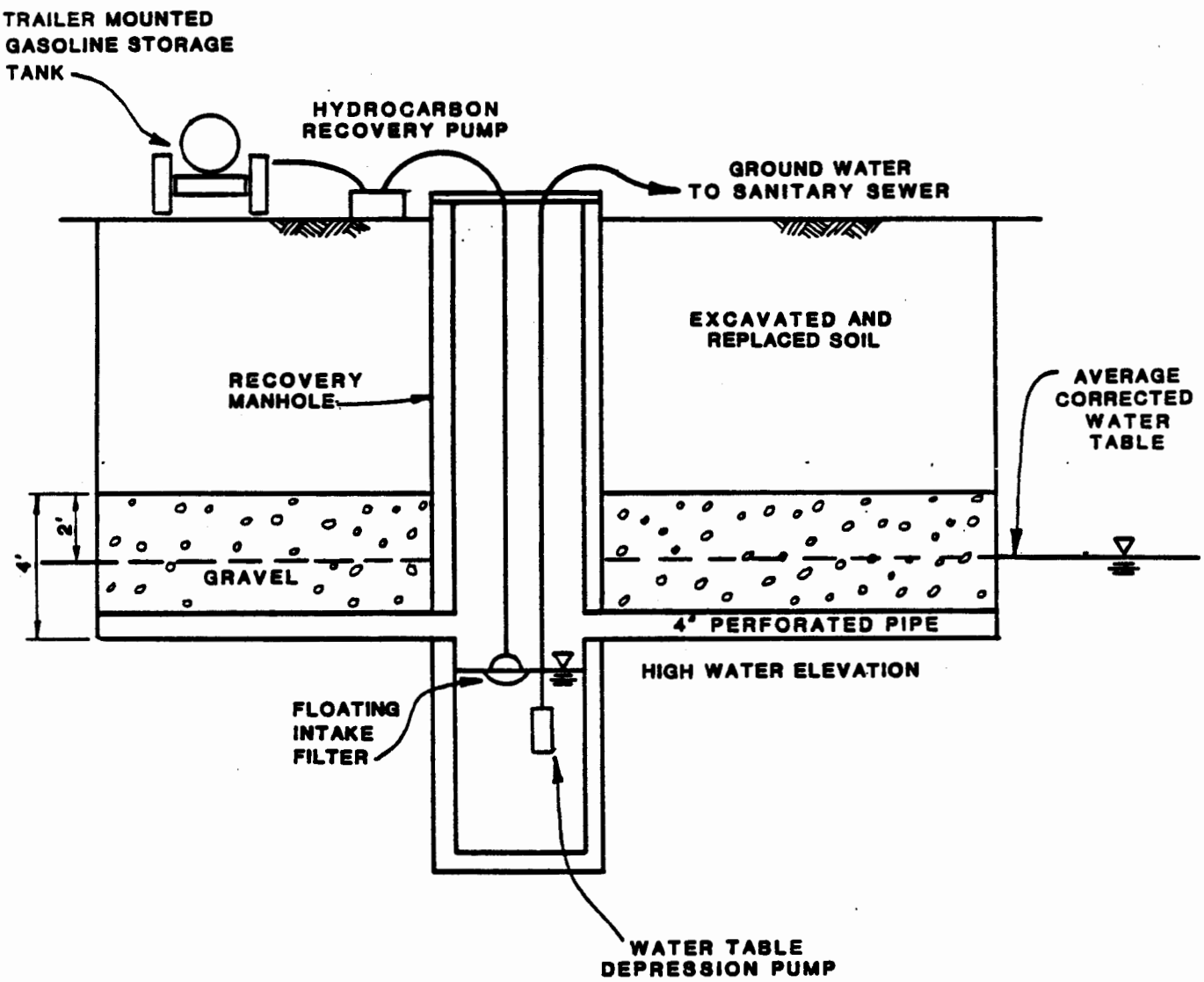


FIGURE 2-2

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

SITE SS-17
TYPICAL
RECOVERY TRENCH CROSS-SECTION

pumped through buried fiberglass reinforced plastic (FRP) pipes to a centralized 1000 gallon mobile tank. Recovery Trench No. 3 transfers gasoline through FRP pipe to a separate 1000 gallon mobile tank.

In April 1990 a site visit was performed by Walk, Haydel to gather data regarding the trench recovery system performance. Subsequently, Addendum 1 to the Technical Report was issued in May 1990. This report made several recommendations to improve the overall effectiveness of the gasoline recovery operations. These recommendations included performance of tank tightness tests on the existing underground storage tanks at the site and the deepening of Trench No. 3 by two and a half feet to allow the active area of the trench (gravel layer) to intersect the water table.

2.2 Summary of Free Product Recovery

2.2.1 Previous Recovery Systems

Shortly after a gasoline leak was first detected in 1981, two recovery wells were installed in the area of maximum gasoline thickness. Approximately 275 gallons of gasoline were recovered. In January 1987, recovery operations resumed using three recovery wells and two recovery trenches. Approximately 14,500 gallons of gasoline were recovered during the period from January to December 1987. Total gasoline removed prior to initiation of Walk, Haydel modifications was approximately 14,775 gallons.

2.2.2 Current Recovery System after Modification

Start-up of the modified trench recovery system, as prescribed by Walk, Haydel, occurred in October of 1989. Analysis of data

obtained from the April 1990 site visit concluded that approximately 11,900 gallons of gasoline were recovered in the period from October 16, 1989 to April 15, 1990.

In June, 1991, Walk, Haydel performed an investigation of Site SS-17 to gather data to be used in the development of this CAP. Trench operating data were available through April 7, 1991. A summary of weekly trench operation reports indicates that between April 16, 1990 and April 7, 1991 approximately 14,500 gallons of gasoline were removed.

Based on conversations with Holloman AFB personnel, Weekly Trench Operation reports from April 8, 1991, to August 25, 1991 indicate about 2,300 gallons of gasoline have been removed during this period. From August 26, 1991 to January 12, 1992, approximately 99 gallons of gasoline have been removed.

The total volume of gasoline removed as of January 12, 1992, since the start-up of the modified recovery trench system on October 16, 1989 is estimated to be 28,799 gallons. The total volume of gasoline removed from the operation of all recovery systems is estimated at 43,574 gallons.

2.3 Performance Evaluation

Trench Nos. 1 and 2, located in the area of greatest product thickness, have accounted for the vast majority of product removed, while Trench Nos. 3 and 4, located on the edge of the plume, have not recovered as much free product due to the smaller amounts of mobile free product in these areas. The total overall average gasoline recovery since start-up (from October 16, 1989 to August 25, 1991) is approximately 300 gallons per

week (GPW). However, gasoline recovery has been generally declining over time. The average gasoline recovery rate from October 16, 1989 to April 15, 1990, was 479 GPW; from April 16, 1990 to April 7, 1991, the average gasoline recovery rate was 284 GPW; from April 8, 1991 to August 25, 1991, the average gasoline recovery rate was 115 GPW and from August 26, 1991 to January 12, 1992, the average gasoline recovery rate was approximately 5 GPW. The relatively low gasoline recovery rate observed during the April 8, 1991 to August 25, 1991 interval can in part be attributed to equipment failures at Trench No. 2, which resulted in significant downtime.

In May 1988, prior to the current system start-up, Walk, Haydel estimated that roughly 30,000 gallons of in-situ mobile product were on the water table at Site SS-17. As previously indicated, since system start-up (October 16, 1989) to January 12, 1992, approximately 28,799 gallons of gasoline have been removed. However, based on water level and apparent product thickness measurements performed by Walk, Haydel in June 1991 (see Table 2-1 for depth to groundwater and apparent product thickness reading of the site wells), it was estimated that approximately 25,000 to 30,000 gallons of in-situ mobile product still remain on the groundwater at Site SS-17. Apparent product thickness is the thickness of product observed in a well. In-situ mobile product is the thickness of product atop the water table which is capable of flowing. Figure 2-3 is an Isopach Map of the in-situ mobile product using June 1991 data. Figure 2-4 is a plot of the apparent product thickness using June 1991 data. Based on this data, a new source of the gasoline plume is possible in the area of monitoring well TH-15.

In general, the apparent product thicknesses at the site and the downgradient portion of the plume remained fairly constant between the April 1990 site visit and the June 1991 site visit. The most notable variability in product thickness was observed in well TH-15. On April 17, 1990, the

TABLE 2-1

SITE SS-17

DEPTH TO GROUNDWATER AND APPARENT PRODUCT THICKNESSES
(JUNE 10, 1991)

Monitoring Well	Depth To Groundwater (ft)	Apparent Product Thickness (inches)
MW-1	8.0	X
MW-2	8.97	X
MW-3	9.31	X
MW-4	9.25	X
MW-5	6.65	X
MW-6	8.09	11.88
MW-7	8.9	20.4
MW-8	13.28	21.6
MW-9	12.50	5.52
W-2	7.36	X
W-4	10.29	X
TH-3	8.35	4.2
TH-6	12.26	19.2
TH-14	10.15	18.12
TH-15	10.02	20.52
TH-20	7.25	X
TH-22	7.83	0.6
EPTL	10.70	9.96

X = No Product Detected

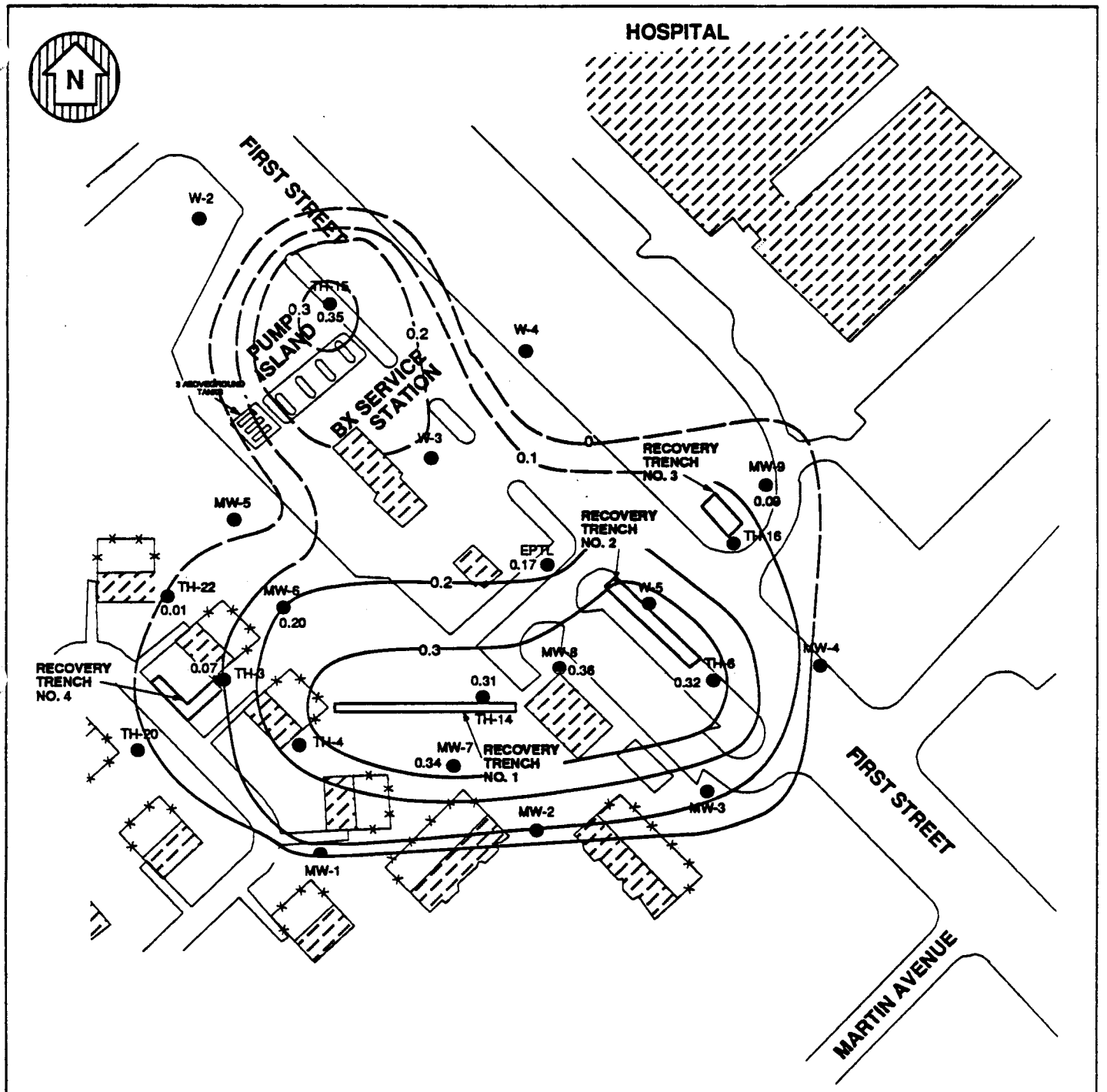


FIGURE 2-3

env-119c

LEGEND:

● MONITORING WELL

CONTOUR INTERVAL = 0.1 FEET

SCALE IN FEET: 1" = 125'

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

SITE SS-17,
IN-SITU MOBILE PRODUCT THICKNESS
JUNE 10, 1991

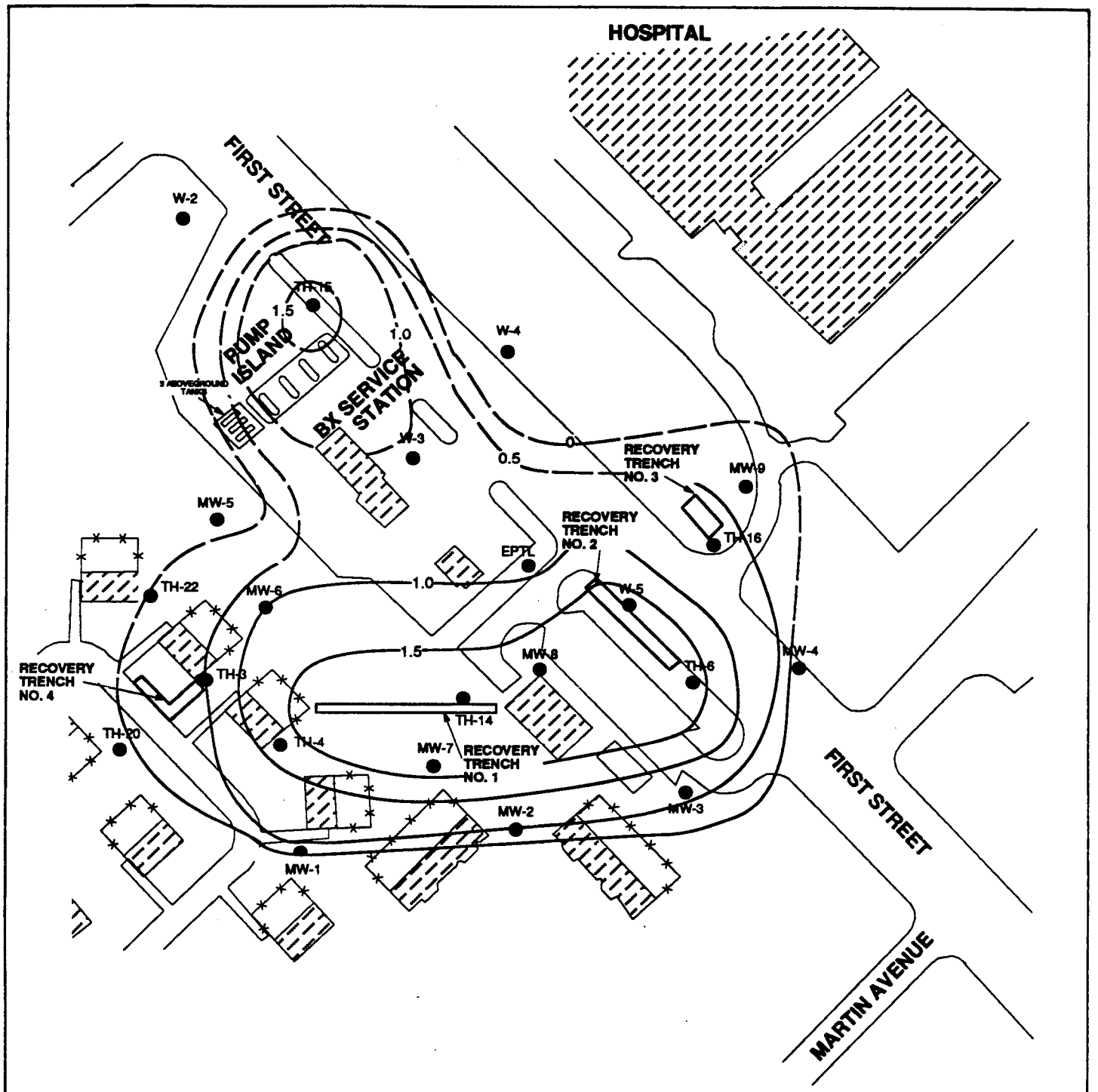


FIGURE 2-4

env-119b

LEGEND:

● MONITORING WELL

CONTOUR INTERVAL = 0.5 FEET

SCALE IN FEET: 1" = 125'

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

SITE SS-17,
APPARENT PRODUCT THICKNESS
JUNE 10, 1991

apparent product thickness in well TH-15 was 0.12 feet; on June 15, 1991, 1.71 feet of product was observed; and on August 4, 1991, only a thin film of product was observed. Well TH-15 is hydraulically upgradient of the main body of the plume and was previously thought to be in an area void of floating product. Because of the lack of wells near well TH-15 and the low monitoring frequency, there is little data to determine the size, location, and volume of free product in this area.

According to information provided by Holloman AFB during the period from February 1990 through August 1990, approximately 5,000 gallons of gasoline was unaccounted for from the now inactive USTs at the BX Service Station. This equates to approximately 8,500 gallons per year (GPY). Additionally, for June and July 1991, a total of approximately 1,700 gallons of gasoline was unaccounted for from the present gasoline supply system (three above ground tanks). It is not known whether a release has occurred or whether there has been an inventory error.

The projected time remaining for the gasoline trench operation, based on the volume of mobile product estimated to be present at the site in June 1991, was estimated to be approximately 2.5 to 3 years. For this estimation, an average recovery rate of approximately 175 GPW was used. This estimated time was used in the development of remedial action alternatives to eliminate highly contaminated soils. It should be noted, however, that this projection has room for error due to 1) uncertainties in the amount of product in the vicinity of well TH-15, 2) uncertainties in the ability of the trench system to affect the entire area of concern in a timely fashion, 3) ability to accurately estimate mobile product thickness based on the June 1991 data and 4) water table fluctuations that would affect product thickness.

Based on Walk, Haydel's understanding of more recent site events, relatively rapid and significant changes in apparent product thickness have occurred at the site since the field work for this investigation was performed (June 1991). Figure 2-5 is a plot of the apparent product thickness plume at the end of September 1991. Data used to make this figure is included in Table 2-2. It could be concluded that the change in apparent product thickness is the result of hydrocarbon recovery. However, only a relatively minimal amount of product was removed during June through September 1991. Review of groundwater elevation data generated during this same period indicates a significant increase in groundwater elevations (see Figure 2-6). This could be caused by an increase in the system downtime. Data used to create Figure 2-6 is included in Table 2-3. Studies (Kemblowski and Chiang, 1990 and Testa and Winegardner, 1991) have indicated that rising water tables can cause decreases in apparent thicknesses of floating product in monitoring wells. Therefore, it is possible that a significant portion of this decrease in apparent product thickness at the site can be attributed to the increase in the water table and water/product interface elevation. The decrease in apparent product thickness at the site is depicted in Figure 2-7. Data used to create this figure is included in Table 2-3. Note that the areas of largest decrease are generally in the areas of greatest water table and water/product interface rise. Furthermore, a large portion of the previously mobile product may be immobilized as residual saturation over the interval of the fluctuating product table.

Residual hydrocarbon saturation refers to that volume of product which is immobilized by being retained within the aquifer matrix. Residual hydrocarbon saturation typically can occur as follows: 1) in the upper limits of the hydrocarbon-air capillary zone where the adhesive forces between the hydrocarbon and aquifer matrix are greater than the gravity draining force and 2) in the upper portion of water-hydrocarbon capillary zone or within the water saturated zone, where the amount of hydrocarbon present

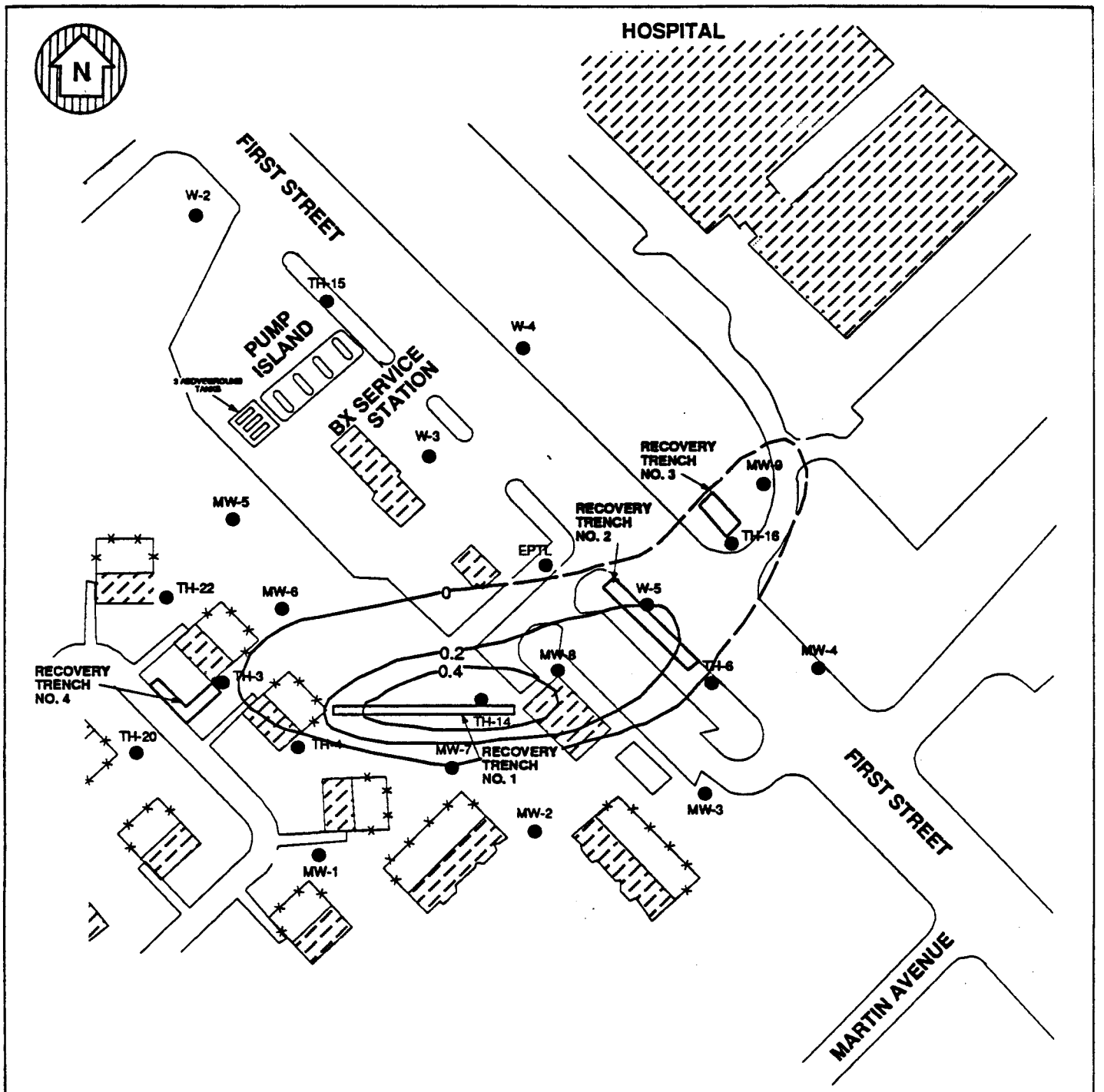


FIGURE 2-5

env-119d

LEGEND:

● MONITORING WELL

CONTOUR INTERVAL = 0.2 FEET

SCALE IN FEET: 1" = 125'

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

SITE SS-17,
APPARENT PRODUCT THICKNESS
SEPTEMBER 28, 1991

TABLE 2-2

SITE SS-17

DEPTH TO GROUNDWATER AND APPARENT PRODUCT THICKNESSES
(SEPTEMBER 28,1991)

Monitoring Well	Depth To Groundwater (ft)	Apparent Product Thickness (inches)
MW-1	--	--
MW-2	8.58	X
MW-3	9.67	X
MW-4	--	--
MW-5	7.58	X
MW-6	7.33	X
MW-7	6.92	X
MW-8	11.67	4
MW-9	9.67	2
W-2	5.67	X
W-4	9.92	X
TH-3	7.33	X
TH-6	--	--
TH-14	8.50	6
TH-15	7.58	X
TH-20	6.08	X
TH-22	7.58	X
EPTL	8.42	X

X = No Product Detected

-- = Not Measured

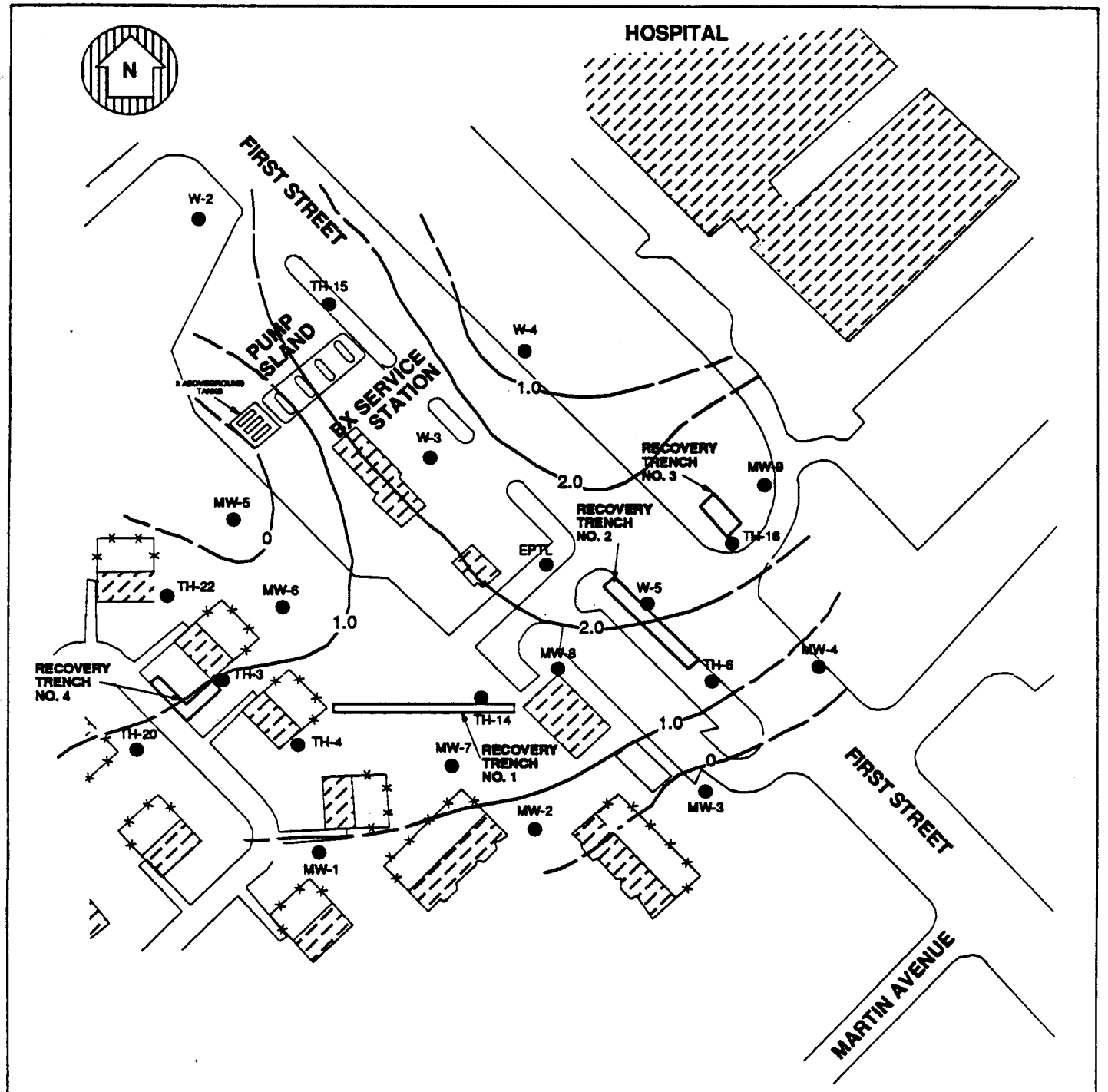


FIGURE 2-6

env-119e

LEGEND:

● MONITORING WELL

CONTOUR INTERVAL = 1.0 FEET

SCALE IN FEET: 1" = 125'

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

SITE SS-17,
INCREASE IN GROUNDWATER
TABLE ELEVATION FROM
JUNE 10, 1991 TO SEPTEMBER 28, 1991

TABLE 2-3

SITE SS-17

DIFFERENCE IN DEPTH TO GROUNDWATER AND APPARENT PRODUCT THICKNESSES FROM JUNE 10, 1991 (TABLE 2-1) AND SEPTEMBER 28, 1991 (TABLE 2-2) MEASUREMENTS

Monitoring Well	Difference of Depth to GW from 6/10/91 to 9/28/91, (ft.)	Decrease in Apparent Product Thickness from 6/10/91 to 9/28/91, (in.)
MW-1	--	--
MW-2	0.39	X
MW-3	-0.36	X
MW-4	--	--
MW-5	-0.93	X
MW-6	0.76	11.88
MW-7	1.98	20.40
MW-8	1.61	17.60
MW-9	2.83	3.52
W-2	1.69	X
W-4	0.37	X
TH-3	1.02	4.20
TH-6	--	--
TH-14	1.65	12.12
TH-15	2.44	20.52
TH-20	1.17	X
TH-22	0.25	0.60
EPTL	2.28	9.96

GW = Groundwater
-- = Cannot be determined due to missing data.
X = No product detected
Note: Negative differences in column 2 indicate a lowering of the water surface elevation between 6/10/91 and 9/28/91 and positive values indicate a rising of the water surface elevation.

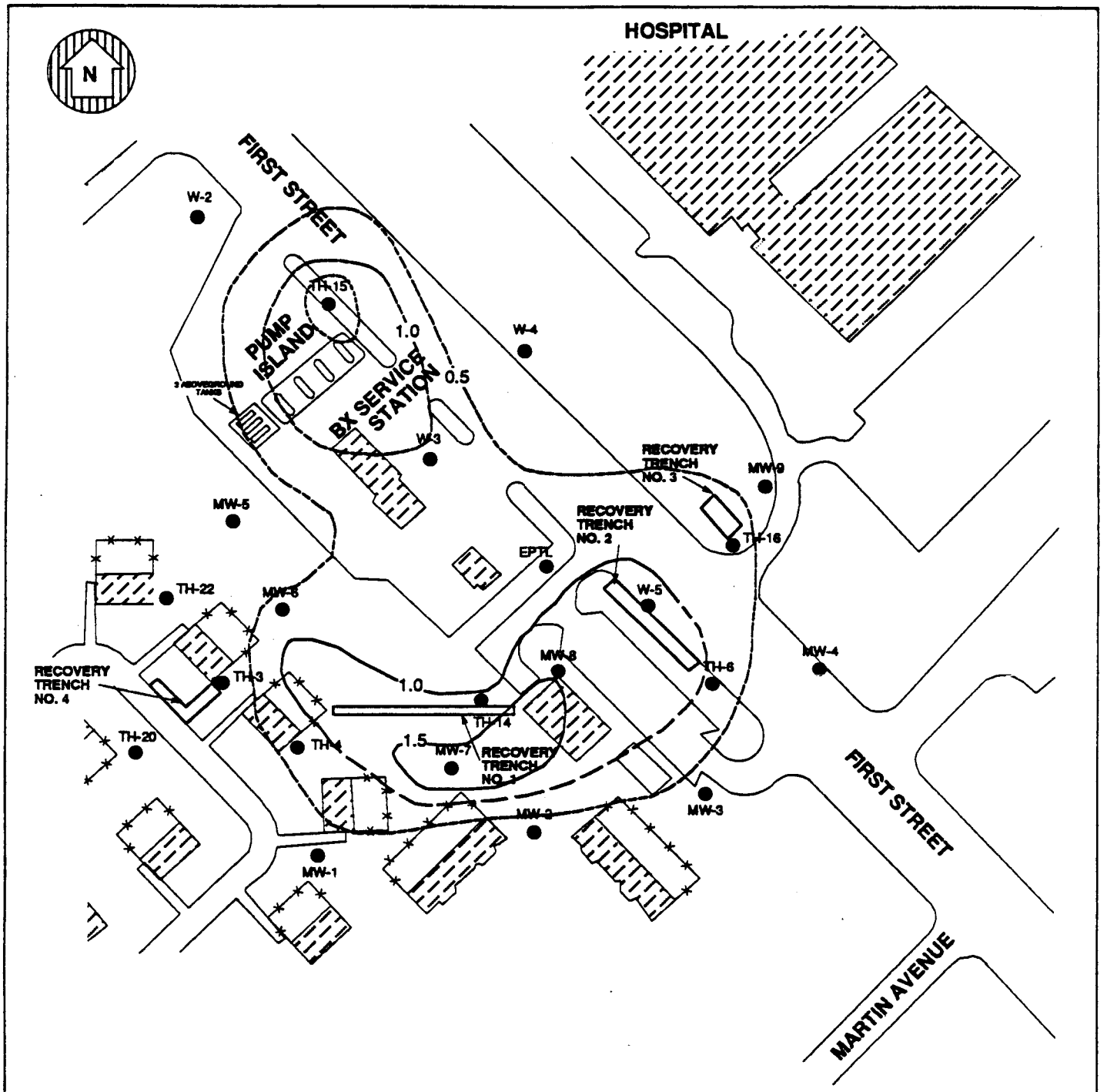


FIGURE 2-7

env-119f

LEGEND:

● MONITORING WELL

CONTOUR INTERVAL = 0.5 FEET

SCALE IN FEET: 1" = 125'

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

SITE SS-17,
DECREASE IN APPARENT PRODUCT THICKNESS,
JUNE 10, 1991 TO SEPTEMBER 28, 1991

is minimal and hydrocarbon movement becomes obstructed by water occupying the aquifer pore spaces. The amount of residual hydrocarbons present will depend, in part, on the aquifer matrix, hydrocarbon constituents, hydrocarbon source location and water table fluctuations.

In summary, the current recovery trench system has removed significant amounts of gasoline from the water table. However, recent changes in apparent product thickness at the site could result in decreased hydrocarbon recovery. The recovery system appears to have been effective in controlling the migration of the gasoline plume and should continue to be effective. As gasoline recovery operations progress, the gasoline recovery rate will decline.

2.4 Preliminary Actions to Increase Efficiency

Preliminary actions to increase the gasoline removal efficiency are discussed below.

2.4.1 Field Bail - Out Tests

To provide better estimates of in-situ mobile product thickness across the site, field bail-out tests should be performed on a routine basis. Procedures for two bail-out test methods are provided in Appendix H. Both should be used to determine which yields the better results. The tests should be performed on a weekly basis on approximately one quarter of the wells with various product thicknesses to allow more accurate correlations to the in situ mobile product thickness.

2.4.2 Delineate Extent of Contamination Near TH-15

The areal extent and volume of free product in the vicinity of well TH-15 must be delineated. It is recommended that water and product levels in well TH-15 be monitored and field bail-out tests (as described above) be performed on a weekly basis to provide a better estimate of in situ mobile product thickness in the area. If no product is present in the well to allow the performance of the bail-out test, then ten well volumes of groundwater should be bailed from the well, and the well observed to see if product accumulates. Delineation of the areal extent would be accomplished by drilling soil borings and installing monitoring wells in a radiating pattern from well TH-15 with particular attention placed on the areas around the pump island and BX Service Station.

2.4.3 Review of Site Data

Walk, Haydel recommends that a monthly program of engineering review of the site data (i.e., product and groundwater recovery rates, product thickness and water table fluctuations) be performed. This would enable a more rapid response to changing site conditions and allow for a smoother transition into the next phase of site remediation.

2.4.4 Monitoring of WWTP Discharge

In addition to the recommendations of bail-out tests, investigation near TH-15 and review of bail-out data, Walk, Haydel recommends that discharged water from the Holloman wastewater treatment plant (WWTP) be analyzed for benzene, ethylbenzene, toluene and xylene (BETX). Water from Site SS-17 activities (as well as unknown

releases from other areas of the base) could contribute to elevated levels of BETX. Currently, the base does not have a NPDES permit. According to base officials, the State is aware of this deficiency. Holloman AFB plans to install a new WWTP in 1995. The new plant will have a NPDES permit.

Recovered water from the trench recovery system currently enters the sanitary sewer system and enters the WWTP. While no state regulations (other than not having unacceptable vapors within lines) could be found concerning concentrations of constituents discharged into sanitary sewer lines, New Mexico does, however, have an Antidegradation Policy which applies to surface waters of the State of New Mexico. NPDES regulations would also apply to the WWTP.

The New Mexico Antidegradation Policy requires that toxic substances such as, but not limited to, pesticides, herbicides, heavy metals and organics, not be present in receiving waters in concentrations which will change the ecological conditions of receiving waters to an extent detrimental to man or other organisms of direct or indirect commercial, recreational, or aesthetic value. Treated wastewater from Holloman AFB flows into Lake Holloman along with any stormwater runoff. The lake is secured by a fence and is not used for any recreational, drinking or irrigational purposes. U.S. Fish and Wildlife personnel are currently involved in a study of the aquatic life in the sewage ponds, Lake Holloman and Lake Stinky. Based upon a telephone conversation with U.S. Fish and Wildlife personnel, a report on conclusions is forthcoming. Toxicological tests on fish and wildlife have been performed. In addition to regular monitoring associated with the wastewater treatment plant, discharge into Lake Holloman should be analyzed for fuel constituents BETX while the trench recovery system is in

operation. Concentrations of these constituents, when added to receiving waters (Lake Holloman), should not deteriorate ecological conditions. Treatment of effluent should be implemented based upon sampling results.

2.5 Possible Actions to Increase Efficiency

The preliminary actions recommended in Section 2.4: 1) performance of field bail-out tests, 2) installation of borings and monitoring wells around Well TH-15, 3) engineering review of site data and 4) monitoring of WWTP discharge, should be implemented before additional actions are performed. Possible actions to increase gasoline removal efficiency, as discussed below, should be refined based on data from the above recommended preliminary actions.

2.5.1 Submersible and Scavenger Pumps

A submersible pump, capable of being lowered into existing site wells, might be utilized to recover product from areas which are not readily affected by recovery trench operations. Although, at present, a pump that scavenges hydrocarbons and pumps groundwater (depresses the water table) is not available to fit into the 2-inch diameter wells on site, a hydrocarbon scavenger unit without water table depression is currently available and could be utilized in 2-inch wells. Such a pump might be utilized in one well on a short term basis and relocated to another well when conditions warrant. Other deviations of this approach could include the use of a more mobile (and fragile) groundwater sampling pump or bailers to manually remove the floating hydrocarbons from the wells on a more frequent basis than is currently employed.

2.5.2 Enlargement of Existing Recovery Trenches

Enlargement of existing recovery trenches could be performed to increase gasoline recovery rates. Significantly enlarging Trench No. 1 would be inhibited by the location of buildings near each end of the trench. Although underground piping occurs around the trench ends of the remaining three trenches, Trench No. 2 would be the most logical choice to enlarge, since it recovers significantly more product than Trench Nos. 3 and 4. Trench No. 2 could be lengthened to the southeast in the direction of well TH-6. To accomplish this, an overhead utility line would require relocation and well TH-6 would need to be removed (see Figure 2-1).

At the time of the CAP field investigation (June 1991) Trench No. 3 was not in operation. This was due to the construction of a brick enclosure for the recovery unit. However, prior to this time, Trench No. 3 recovered very little product. A possible explanation of why Trench No. 3 is not recovering gasoline could be that the relatively small amount of mobile product in the vicinity of the trench becomes less mobile as the water table drops due to the action of the water table depression pump. That is, as the water table drops, the gasoline migrates downward and eventually becomes part of the immobilized residual hydrocarbon above the water table (refer to Section 2.3 for a discussion of residual saturation). Operation of the water table depression pump at an elevation more closely approximating the static water table elevation, followed by the lowering of the pump elevation and operation of the trench in the typical fashion, could allow the recovery of gasoline that might not normally be recovered.

Another possible explanation of why Trench No. 3 is not recovering gasoline is that the mobile product in the area may actually be significantly smaller than originally believed. The basis for projecting the extent of free product into the area is data from MW-9 (refer to Table 2-1). The nearest well to MW-9 is roughly 160 feet downgradient. By performing the actions of removing the product from the well and performing field bail-out tests to determine in-situ mobile product thickness, as described above, one should be able to determine if the product in the vicinity of MW-9 is actually more limited than believed.

2.5.3 Vacuum - Assisted Recovery

A vaccum system could be coupled to the present recovery system, which could serve to increase the removal of liquid hydrocarbons. A vacuum would be placed on the recovery manholes causing an increase in the zone of influence of the liquid hydrocarbon recovery system. In addition, residual liquid hydrocarbons might be mobilized and flow to the recovery system when subjected to less than atmospheric pressures.

3.0 CAP FIELD INVESTIGATION

3.0 CAP FIELD INVESTIGATION

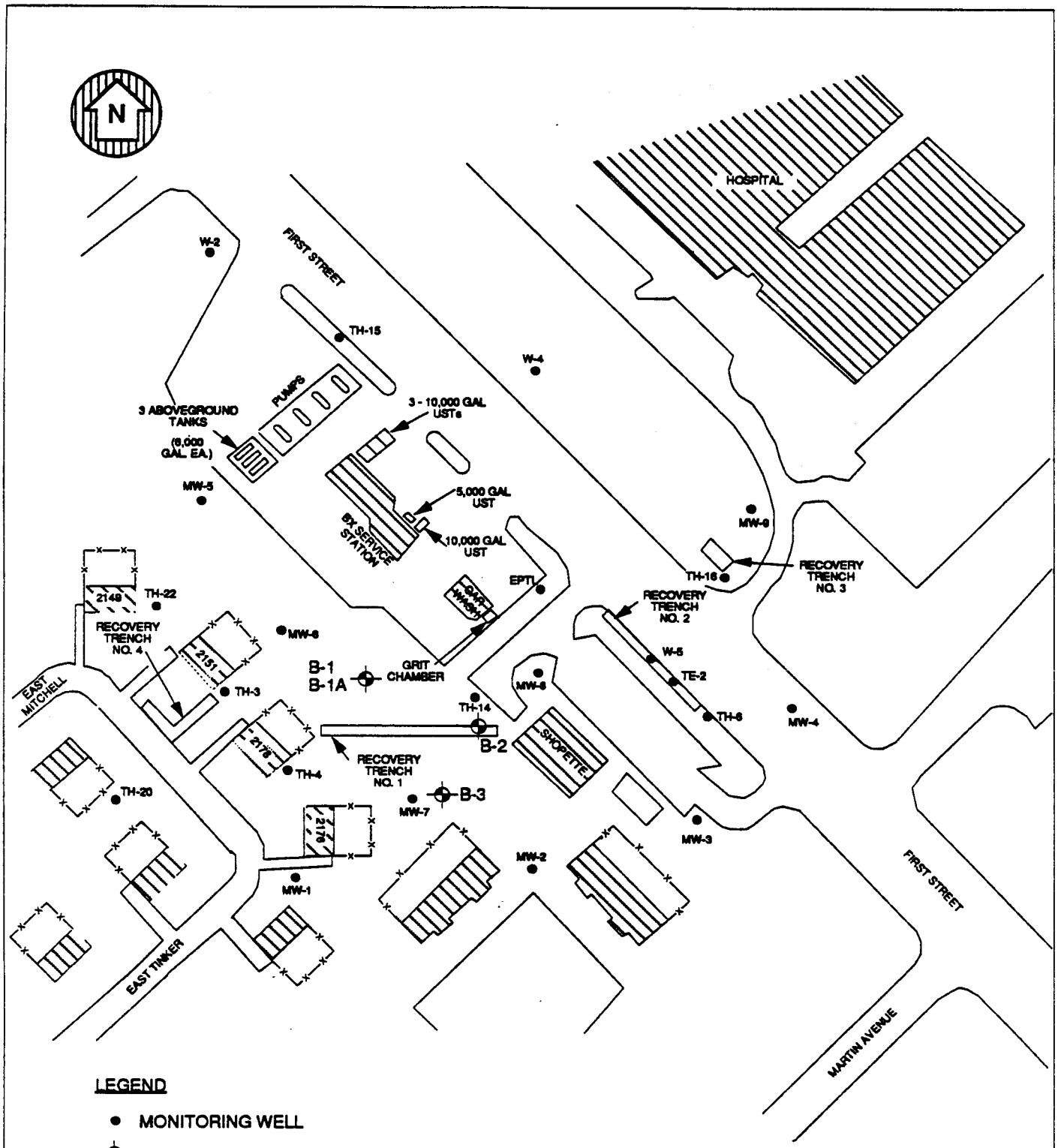
The CAP field investigation was conducted in June 1991 and consisted of: 1) drilling and sampling of three soil borings, 2) sounding of all Site SS-17 monitoring wells, 3) sampling of Site SS-17 wells that did not contain floating product, 4) sampling of the five USTs, 5) a vapor survey of the underground utilities and four abandoned houses at the site, and 6) sampling of the effluent from the gasoline recovery trench system. Each of these activities is discussed below.

3.1 Geotechnical Investigation

Soil boring logs from borings performed in June 1991 (see Figure 3-1) indicate that the soils encountered at these locations are generally consistent with those encountered at other locations in the subject area during previous investigations. Appendix B contains soil boring logs. It is noted however that the silt (ML) content at these 1991 boring locations appears to be higher than at most other boring locations across the site.

3.2 Underground Storage Tank Investigation

The UST investigation was conducted in conjunction with the records search in April 1991. As part of the UST investigation, historical utility and design drawings were obtained from Holloman AFB. These drawings showed the evolution of the BX Service Station and associated tanks and utilities. Through the use of the drawings, the location of the five USTs were noted and confirmed in the field. The location of the UST lines and utilities associated with the BX Service Station were confirmed.



LEGEND

- ● MONITORING WELL
- ⊕ BORING LOCATIONS (6-91)

NOTE: DRAWING NOT TO SCALE

FIGURE 3-1

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

SITE SS-17,
JUNE 1991 BORING LOCATIONS

env-197d
5362.54

3.3 Analytical Investigation

Analytical samples were collected from soil borings, monitoring wells that did not contain floating product, the gasoline recovery trench effluent, and the 5000 gallon UST. The four remaining (10,000 gallon) USTs were found to be empty. The results are discussed below. See Appendix C for raw analytical data.

3.3.1 Soil

Four soil borings (B1, B1(A), B2 and B3) were drilled at Site SS-17 in areas which historically had the thickest product layer. See Figure 3-1 for boring locations. Soil samples were collected from three of the borings (B1(A), B2, and B3). The purpose of the borings was to determine the degree of soil contamination in the vadose zone above the floating product. One soil boring, B1, was abandoned at a depth of four feet after drilling through the water drainage line for Trench No. 4. The drainage line was later repaired by the base. Four soil samples were collected from each boring at the following intervals: BI(A) and B3: 0-2 feet, 2-4 feet, 4-6 feet, and 6-8 feet, and B2: 0.5-2.5 feet, 2.5-4.5 feet, 4.5-6.5 feet, and 6.5-8.5 feet.

Soil samples were analyzed for volatile organic compounds (VOCs), Total Petroleum Hydrocarbons (TPH), and lead. Results of the above analyses are a means to comparatively measure locations of contamination. New Mexico UST Regulations contain TPH requirements, but only if the underlying groundwater contains 10,000 mg/L or less TDS. Samples of groundwater underlying Site SS-17 were analyzed by the USACE for TDS levels. Some samples contained greater than 10,000 mg/L TDS and others less than 10,000 mg/L TDS. Should groundwater contain less than 10,000

mg/L TDS, groundwater clean-up would be required, as well as soil remediation to meet TPH requirements. Based upon correspondence with the NMED (refer to May 11, 1992 letter of Appendix E), groundwater remediation (other than the removal of free product) is not necessary. Therefore, it can be inferred that groundwater quality is not sufficient to enforce soil TPH requirements.

As shown on Table 3-1, two laboratory contaminants, acetone and methylene chloride, were detected in samples from all three borings. Acetone and methylene chloride were also detected in the laboratory blank in the 2-4 foot sample from BI(A) and the 4.5-6.5 foot sample from B2. 2-Butanone, a common solvent, was detected in the B1(A) laboratory blank in samples from the 2-4 feet, 4-6 feet, and 6-8 feet intervals and in the 4.5 - 6.5 feet and 6.5 - 8.5 feet samples from B2.

Typical petroleum hydrocarbon components - benzene, ethylbenzene, toluene, and xylene (BETX), were detected in low concentrations from B1(A). Ethylbenzene and xylene(s) concentrations increased with depth in all B1(A) samples; benzene and toluene were only detected in the 6-8 foot interval. High concentrations of TPH (31,200 to 1,440,000 ug/kg) were detected in samples collected from B1(A). Lead (ranging from 2.1 to 24.7 mg/kg) were detected in all samples collected from BI(A).

Low concentrations of BETX were detected in soil samples from B2. Ethylbenzene and xylenes were detected at a maximum concentration of 65 and 490 ug/kg, respectively, at 2.5 feet. Benzene and toluene were only detected in the 6.5 foot sample; the concentrations were 3 ug/kg and 18 ug/kg, respectively. TPH was detected throughout the boring at concentrations ranging from 7400

TABLE 3-1

SITE SS-17

SOIL ANALYTICAL DATA
(JUNE 1991)

Contaminants	B1(A) (0-2')	B1(A) (2-4')	B1(A) (4-6')	B1(A) (6-8')
Acetone (ug/kg)	95	2(B)	-	-
Benzene (ug/kg)	-	-	-	10
2-Butanone (ug/kg)	-	4(B)	9(B)	24(B)
Ethylbenzene (ug/kg)	-	3	8	38
Methylene Chloride (ug/kg)	-	0.6(B)	-	-
Xylene (ug/kg)	17	27	81	230
Toluene (ug/kg)	-	-	-	78
TPH (ug/kg)	31,200	907,000	852,000	1,440,000
Pb (mg/kg)	2.1	4.6	24.7	3.5
	B2 (0.5-2.5')	**B2 (2.5-4.5')**	**B2 (4.5-6.5')**	**B2 (6.5-8.5')**
Acetone (ug/kg)	-	74	1(B)	-
Benzene (ug/kg)	-	-	-	3
2-Butanone (ug/kg)	-	-	4(B)	9(B)
Ethylbenzene (ug/kg)	-	65	4	37
Methylene Chloride (ug/kg)	-	-	0.6(B)	-
Toluene (ug/kg)	-	-	-	18
Xylene (ug/kg)	-	490	19	110
TPH (ug/kg)	7,400	599,000	594,000	1,820,000
Pb (mg/kg)	2.3	0.86	1.2	1.6
	B3 (0-2')	**B3 (2-4')**	**B3 (4-6')**	**B3 (6-8')**
Acetone (ug/kg)	20	-	-	28
1,2-Dichloroethane (ug/kg)	-	-	-	6
Methylene Chloride (ug/kg)	-	8	8	7
TPH (ug/kg)	9,410	-	-	-
Pb (mg/kg)	5.9	0.81	2.2	0.89

- = Below Practical Quantitation Limit
(B) = Detected in Blank
ug/kg = micrograms per kilograms

ug/kg at 0.5 feet to 1,820,000 ug/kg at 6.5 feet. Lead concentrations ranged from 0.86 to 2.3 mg/kg.

No BETX compounds were detected in samples from B3. Only one organic compound, 1,2-dichloroethane, an anti-knock gasoline additive, was detected at a depth of 6 feet at 6 ug/kg. TPH was detected in only the surface soil sample at a concentration of 9410 ug/kg. Lead was detected in all soil samples at concentrations ranging from 0.81 to 5.9 mg/kg.

3.3.2 Groundwater

Groundwater samples were collected from eight Site SS-17 monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-5, W-2, W-4, and TH-20) and were analyzed for VOC, TPH, and lead. See Figure 3-1 for sampling locations and Table 3-2 for groundwater analytical data. As previously stated, groundwater analytical samples were collected only from wells that did not contain floating product as determined with a bailer and/or an oil/water interface probe. Wells MW-6 through MW-9, TH-3, TH-6, TH-14, TH-15, TH-22 and EPTL contained free product (see Table 2-1 in Section 2.3). From Table 3-2, it can be seen that no contaminants were detected in MW-4. Only chloroform, a solvent, was detected in W-4 at a concentration of 5 ug/L. 1,2-Dichloroethane was detected in MW-1, MW-2 and MW-3 at concentrations of 870 ug/L, 260 ug/L and 12 ug/L, respectively. A laboratory contaminant, methylene chloride, was also detected in MW-3. Benzene and 1,2-dichloroethane were detected in TH-20 at concentrations of 16 ug/L and 440 ug/L, respectively. Toluene and xylene were detected at concentrations of 6 ug/L in W-2. MW-5 contained the highest concentrations of contaminants at Site SS-17 with benzene detected at 1400 ug/L, ethylbenzene at 980

TABLE 3-2

SITE SS-17

GROUNDWATER ANALYTICAL DATA (JUNE 1991)

Detected Compounds	MW-1	MW-2	MW-3	MW-4	MW-5	W-2	W-4	TH-20
Benzene (ug/L)-	-	-	-	-	1400	-	-	16
Chloroform (ug/L)	-	-	-	-	-	-	5	-
1,2-Dichloroethane (ug/L)	870	260	12	-	120	-	-	440D
Ethylbenzene (ug/L)	-	-	-	-	980	-	-	-
Methylene Chloride (ug/L)	-	-	6	-	-	-	-	-
Toluene (ug/L)	-	-	-	-	42	6	-	-
Xylene (ug/L)	-	-	-	-	210	6	-	-
TPH (ug/L)	-	-	-	-	2,620	-	-	-
Pb (mg/L)	0.008	0.005	0.008	-	0.015	0.008	-	0.028

- = Below Quantitation Limit
ug/L = micrograms per liter
D = Quantitated by Secondary Dilution

ug/L, toluene at 42 ug/L and xylene at 210 ug/L. TPH and 1,2-dichloroethane were also detected in MW-5 at 2,620 ug/L and 120 ug/L, respectively.

Lead was detected in groundwater from MW-1, MW-2, MW-3, MW-5, W-2, and TH-20 in low concentrations ranging from 0.005 ppm to 0.028 mg/L.

3.3.3 Effluent

A grab sample of the gasoline recovery trench effluent was collected from the grit chamber. See Figure 3-1 for the location of the grit chamber. The effluent was collected at the point of discharge into the grit chamber and analyzed for VOC, TPH, and lead. Concentrations of BETX and TPH were detected. No lead was detected in the sample. See Table 3-3 for the effluent analytical data.

3.3.4 Underground Storage Tanks

During the UST investigation, the five Site SS-17 USTs were sounded. See Figure 3-1 for UST locations. The soundings revealed that only UST No. 2 contained product. See Table 3-4 for the physical data on each UST. Since product was confirmed and measured in only one UST (UST No. 2), it was the only tank sampled.

UST No. 2 contents were analyzed for lead and flashpoint. The lead concentration of the sample was 3.2 mg/L and the flashpoint $\leq$ 25°C. See Table 3-5 for the analytical data from UST No. 2.

TABLE 3-3

SITE SS-17

GASOLINE RECOVERY TRENCH EFFLUENT ANALYTICAL DATA (JUNE 1991)

Parameter	Concentration (ug/L)
VOC:	
Benzene	17,000
Ethylbenzene	2,600
Toluene	18,000
Xylenes	8,500
TPH	10,300
Lead*	-

- = not detected
* = mg/l (milligrams per liter)
ug/L = micrograms per liter

TABLE 3-4

SITE SS-17

UNDERGROUND STORAGE TANKS - PHYSICAL DATA
(JUNE 1991)

Physical Data	UST No. 1	UST No. 2	UST No. 3	UST No. 4	UST No. 5
Volume (gallons)	10,000	5,000	10,000	10,000	10,000
Bottom Description	Hard	Soft	Hard	Hard	Hard
Contents: (inches)*					
Water	<1	5.4	-	-	-
Product	-	0.6	-	-	-
Unable to determine	-	-	0.5	1	<1

* As measured with an oil/water interface probe.

TABLE 3-5

SITE SS-17

UST NO. 2 CONTENTS - ANALYTICAL DATA
(JUNE 1991)

Parameter	Concentration
Lead	3.2 mg/L
Flashpoint	$\leq$ 25 °C

mg/L = milligrams per kilogram
°C = degrees centigrade

3.4 Vapor Monitoring Results

Air and sewer gas monitoring was conducted at Site SS-17 as part of the CAP field investigation. Explosivity and organic vapor monitoring (benzene, ethylbenzene, toluene, xylene) was conducted at four vacant residences (Buildings 2149, 2151, 2178, 2176), 11 stormwater sewer manholes, the Car Wash Grit Chamber, and a sanitary sewer lift station. See Figure 3-2 for the Site SS-17 air monitoring locations. These locations were monitored for four consecutive days at different time periods each day (early morning, late morning-early afternoon, late afternoon, and early evening). See Appendix D for a detailed report on the Site SS-17 air monitoring.

The results of the explosivity and organic vapor monitoring in the residences are presented in Table 3-6. The organic vapor readings are all below 2 ppm. Had vapors been detected above 5 ppm, BETX monitoring, using a field Gas Chromatograph, would have been performed to identify and quantify the compounds causing the elevated readings (refer to Site SS-17 CDAP, June 1991). The highest reading was 1.2 ppm in Building 2178 on June 10, 1991. No explosive vapors were detected in any residences.

Table 3-7 presents the air monitoring results for the 11 manholes (MH-88 was inaccessible), the Car Wash Grit Chamber, and the lift station. The highest BETX concentrations were detected in the Car Wash Grit Chamber followed by MH-90, MH-91 and MH-92. The highest levels of explosive vapors were recorded in MH-92 at 23% Lower Explosive Limit (LEL) and 35% LEL on 12 June and 13 June, respectively. BETX was detected at the grit chamber at concentrations ranging from <1 ppb to 37 ppb xylene under all flow conditions. No explosive vapors were detected at the grit chamber. BETX concentrations at the lift station ranged from a low of <1 ppb to a high of <3 ppb xylenes; no explosive vapors were detected.

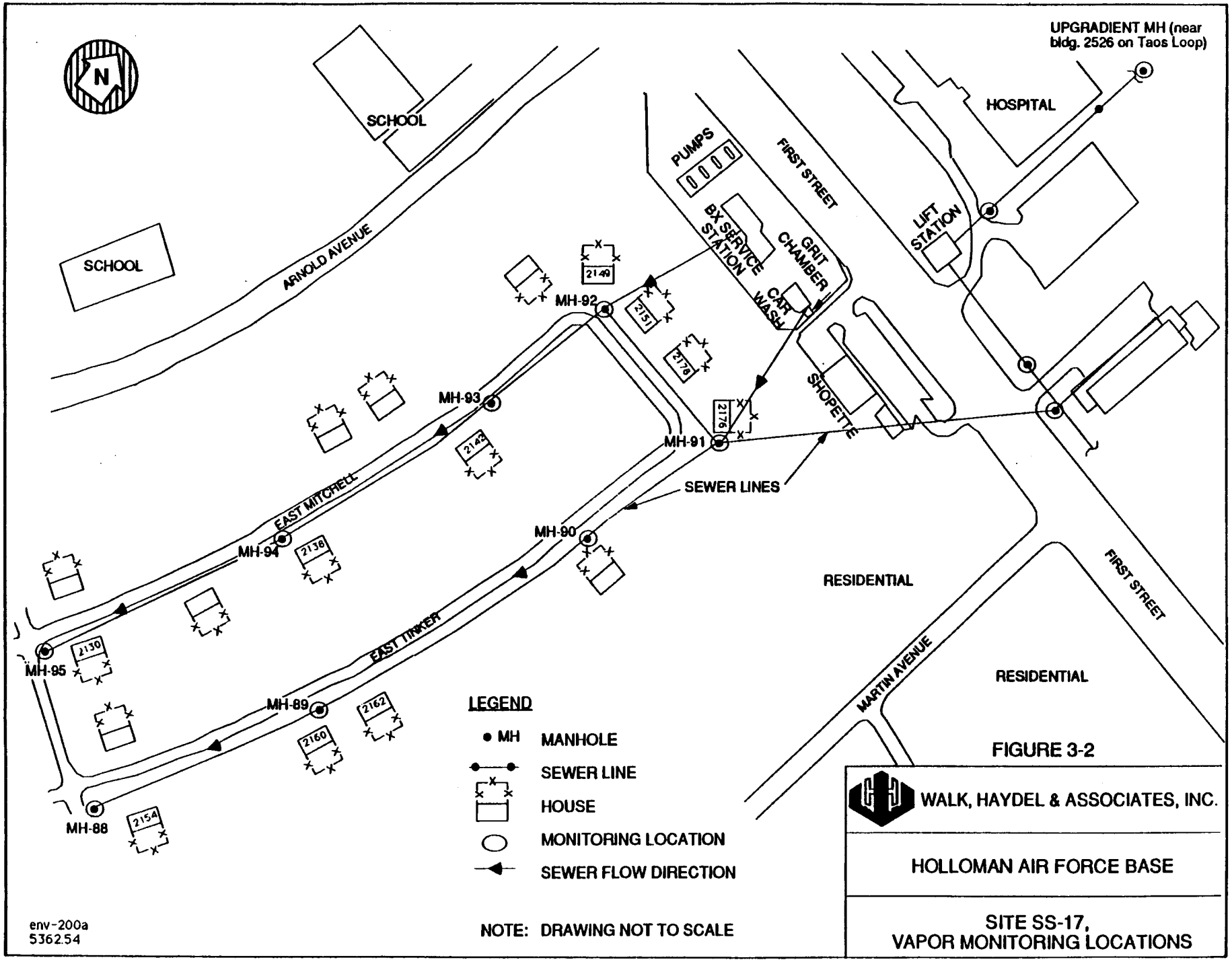


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TABLE 3-6

SITE SS-17
EXPLOSIVITY AND ORGANIC VAPOR DATA - RESIDENCES

Building Number	Date	Time	Explosive Gases (% LEL)	Results Organic Vapors (PPM)	Location of Peak Reading
2149	6/10/91	1330	0	0.2	Back Bathroom
	6/11/91	1515	0	0.2	No Peak Reading
	6/12/91	1905	0	0.0	No Peak Reading
	6/13/91	0556	0	0.1	No Peak Reading
	6/13/91	9848	0	0.0	No Peak Reading
2151	6/10/91	1331	0	0.6	Back Bathroom
	6/11/91	1519	0	0.2	No Peak Reading
	6/12/91	1909	0	0.3	Both Bathrooms
	6/13/91	0600	0	0.3	Back Bathroom
	6/13/91	0952	0	0.0	No Peak Reading
2176	6/10/91	1344	0	0.8	Back Bathroom
	6/11/91	1529	0	0.2	No Peak Reading
	6/12/91	1919	0	0.2	No Peak Reading
	6/13/91	0624	0	0.1	Back Bathroom
	6/13/91	1002	0	0.1	Back Bathroom
2178	6/10/91	1344	0	1.2	Hall Bathroom
	6/11/91	1524	0	0.4	Hall Bathroom
	6/12/91	1914	0	0.1	No Peak Bathrooms
	6/13/91	0606	0	0.8	Both Bathrooms
	6/13/91	0957	0	0.6	Back Bathroom

LEL: Lower Explosive Limit
PPM: Concentration of organic vapors in parts per million on a volume to volume basis.

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TABLE 3-7

SITE SS-17

EXPLOSIVITY AND ORGANIC VAPOR MONITORING - SANITARY SEWER SYSTEM

Sampling Location	Date	Time	Explosive Gases (% LEL)	Volatile Organic Aromatic Compounds (ppb)				Notes
				Benzene	Toluene	Ethylbenzene	Xylenes	
MH-89	6/10/91	1750	0	<1	<1	<1	<3	Low Flow
	6/11/91	1119	0	<1	<1	<1	<3	Low Flow
	6/12/91	1720	0	<1	<1	<1	<3	Low Flow
	6/13/91	0712	0	4	3	<1	<3	Low Flow
MH-90	6/10/91	1705	0	<1	<1	<1	<3	Standing Water
	6/11/91	1138	0	17	16	5	14	Low Flow
	6/12/91	1734	3	19	18	5	17	Low Flow
	6/13/91	0723	0	8	5	<1	4	Low Flow
MH-91	6/10/91	1555	0	25	25	7	21	Moderate Flow
	6/11/91	1152	0	21	26	4	11	Heavy Flow
	6/12/91	1820	0	<1	<1	<1	<3	Moderate Flow
	6/13/91	0735	0	17	18	1	12	Low Flow
MH-92	6/10/91	1440	1	3	4	<1	<3	Dry
	6/11/91	1104	0	<1	2	<1	<3	Dry
	6/12/91	1800	35	12	18	4	13	Dry
	6/13/91	0803	23	<2	8	<2	<6	Dry
MH-93	6/10/91	1844	5	6	12	<1	<3	Moderate Flow
	6/11/91	1056	0	15	27	2	<3	Standing Water
	6/12/91	1624	1	<1	<1	<1	<3	Low Flow
	6/13/91	0656	0	<1	2	<1	<3	Low Flow

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TABLE 3-7 (Continued)

SITE SS-17

EXPLOSIVITY AND ORGANIC VAPOR MONITORING - SANITARY SEWER SYSTEM

Sampling Location	Date	Time	Explosive Gases (% LEL)	Volatile Organic Aromatic Compounds (ppb) Benzene	Toluene	Ethylbenzene	Xylenes	Notes
MH-94	6/10/91	1827	0	<1	<1	<1	<3	Standing Water
	6/11/91	1039	0	<1	4	<1	<3 *	Standing Water
	6/12/91	1638	3	<1	<1	<1	<3	Low Flow
	6/13/91	0631	1	<1	<1	<1	<3	Low Flow
MH-95	6/10/91	1812	0	<1	<1	<1	<3	Low Flow
	6/11/91	1024	0	<1	<1	<1	<3 *	Low Flow
	6/12/91	1702	0	<1	<1	<1	<3	Low Flow
	6/13/91	0616	0	<1	<1	<1	<3	Moderate Flow
MH-A	6/10/91	1525	0	<1	<1	<1	<3	Dry
	6/11/91	1251	0	<1	<1	<1	<3	Dry
	6/12/91	1610	0	<1	<1	<1	<3	Dry
	6/13/91	0912	0	<1	<1	<1	<3	Dry
MH-B	6/10/91	1540	0	<1	<1	<1	<3	Heavy Flow Before Sampling
	6/11/91	1311	0	<1	<1	<1	<3	Low Flow
	6/12/91	1547	1	<1	<1	<1	<3	Moderate Flow
	6/13/91	1024	0	<1	<1	<1	<3	Heavy Flow Before Sampling

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TABLE 3-7 (Continued)

SITE SS-17

EXPLOSIVITY AND ORGANIC VAPOR MONITORING - SANITARY SEWER SYSTEM

Sampling Location	Date	Time	Explosive Gases (% LEL)	Volatile Organic Aromatic Compounds (ppb) Benzene	Toluene	Ethylbenzene	Xylenes	Notes
MH-C	6/10/91	1911	0	<1	<1	<1	<3	Low Flow
	6/11/91	1431	0	<1	<1	<1	<3	Low Flow
	6/12/91	1528	0	<1	<1	<1	<3	Low Flow
	6/13/91	1040	0	<1	<1	<1	<3	Low Flow
MH-D	6/10/91	1944	0	<1	<1	<1	<3	Standing Water
	6/11/91	1452	0	<1	<1	<1	<3	Standing Water
	6/12/91	1512	0	<1	<1	<1	<3	Standing Water
	6/13/91	1056	0	<1	<1	<1	<3	Low Flow
Lift Station	6/10/91	1735	0	<1	<1	<1	<3	Moderate Flow
	6/11/91	1412	0	<1	<1	<1	<3	Moderate Flow
	6/12/91	1932	0	<1	2	<1	<3	Moderate Flow
	6/13/91	0748	0	<1	<1	<1	<3	Moderate Flow
Car Wash Grit Chamber	6/10/91	1615	0	25	35	10	37	Discharge from Line 2
	6/11/91	1327	0	15	18	5	12	Discharge from Line 1 Car Wash In Use
	6/12/91	1845	0	5	5	<1	<3	Discharge from Line 4 Car Wash In Use
	6/13/91	0840	0	30	31	15	34	Discharge from Line 2

LEL: Lower Explosive Limit
ug/L: micrograms per liter of air
*: System interferences and or contamination may have impacted the ability to detect concentrations of the indicated constituents at or slightly above the reported detection limit.

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It is believed that these vapors are present due to the operating trench fuel recovery system. Recovered waters from the four trench systems are routed to the sanitary sewer system which flows from north to south. Trench Nos. 1 and 2 are nearest the Service Station and discharge recovered groundwater to the Grit Chamber. Water from the Grit Chamber flows to MH-91. It would be logical that manholes MH-90, MH-91, MH-92, and the Grit Chamber would have elevated vapor readings due to their proximity to Trenches Nos. 1 and 2 and their downgradient positions. It is not believed that vapors within the manholes are due to vapor seepage from surrounding soils. Based on this data and information obtained, it can be concluded that Site SS-17 soils are not a source of potentially harmful vapors in utilities, basements or other surface or subsurface structures.

4.0 SUMMARY OF APPLICABLE REGULATIONS

4.0 SUMMARY OF APPLICABLE REGULATIONS

The investigation of Site SS-17 at Holloman AFB began under the Installation Restoration Program (IRP) format (as initiated by the DOD). The Department of Defense (DOD) has now adopted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) protocol pertaining to its site investigations. CERCLA requires, for substances left on-site at the conclusion of remedial action, that the action require a level or standard of control which at least attains applicable or relevant and appropriate Federal or State environmental or public health requirements (refer to EPA document CERCLA Compliance with Other Laws Manual, Interim Final, August 1988). Therefore, remediation of Site SS-17 at Holloman AFB should comply with New Mexico UST Regulations. Specifically, Part XII, Corrective Action for Petroleum UST Systems, would be applicable to Site SS-17, since tank leakage is likely or known. Therefore, remediation of this site should follow the New Mexico UST Regulations (UST Regulations).

As stated in the UST Regulations, if "highly contaminated" soils are present, the owner and/or operator must follow the requirements of Sections 1209.A, B, C and D. According to NM UST Bureau Soil Guidelines, "highly contaminated" soils are defined as soils which are saturated with any type of petroleum product. Two methods of determining this are:

A. Filter paper method

1) Place a sample of the soil on filter paper.

2) Observe the paper under the soil. If hydrocarbon is able to saturate the paper, the soil is highly contaminated.

B. Observation of physical properties

1) Study a sample of the soil for observable free petroleum product, moisture content, gross staining, and evidence of very strong odor. These physical properties are criteria which may be used to determine if the soil is highly contaminated.

As noted in A and B above, these methods for determining whether a soil is "highly contaminated" are subjective, thus it is anticipated that agency assistance will be needed to aid in this determination. In the remainder of this report, "highly contaminated" will not be placed within quotations. When referenced, however, highly contaminated soils will refer to soils which meet the definition for highly contaminated soils as stated in the NM UST Bureau Soil Guidelines.

It is believed that highly contaminated soils are likely at Site SS-17 due to the known presence of floating product. According to Section 1209A:

> Where highly contaminated soils are present, the owner or operator must
>
> (1) excavate the contaminated soils to the greatest practicable depth within 96 hours of discovery and treat them by spreading them in a single lift no more than 6 inches thick;
>
> (a) in a bermed area where groundwater is greater than 100 feet deep; or
>
> (b) in a bermed area on an impervious liner or surface in a level area where the groundwater is less than 100 feet deep. All necessary precautions must be taken to prevent runoff or infiltration of contaminants; or

(2) treat, recycle or dispose of the excavated soils using an alternate method approved in advance by the division. Soils stored temporarily on-site must be stored in a bermed area on an impervious liner or surface in a manner that does not contaminate groundwater, surface water or other uncontaminated soil.

It is likely that highly contaminated soils may be present over a large area of Site SS-17 (based upon the estimated plume of free product). According to Section 1209.B:

> Where highly contaminated soils remain beyond the depth or horizontal extent of practicable excavation, or when the owner or operator choose to treat contaminated soils in place, the owner and operator must design, install and operate an enhanced soil venting system, or other appropriate soil treatment system approved by the division, within 45 days. This system must be capable of reducing soil contamination levels in a timely manner. Soil venting systems are generally appropriate only for use on releases of volatile contaminants.

The five inactive USTs at Site SS-17 were removed from January 22 to February 6, 1992. Mr. Lincoln Adkins of the NM Environment Department (NMED) and Mr. Roger Wilkson of Holloman AFB were present during the tank removals. According to information gathered from Mr. Wilkson during a February 11, 1992 meeting (refer to letter of February 18, 1992 in Appendix E), soil samples collected near the removed tanks had PID readings of 300 to 600 ppm. No filter paper testing was performed on soil within the excavation to determine if it was highly contaminated. The 5,000 gallon and one - 10,000 gallon tank had evidence of leakage.

Mr. Adkins believed the soil to be highly contaminated based upon black stains and odors. Mr. Wilkson did not believe the soil to be highly contaminated. This difference of opinion prompted the need to determine a less subjective means (i.e., other than the NM UST Bureau Soil Guidelines definition of highly contaminated soil) of defining soils which would need to be remediated. Telephone conversations and correspondence between the NMED, the USACE, Holloman AFB and Walk, Haydel are presently attempting to determine a less subjective means of defining highly contaminated soil.

This CAP report will investigate soil venting as well as other appropriate in-place soil treatment systems. Excavation will also be investigated as a means of comparison to in-place soil treatment systems.

UST regulations are applicable to Site SS-17, although not all portions are relevant and appropriate. According to Section 1209.D:

> Remediation of soil contamination will be considered complete when:
>
> (1) soil contamination has been reduced to a level which will not contaminate ground water through percolation or as the water table rises and falls with seasonal fluctuations, and the soil is not a source of potentially explosive or potentially harmful vapors in utilities, basements or other surface or subsurface structures;
>
> (2) no highly contaminated soils remain in the ground; and
>
> (3) an analysis of what appears to be the most contaminated soil reveals:
>
> (a) the total aromatic hydrocarbon value to be less than 50 ppm and the benzene concentration to be less than 10

ppm when measured using an appropriate laboratory test, or the total aromatic hydrocarbon value to be less than 100 ppm when measured using an appropriate field instrument, in areas where the underlying ground water contains 10,000 milligrams per liter or less total dissolved solids and the contaminated soil is 50 feet or less above the seasonal high static ground water level; and

(b) if the soil was contaminated by diesel fuel, motor oil, heating oil, kerosene, jet aviation fuel or other heavy petroleum product, the total petroleum hydrocarbon value (TPH) is less than 100 ppm using an appropriate laboratory test in areas where the underlying ground water contains 10,000 milligrams per liter or less total dissolved solids and the contaminated soil is 50 feet or less above the seasonal high static ground water level.

Groundwater beneath Holloman AFB contains in excess of 10,000 mg/l Total Dissolved Solids (TDS). However, groundwater samples collected at Site SS-17 reflect TDS levels above and below 10,000 mg/L. Based upon this data, clarification of the need for groundwater remediation at Site SS-17 (other than removal of free product) was requested from the NMED (refer to March 25, 1992 and May 11, 1992 correspondence included in Appendix E). According to Ms. Kathleen M. Sisneros, the Director of the Water and Waste Management Division of NMED, during an April 28, 1992 meeting at Holloman AFB in which NMED and Holloman AFB representatives were in attendance, no groundwater remediation (other than removal of free product) is necessary. Therefore, requirements (3)(a) and (b) are not applicable to Site SS-17. Also, based upon correspondence with the UST Bureau of the NMED, requirement (1) is also not applicable to Site SS-17. Due to groundwater usage and quality (TDS levels greater than 10,000 mg/l) beneath Site SS-17, contaminated soil which may contact groundwater (due to

seasonal fluctuations in the water table elevations) need not be removed. However, highly contaminated soils or soils which are potentially explosive or are a source of potentially harmful vapors in utilities, basements or other surface or subsurface structures (as per 1209.D.(1)) are subject to the UST requirements.

An investigation was performed to determine whether Site SS-17 contains soils which are potentially explosive or are a source of potentially harmful vapors in utilities, basements or other surface or subsurface structures. "Potentially explosive levels of petroleum hydrocarbon vapors" are defined by UST Regulations as vapors which register in excess of 30% LEL (lower explosivity limit) on a combustible gas indicator properly calibrated for pentane. "Potentially harmful petroleum hydrocarbon vapors" are defined as vapors which register a reading of 5 ppm total aromatic hydrocarbons in any off-site surface or subsurface structure, or 10 ppm total aromatic hydrocarbons in any on-site structure, on a photoionization detector (PID), flame ionization detector (FID) or an equivalent device properly calibrated to detect hydrocarbon vapors at a minimum detection limit of at least 1 ppm.

Based upon field measurements performed by Geraghty and Miller from June 10 to June 13, 1991, (see Appendix D) organic vapor readings within nearby residences did not exceed 5 ppm nor were explosive vapors detected. Explosive vapor and BTEX readings were also collected from eleven surrounding manholes, a lift station and the Car Wash Grit Chamber. The highest levels of vapors recorded at Site SS-17 were in manhole MH-92 at 23% LEL and 35% LEL on June 12th and 15th, respectively. The highest reported concentrations of BETX were detected in the Car Wash Grit Chamber. As discussed in Section 3.4, it is not believed that vapors within the manholes are due to vapor seepage from surrounding soils, rather they are the result of the trench systems effluent emptying into the sanitary sewer system. It can be concluded that Site SS-17 soils are not a source of potentially harmful vapors in utilities, basements or other surface or subsurface structures, based upon results summarized in Section 3.0. Sewer lines, however, should be vented due to recovered groundwater contents with vapor

concentrations greater than 30% LEL. Holloman AFB has hired the firm Wilson and Company of Albuquerque, New Mexico to determine the most effective and cost-effective means of venting the lines. To date, further monitoring of the lines has been performed and results, as well as suggested venting methodology, should be complete in the near future.

Section 1209.D.(1) is not appropriate for Site SS-17. Appropriate sections of 1209.D are reduced to:

> Remediation of soil contamination will be considered complete when:
>
> (2) no highly contaminated soils remain in the ground.

This CAP serves as the "Reclamation Proposal" referenced in Section 1212 of the NM UST Regulations. A variance request (refer to Section 1222 of the UST Regulations) has been sent to the NMED, UST Bureau, to relieve the time table requirements of the UST regulations. This variance does not, however, relieve appropriate reclamation termination requirements which are as follows (from Section 1219):

> (1) no floating product is present on the water table;
>
> (6) any other conditions which threatened health, public welfare or the environment have been remediated.

Based upon a conference held in Santa Fe, NM on August 12, 1991 with the NMED, UST Bureau, and representatives from Walk, Haydel, Holloman AFB and the U.S. Army Corps of Engineers (USACE), a representative from the UST Bureau stated that eight consecutive quarters of detecting no free product in any well is the test used to determine completion of groundwater cleanup. If, after eight consecutive quarters, no free product is detected in the monitoring wells, then the

site is considered clean and no remediation of the soil is necessary (refer to August 12, 1991 Conference Record included in Appendix E). Thus, considering this possibility, the CAP will investigate the feasibility, effectiveness and cost of meeting this criterion as an alternative in addition to other alternatives in which soil remediation technologies are employed to meet appropriate requirements.

5.0 IDENTIFICATION AND SCREENING OF SOIL REMEDIATION TECHNOLOGIES

5.0 IDENTIFICATION AND SCREENING OF SOIL REMEDIATION TECHNOLOGIES

Four possible means of soil remediation have been identified for Site SS-17:

1) soil venting,
2) soil flushing,
3) bioremediation, and
4) excavation.

Soil venting, soil flushing and bioremediation are in-situ treatments. These technologies could be implemented at present with the existing recovery trench system in operation. The fourth possible means of remediation, excavation, would be implemented only after trench recovery operations cease. If excavation was implemented prior to the trench system's cessation, soils within the identified gasoline plume (and possibly beyond), at depths believed to contain gasoline, would have to be excavated. This would entail excavation of the trenches (cessation of free product recovery) as well as recovery of remaining free-phase gasoline which would flow into excavated areas. In accord with NM UST Regulations, excavation will be considered as a means of remediation only if a practicable volume of highly contaminated soil remains to be excavated after trench operations cease.

The following subsections investigate each technology, its applicability to Site SS-17 and effectiveness to eliminate highly contaminated soil.

5.1 Soil Venting

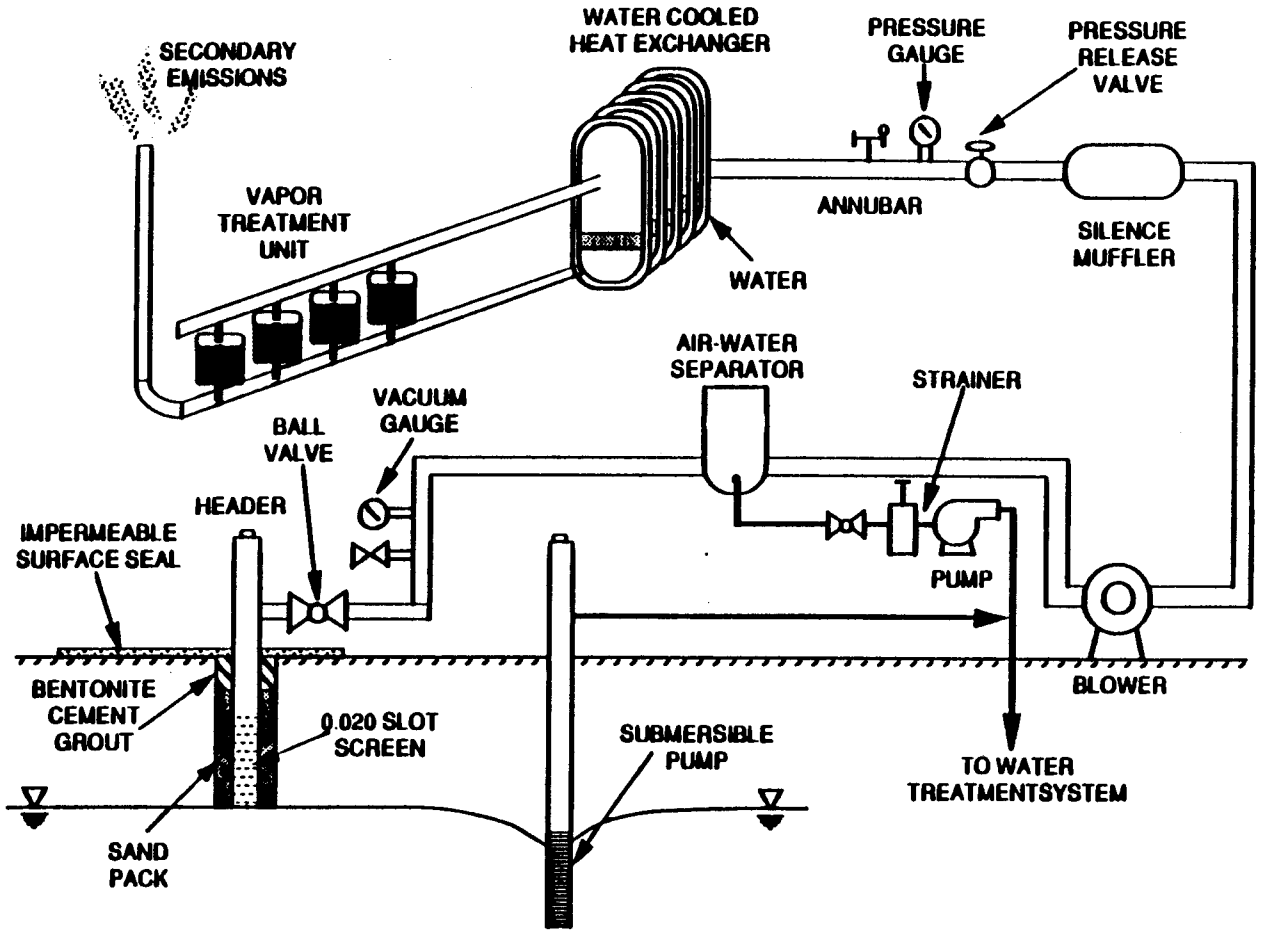
Soil venting (also called soil vapor extraction, vacuum extraction, soil aeration, in-situ volatilization and enhanced volatilization) is a process used to remove volatile organic contaminants from unsaturated soils by induced air flow. It is used to treat contamination in the vadose zone. In this

process, a blower places a vacuum on the soil through a series of trenches or wells. Soil venting relies on the characteristics that cause a contaminant to volatilize into the air available in the void spaces within the subsurface soil matrix. Contaminants volatilize and are then transported to the surface through withdrawal wells. Refer to Figure 5-1 for a schematic of a typical venting system.

A treatment system may be required to treat the off-gas to acceptable air limits. Soil venting is effective only on volatile organic compounds and offers little remediation of semi-volatile compounds and no remediation for metals or non-volatile compounds.

Soil venting has proved successful in remediating contaminated soils at many sites (Newton, 1990). However, a wide variety of environmental and soil factors affect this process. They include water content, soil porosity and permeability, clay content, adsorption, soil density, temperature, evaporation and precipitation.

Increased water content in the soil decreases the rate of volatilization by reducing the available soil vapor spaces. Thus, as the water content increases, the soil air permeability decreases. While a high water content inhibits volatilization, too low a water content may inhibit volatilization by increasing the soils sorption coefficient. Reible (1989) showed that electrostatic force increases for drier soils, leading to reduced volatilization from the dissolved phase into soil vapor spaces. When adequate water is available, sorption of contaminants to soil decreases as water displaces contaminant molecules. The optimal soil moisture for soil venting is a water content low enough to ensure adequate air permeability, yet wet enough to reduce electrostatic sorption forces (Pedersen and Curtis, 1991). Davies (1989) states that the critical moisture for soil venting is 94 to 98.5% relative humidity in the soil air spaces. Below this range volatiles are more tightly



SOURCE: PEDERSEN AND CURTIS, 1991

FIGURE 5-1

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

TYPICAL VENTING SYSTEM

bound to soil and may not be as readily volatilized. Soil porosity and permeability have a decided influence on the capability of the soil to transport vapor. The more porous the soil, the more vapor that can be transported through it. Clay content influences soil venting because an increased clay content causes decreased soil permeability. Soils with high mineral and organic content will also have a difficult time releasing contaminants. The contaminants tend to sorb onto the clay or organic matter surfaces and must be desorbed before volatilization can occur. Higher temperatures and evaporation will increase volatilization of the contaminants. Increased precipitation will decrease volatilization.

Often, air is introduced into the vadose zone in concert with a vacuum. Air can either be injected with aid of a compressor or passively introduced through a well open to atmospheric conditions. The increased amount of subsurface oxygen from enduced air enhances biodegradation. If heated air is introduced, the time required for microbes to multiply is typically reduced. Thus, microbial activity is stimulated and the rate of biodegradation is increased (Ardito and Billings, 1990).

Soil venting is often hindered by the proximity of the vent wells or trenches to the water table. Generally, wells can be used if the groundwater is 10 feet or more below the surface. Trenches would typically be used for shallower water table areas (Newton, 1990). Often, surface seals are used when employing soil venting to increase the radius of influence of an induced vacuum and minimize inflow from the surface. Surface seals also prevent infiltration of precipitation, thus decreasing the volume of air-water mixture recovered from an extraction well which would require separation. Surface seals generally are made of high density polyethylene material, clay, concrete or asphalt (Pedersen and Curtis, 1991).

The groundwater table at Site SS-17 ranges from five to ten feet below ground surface. The first one to two feet of soil at the site is gravel, sand and silt. Two to five feet below the ground surface are silts and fine sands. Five to ten feet below ground surface is silty sand with a permeability of approximately 10^{-5}cm/sec. Porosity is estimated to be 10%. Ten to fifteen feet below ground surface is clay. The top of USTs and lines from the tanks are approximately three feet or more below ground surface. It is likely that fuel leakage occurred at three feet or more below the ground surface. Soils at this depth and below are silts, fine sands, silty sand and clay. The groundwater has been recorded to occur two feet to seven feet below the leakage. Therefore, two to seven feet of highly contaminated soil may exist in the vadose zone (depending upon the present groundwater table level).

The more permeable and porous a soil, the greater the ease of venting. Soils at Site SS-17 have a moderately low permeability (10^{-5}cm/sec) and have a rather low porosity. The degree of success of venting can only be evaluated based upon results of a pilot test. Factors which could increase the likelihood of successful venting at Site SS-17 would include the high probability of secondary porosity (burrows, desiccation cracks, fractures in caliche) and the probable low moisture content of soils above groundwater. Figure 5-2 (from Pederson and Curtis, 1991), was used as a preliminary means to determine the likely success of venting at Site SS-17. Using the time since release as "years", the soil air permeability as an upper range clay, and vapor pressure ranging from benzene to xylene, the success of soil venting is somewhat likely.

The greater the moisture content of a soil, the more difficult venting. In order to vent soils likely to be highly contaminated at SS-17, the groundwater table would need to be lowered. This would increase the depth of the unsaturated (vadose) zone and allow venting. Pumps within existing trenches could be used to depress the water table within their zone

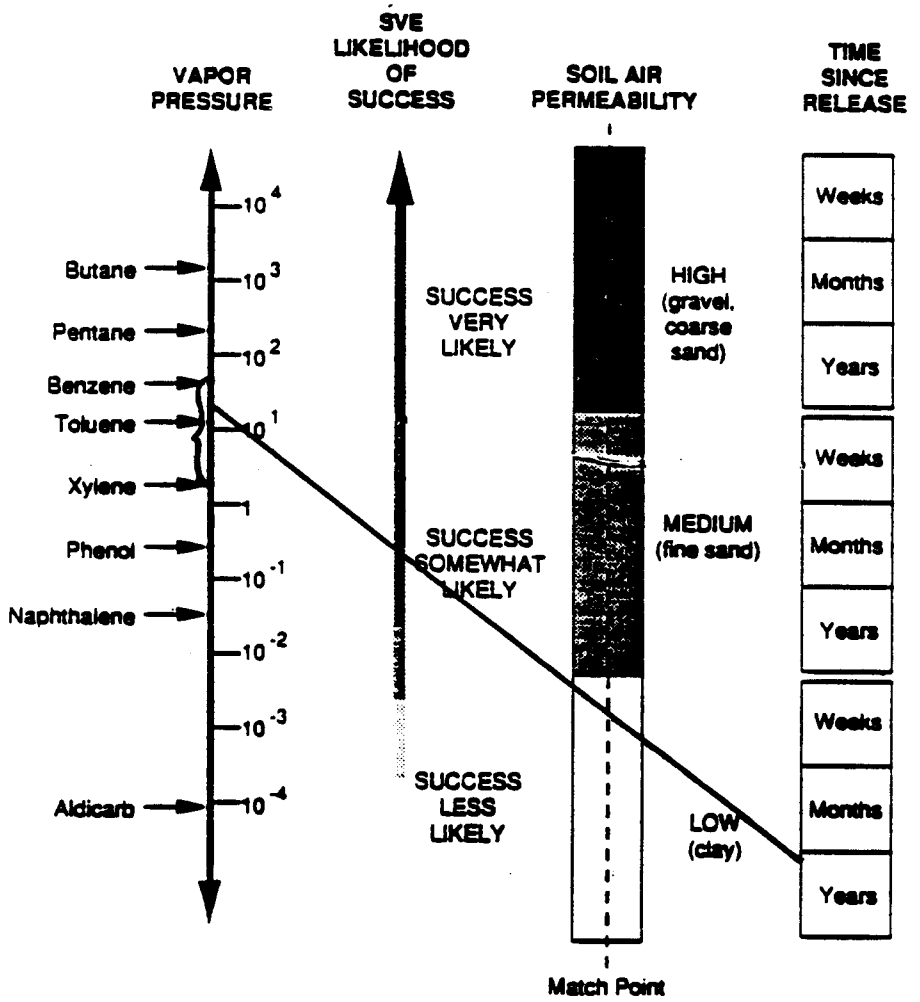


FIGURE 5-2

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

SOIL VENTING APPLICABILITY NOMOGRAPH

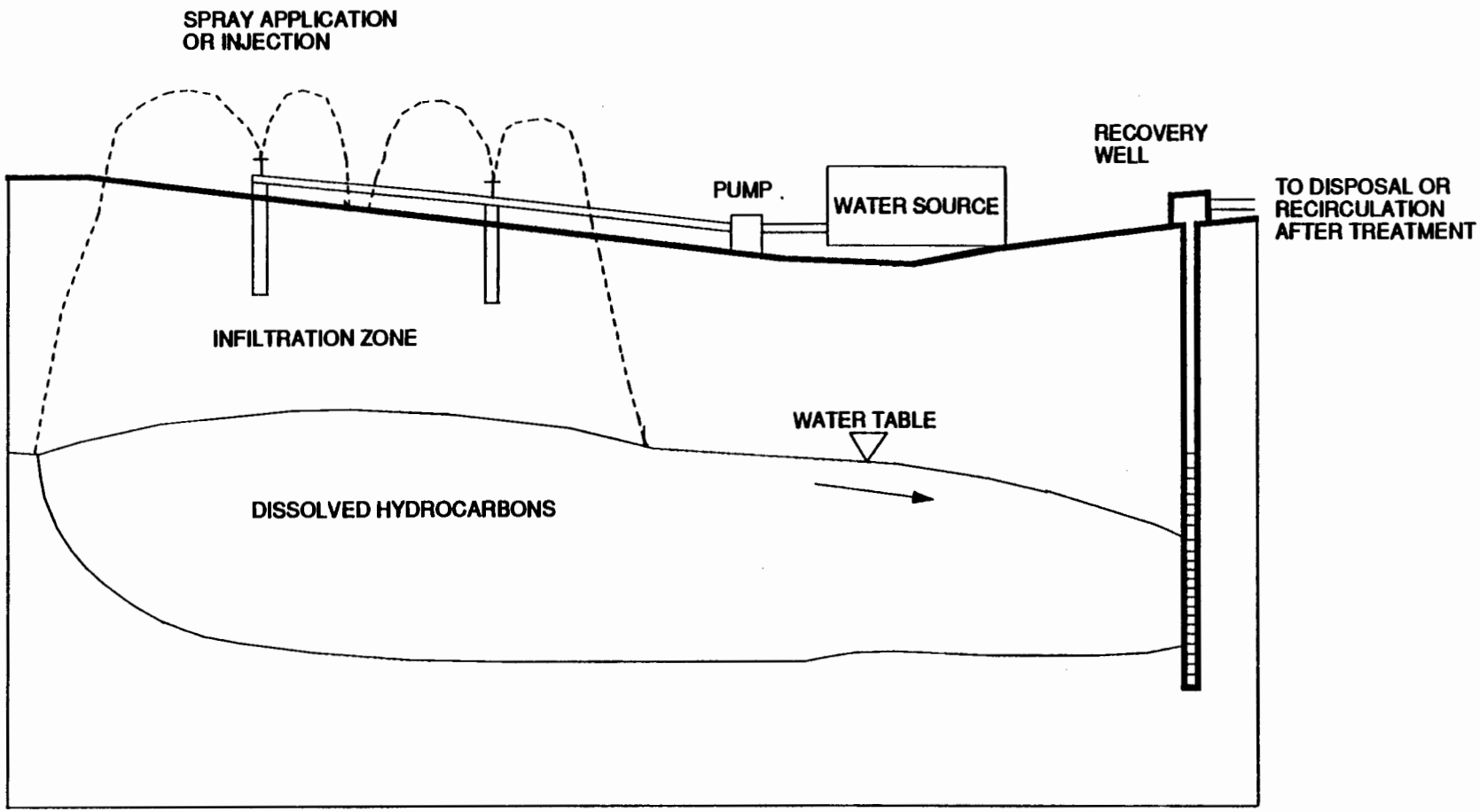
SOURCE: PEDERSEN AND CURTIS, 1991

of influence. Should highly contaminated soils exist beyond their influence, additional trenches or wells may be needed to depress the water table.

5.2 Soil Flushing

Soil flushing uses the movement of a fluid through contaminated porous media to displace contaminants and allow them to be recaptured. Soil flushing can be described as an accelerated precipitation and percolation process. Refer to Figure 5-3 for a typical schematic of a soil flushing system. Fluid can be water or an aqueous solution with a specified concentration of a surfactant (i.e., a surface-active agent that reduces surface tension). Soil flushing makes use of the solubility of a substance in water to transfer it from the soil matrix into the groundwater. Typically, an underground piping network or above-ground bermed area or pit is constructed to fit the dimensions of the contaminated area. Water flow is maintained through the soil and the groundwater is pumped to the surface through recovery wells and treated. The treated groundwater may be reinjected into the area in which contaminated soil is located. Organics having high solubilities are easily flushed from soil. Organics that have relatively medium solubilities may also be effectively removed. A major factor to be considered when designing a soil flushing system is the capacity of the groundwater recovery system. It must be verified that the groundwater recovery system will recover all the contaminants flushed from the soil. In addition, the treatment system must be designed to handle the added contaminant loading.

Soils at Site SS-17 likely to be highly contaminated have an estimated hydraulic conductivity of 10^{-5} cm/sec and are mostly silty sands. Although higher hydraulic conductivities are more conducive to soil flushing, flushing is feasible. Examination of the relative sorption potential of gasoline components - benzene, ethylbenzene, toluene and xylene (BETX) - also



SOURCE: API PUBLICATION 1628

FIGURE 5-3

WALK, HAYDEL & ASSOCIATES, INC.

HOLLOMAN AIR FORCE BASE

TYPICAL
SOIL FLUSHING SYSTEM

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gives an indication of the likelihood of successful soil flushing. The organic carbon partition coefficient (Koc) indicates the tendency of an organic chemical to be adsorbed and it is largely independent of soil properties (EPA, 1986). BETX have Koc values ranging from 83 to 1100 ml/g (EPA, 1986). These values indicate a moderate to low adsorption potential. Therefore, they would tend to leach from soil into groundwater. A factor, however, that may inhibit soil flushing at Site SS-17 is the inhomogeneities which exist in the silty sands requiring flushing. Flow may concentrate in fractures and more sandy soils and may not adequately flush other portions of the soil. A surfactant would have to be used due to relatively low solubilities of BETX components of gasoline. Full recapturing of the surfactant/water mixture would need to be insured and the mixture treated before discharge.

5.3 Bioremediation

Bioremediation involves the physical and chemical break down of contaminants by microorganisms. Refer to Figure 5-4 for a schematic of a typical bioremediation system. The microorganisms break down contaminants through metabolic processing into the elemental constituents of water and carbon dioxide. The microorganisms may be indigenous or introduced, aerobic or anaerobic bacteria. Over time, the bacteria degrade the organic compounds that are present.

The in-situ bioremediation process involves the stimulation of the natural degradation process by introducing nutrients, and/or oxygen, and/or microbes into the soil. Environmental parameters, such as soil pH and temperature, may also be adjusted. The environmental factors that affect microbial activity and the population size determine the rate of remediation. These factors include:

- Site subsurface hydrology

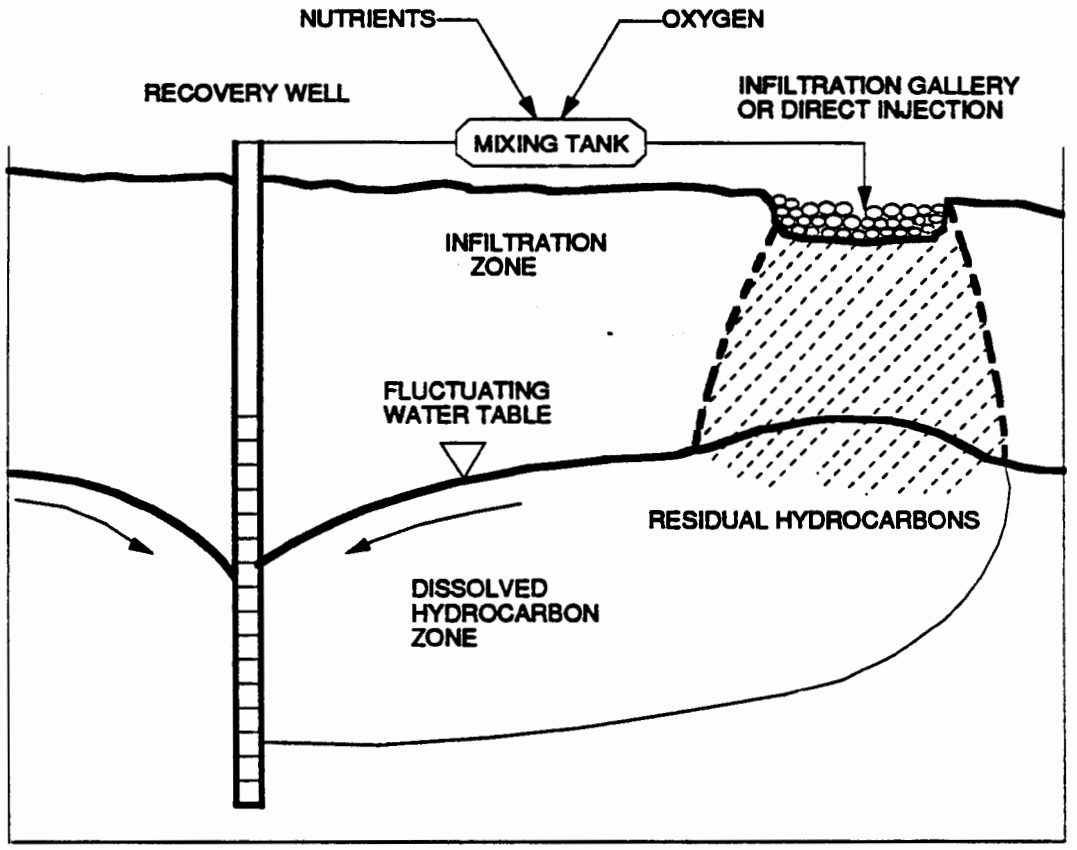

FIGURE 5-4

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HOLLOMAN AIR FORCE BASE

TYPICAL
BIOREMEDIATION SYSTEM

SOURCE: API PUBLICATION 1628

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WH&A 1012 (REV. 5/91)

WALK, HAYDEL & ASSOCIATES, INC.
PROJECT MANAGERS-ENGINEERS-CONSTRUCTION MANAGERS
NEW ORLEANS-MOBILE-BATON ROGUE-LITTLE ROCK

- Soil pH
- Soil temperature
- Hydraulic conductivity
- Types and concentrations of contaminants
- Salinity
- Competition among microbial populations

Many of these factors can be adjusted to obtain optimal environmental conditions for the microorganisms.

Under certain conditions, petroleum products (such as those at Site SS-17) are biodegradable to aerobic bacteria. There are several naturally occurring bacterial species that utilize gasoline as a source of energy for rapid growth in the presence of trace nutrients and oxygen. When gasoline is no longer available, the bacteria die and are decomposed by other natural soil organisms.

Although major strides have been made in recent years with bioremediation, enhanced bioremediation has not been fully proven. Furthermore, treatment of vadose zone contamination with this technology is typically more difficult (Hinchee, 1987).

To optimize growth, the soil and groundwater geochemical properties at Site SS-17 would need to be studied in order to establish the types and amounts of nutrients to be added. Typical of the added nutrients are ammonium chloride, sodium phosphate and disodium phosphate. A standard procedure is to mix the nutrients with water in an air-agitated tank, then inject the mixture into the contaminant plume. Periodic groundwater sampling and analysis are required to adjust injection mixtures as needed.

Oxygen is the primary limiting factor of bioremediation. Addition of nutrients, as discussed above, is sometimes needed, but often these nutrients are already present in the soils. Maintaining moisture content in the soil (to maintain adequate oxygen) is essential due to the fact that bioremediation occurs in soil moisture.

Bacterial biodegradation techniques can be effective in eliminating residual gasoline soil contamination (API, 1989). However, if free-phase gasoline is present, microbes may not be able to survive in the area containing free-phase gasoline because the environment is toxic for natural microorganisms. Site SS-17 may be amenable to bacterial biodegradation within the vadose zone, but specific testing is warranted to confirm feasibility. Since bioremediation is still considered by many agencies to be a developing technology, this technology will not be considered when developing remedial alternatives for Site SS-17. Instead, venting, which enhances bioremediation by inducing oxygen into contaminated areas, will be considered.

5.4 Excavation

Excavation will be considered as a practical remedial action technology if and only if after cessation of trench operations, highly contaminated soil is within a practicable horizontal and vertical extent for excavation. Excavatory equipment would be used to remove the trenches and highly contaminated soils. Soils would either be disposed of at an approved off-base facility or treated on base.

6.0 IDENTIFICATION OF REMEDIAL ALTERNATIVES

6.0 IDENTIFICATION OF REMEDIAL ALTERNATIVES

According to applicable state requirements (UST Regulations), remediation of Site SS-17 will be complete when no highly contaminated soils remain in the ground and no floating product is present on the water table. Presently, recovery trenches are removing free product from atop the water table. After free product has been removed and trench operations cease, it is likely there will exist residual free product which will deem some soils highly contaminated. These will likely exist in the 5 to 10 foot range beneath ground surface in which the water table fluctuates and in particular, near existing trenches. Other soils above the groundwater table may be deemed highly contaminated due to strong hydrocarbon odors. Considering remediation technologies identified in Section 5.0, possible remedial alternatives whose results adhere to UST Regulations (with exception of Alternative 1, No Action) have been identified for Site SS-17. Each is listed below:

Alternative 1 - No Action - The no action alternative would not produce results required by NM UST Regulations. Potentially highly contaminated soils would remain in place and thus violate Section 1209.D.(2). The no action alternative is included for comparative purposes only.

Alternative 2 - Limited Action - Based upon information obtained from the August 12, 1991 conference with the NMED, UST Bureau, if no free product is detected in any site monitoring well after eight consecutive quarters of monitoring, the site is considered to be clean and no remediation of soil is necessary. Although the Bureau's guidance is not specified in the NM UST Regulations, this criterion for a clean site will be considered a remedial alternative. It is a passive remedial alternative with no active remediation of highly contaminated soils.

Alternative 3 - Excavation - Highly contaminated soil would be excavated and disposed of at an approved off-base facility or treated on-base. This alternative would be implemented after trench operations cease to recover free product. This

alternative assumes practical volumes of highly contaminated soil remain after cessation of trench operations. Should this not be the case, an alternate means of remediation would be needed.

Alternative 4 - Soil Venting - This alternative could be implemented while the trench recovery systems are operating to remove free product. Air would be drawn from (and possibly injected into) the vadose zone (above the depressed groundwater table) to reduce the presence of fuel materials in soils to a level that is not classified as highly contaminated. By inducing subsurface air flow, in addition to capturing hydrocarbon gases, oxygen from non-contaminated areas would be forced into contaminated areas. This oxygen would enhance natural bioremediation of residual hydrocarbons. After free product is removed, the groundwater table would be raised and then lowered. Residuals which have adhered to soils by this raising and lowering of the groundwater table would then be removed by reactivation of the soil venting system. This process of raising and lowering the groundwater, followed by reactivation of the soil venting system, could be repeated until recovered vapors stabilize.

Alternative 5 - Soil Flushing - A horizontal piping system would be established over the area believed to contain highly contaminated soils and water with surfactants would be allowed to percolate into the soil. This alternative could be implemented while the trench recovery system is operating to remove free product. Introduced water with washed constituents and groundwater would be captured by the trench recovery system and recovered water could be routed to the sanitary sewer system. Pretreatment of collected groundwater would likely be needed prior to discharge to the sanitary sewer system.

7.0 EVALUATION OF REMEDIAL ALTERNATIVES

7.0 EVALUATION OF REMEDIAL ALTERNATIVES

7.1 Introduction

Each of the remediation alternatives presented in Section 6.0 will be evaluated using five criteria. The five criteria are: implementation, effectiveness, impact on base operations, fire/explosion risk, and cost. Each criteria is discussed below.

- **Implementation** - The evaluation of the technical and administrative feasibility of the alternative and the availability of goods and services.

- **Effectiveness** - The evaluation of the effectiveness of the alternative methods in achieving the NM UST Regulation requirements.

- **Impact on Base Operations** - The evaluation of the impacts on base operations resulting from the implementation of each alternative.

- **Fire/Explosion Risk** - The evaluation of the fire and/or explosion risks created when implementing each alternative.

- **Cost** - The evaluation of the capital, operation and maintenance (O&M), and present worth costs of each alternative.

7.2 Alternative 1 - No Action

7.2.1 Implementation

The no action alternative is the absence of any form of treatment or response. Other than the operation of the existing trench recovery

system, no action would be performed to remediate highly contaminated soils. Therefore, no implementation is required.

7.2.2 Effectiveness

The no action alternative would not be effective in meeting UST Regulation requirements of soil remediation. According to Section 1209.D, remediation of soil contamination will be considered complete when no highly contaminated soils remain in the ground. This alternative does not contribute to the elimination of highly contaminated soil.

7.2.3 Impact on Base Operations

The no action alternative would have no effect upon existing base operations. However, should construction be desired in an area suspected of containing highly contaminated soils, a potential risk of releasing hydrocarbons into the new construction would exit. In addition, should excavation be needed for construction, fire/explosion risks associated with elevated hydrocarbon vapors could be present. An alternate area may need to be chosen.

7.2.4 Fire/Explosion Risk

Since no construction is necessitated by this alternative, fire/explosion risks would not increase from risks at present. While the trench recovery system is in operation, gasoline is collected and removed from the trench manholes. Soils within the trench and in its immediate vicinity are likely petroleum saturated (due to the imposed water table drawdown) and therefore contain higher concentrations of hydrocarbons and thus a higher risk for fire or explosion than

other non-saturated soils at the site. After cessation of trench recovery operations, it is likely that soils within the trench and in its immediate vicinity will remain petroleum saturated and thus contain a higher risk for fire and explosion than other non-saturated soils at the site.

7.2.5 Cost

No costs would be incurred with the no action alternative.

7.3 Alternative 2 - Limited Action

7.3.1 Implementation

The limited action alternative entails no active remediation of highly contaminated soil but requires that site wells be monitored for floating product. If after eight consecutive quarters of monitoring, no free product is observed in any of the wells, the site is considered clean and no soil remediation is required. The following is a list of accessible site wells which would be monitored: MW-1 through MW-9, W-2, W-4, TH-3, TH-6, TH-14, TH-15, TH-20, TH-22 and EPTL. Their locations can be found on Figure 2-1. Monitoring would begin when trench product recovery becomes negligible over time. It has been projected that with recovery trenches operating at the present rate, and assuming no improvements are made to the existing system, another 2.5 to 3 years could be required to remove all of the remaining recoverable product. Thus, monitoring would potentially begin in mid to late 1994. Monitoring would be performed using an interface detector to determine if free product is present. It was assumed, for costing purposes, that during the first two quarters of sampling, free product is detected in some wells. The free product

would be pumped (or bailed) out of the wells during each quarter and the remaining eight quarters of monitoring result in no indication of free product in any well.

7.3.2 Effectiveness

This alternative assumes that if no floating product is detected in any site wells over the course of two years, residual quantities of gasoline remaining in the soil do not warrant remediation. Since no active remediation is performed on soils in this alternative, effectiveness cannot be measured, other than to the standard that no further free product can be removed from the groundwater.

7.3.3 Impact on Base Operations

Since no construction is required for this alternative, base operations would not be impacted. The base may, however, restrict construction in areas believed to contain highly contaminated soil until eight consecutive quarters of well monitoring renders no free product. At this time, the site soil would be considered clean and no soil remediation necessary.

7.3.4 Fire/Explosion Risk

Since no construction is necessitated by this alternative, fire/explosion risks would not increase from risks at present. While the trench recovery system is in operation, gasoline is collected and removed from the trench manholes. Soils within the trench and in its immediate vicinity are likely petroleum saturated (due to the imposed water table drawdown) and therefore contain a higher risk for fire or explosion than other non-saturated soils at the site. After cessation

of trench recovery operations, it is possible that soils within the trench and in its immediate vicinity could still be petroleum saturated and thus contain a higher risk for fire and explosion than other non-saturated soils at the site. It can be assumed that risks remain if residual areas of highly contaminated soil are present.

7.3.5 Cost

Monitoring of wells would begin after cessation of trench recovery operations projected to be approximately 2.5 to 3 years in the future (approximately mid 1994). Eighteen wells would be monitored quarterly. For costing purposes, it was assumed that the first two quarters of monitoring reveal traces of floating product and that the following eight quarters reveal no detectable free product. Therefore, a total of 10 sampling events for 18 wells was assumed for this alternative. Also, pumping or bailing of the wells after the first and second quarters to remove traces of free product is included in the cost of the alternative. The present worth cost to perform this alternative is approximately $10,000.

7.4 Alternative 3 - Excavation

7.4.1 Implementation

This alternative would be implemented after operation of the trench recovery system has ceased. If it were implemented prior to the cessation of the trench system, it is likely a larger area (possibly the entire plume contour) may have to be excavated. By removing free product from atop the groundwater via the trench recovery system, it is likely that the volume of highly contaminated soils would be reduced. The less soil to be excavated, the less time for worker

exposure to hydrocarbon vapors and less volume of soil to be treated.

Presently, highly contaminated soil may exist in the area estimated to contain the gasoline plume (see Figure 2-3). It is likely to be present in the range of 5 to 10 feet below the ground surface in which the groundwater table fluctuates. During the CAP field work (June 1991) when borings were drilled, soil samples were tested using the filter paper test to determine if indeed they were highly contaminated by the UST Bureau definition (see Section 4.0 for explanation of the filter paper test). It was found that samples did not stain the filter paper with hydrocarbons, but that some samples were discolored, had a petroleum odor and thus could be deemed highly contaminated.

Once trench recovery operations cease (projected to be in mid 1994), the area suspected to contain highly contaminated soil will likely differ from that presently assumed. It is possible that by removing mobile free product from the site through the use of recovery trenches, soils once considered highly contaminated could be deemed not highly contaminated and thus need not be remediated. For estimating purposes, it was assumed that after trench recovery operations cease, highly contaminated soils remain only in the trenches and their immediate vicinity. This is assumed to be probable because water containing petroleum constituents and the non-aqueous layer are forced to flow toward the trenches under the influence of groundwater drawdown and thus, accumulations of high levels of residuals may remain in the trenches and their vicinity.

Figure 7-1 shows the area assumed (for comparison and cost estimation purposes) to contain highly contaminated soils after

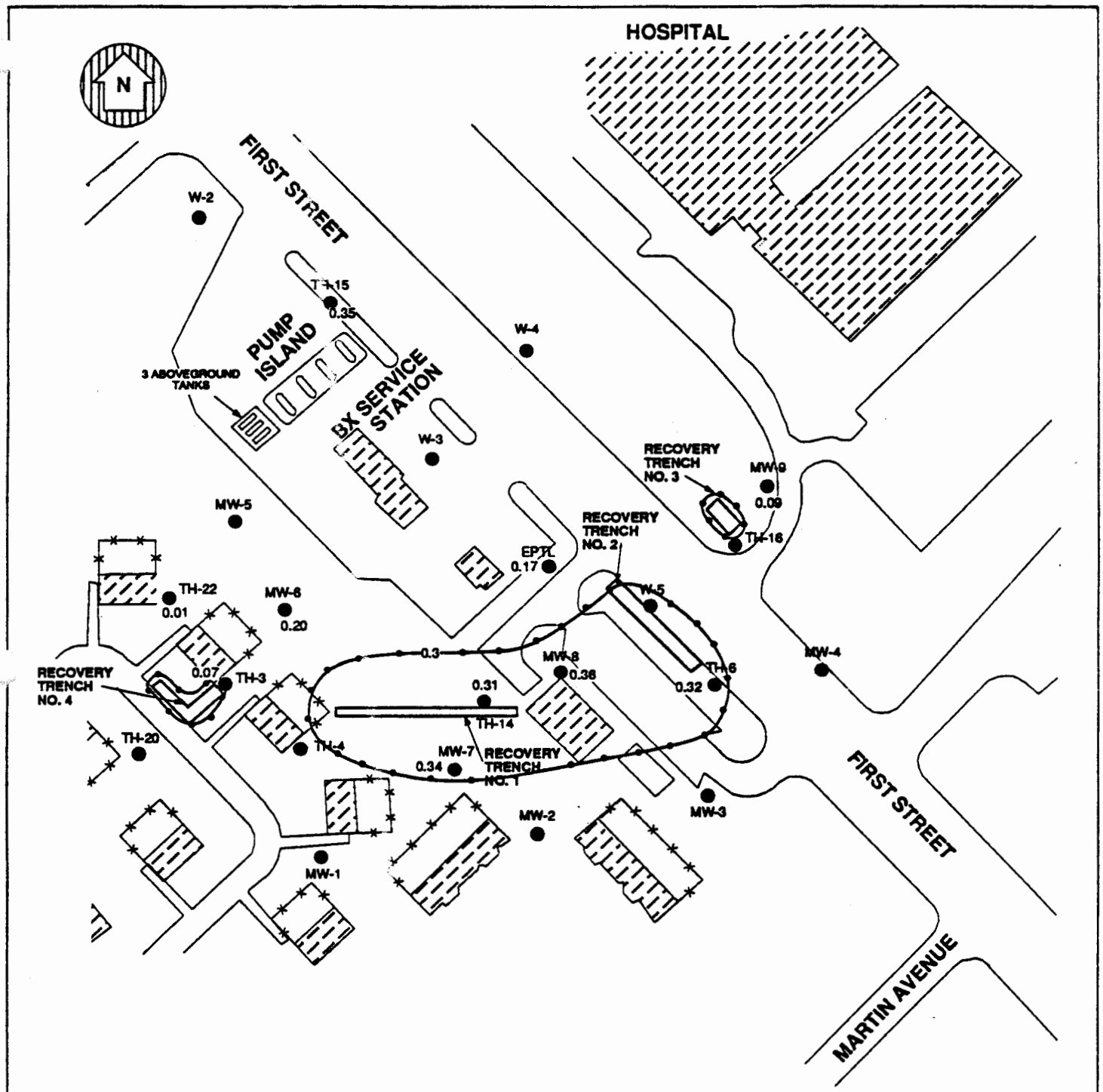

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FIGURE 7-1

SCALE IN FEET: 1" = 125'

LEGEND:

- MONITORING WELL
- IN-SITU MOBILE PRODUCT THICKNESS CONTOUR (6/91)
- EXTENT OF "HIGHLY CONTAMINATED" SOIL

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HOLLOMAN AIR FORCE BASE

SITE SS-17,
ASSUMED AREAL EXTENT OF
HIGHLY CONTAMINATED SOIL

cessation of trench operations. This area includes the area within the June 1991 0.3 foot contour of in-situ mobile product and also Trench Nos. 3, 4 and a portion of Trench No. 2 north of the 0.3 foot contour.

Before excavation takes place, the area of highly contaminated soils would be defined by field confirmation. Field confirmation would consist of drilling test borings to 10 feet and collecting samples to be defined as highly contaminated or not highly contaminated based upon the UST Bureau definition. It is recommended that four borings be drilled around Trench Nos. 3 and 4 (north, south, east and west of each trench) and six borings be drilled around both Trench No. 1 and Trench No. 2. Thus, twenty borings are estimated initially. If highly contaminated soils are found to be within a boring, depths would be noted and another boring drilled at a further distance from the trench until no highly contaminated soils are encountered. If no highly contaminated soils are encountered within a boring, another would be drilled nearer the trench to limit the area defined as highly contaminated. It is recommended that initial borings be drilled within ten feet of the trenches. For cost estimating purposes, it was assumed that 40 test borings would be drilled. By observing test boring samples, the area to be excavated could be estimated and a determination made to the practicability of this alternative.

It was assumed, based on Figure 7-1, that 6750 CY of highly contaminated soil remains after cessation of the trench operations (refer to Appendix G for calculations). Soil not considered highly contaminated would need to be excavated and stockpiled in order to excavate deeper soils deemed highly contaminated. It was calculated that 6750 CY of <u>non</u> highly contaminated soil may need to be excavated in order to reach highly contaminated soil.

Concrete and asphalt would have to be removed prior to excavation. Rubble would be disposed of at the Main Base Landfill. Excavated highly contaminated soil would be handled in one of two ways. It would either be transported to Site 1 (the Main Base Landfill) where it would be treated, or transported in lined trucks to Nu Mex Landfill (approximately 150 miles from Holloman AFB in Sunland Park) for disposal.

Treatment of soil at Site SS-17 was assumed to be landfarming. This would require a lined, bermed area to be constructed on which highly contaminated soils would be spread. Soils would be spread in a single layer no greater than six inches thick and turned or disced to enhance aeration approximately once every two weeks. The liner could be constructed of either a geomembrane material or clay. If a geomembrane material were to be used, sand and gravel would be needed atop the membrane material to enable discing machinery to traverse the area without damaging the liner. If clay were to be used as a liner, it should have a permeability of less than 10^{-7} cm/sec to prevent infiltration. If soil is stockpiled prior to treatment, it must be stockpiled on a lined, bermed area. Due to high evapotransporation in the Holloman AFB area, a collection system to collect contained rainfall within bermed areas is not anticipated.

A preliminary cost estimate was performed to determine the cost of constructing a landfarm area using a geomembrane liner versus a clay liner. Results indicate that using a clay liner is approximately 30% less expensive than developing a landfarm area using a geotextile material for a liner. Therefore, when developing costs for this alternative, it was assumed that clay would be used as liner material.

A treatability study is anticipated prior to implementation of this alternative to determine if other means besides discing (i.e., addition of microbes) must be considered for adequate treatment of soil. The cost for this study has been included in the total cost of Alternative 3.

Referring to Figure 7-1, the Shopette building is within the assumed area to contain highly contaminated soils after cessation of trench operations. Soils could not be excavated near the building or under the building without disturbing its structural integrity. Therefore, either another means of remediating soil under the building must be investigated or, the building demolished and reconstructed at another location or reconstructed at the same location after excavation activities are complete. The base has plans to enlarge the Shopette building to incorporate a Car Wash. The existing Car Wash and BX Service Station are to be demolished. The gasoline pumps and above ground tanks are to be moved to the Shopette area. This work is scheduled for fiscal year 1993 or 1994. Because of these plans, it is not desirable to demolish the Shopette, but rather, perform in-situ remediation of assumed highly contaminated soils beneath the building. The form of in-situ remediation could be soil venting or soil flushing. For costing purposes, it was assumed that soil venting would be used.

Once highly contaminated soils are removed, the area would be backfilled with excavated soil (which is not highly contaminated) and soil from the base borrow pit used to replace excavated soils deemed highly contaminated..

7.4.2 Effectiveness

The excavation alternative would reasonably be considered to be 100 percent effective in removing highly contaminated soil in areas of positive identification and excavation. The effectiveness of remediation of soils in areas inaccessible to excavation would depend upon the selected remediation technology. For cost estimating purposes, soil venting was chosen as the selected technology for remediating contaminated soils under the Shopette in this alternative. The reader is referred to Section 7.5.2 for a discussion of the effectiveness of soil venting.

7.4.3 Impact on Base Operations

Trench Nos. 2 and 3 are very near First Street. First Street is a highly trafficked street leading into and out of the base. Trench Nos. 1 and 4 are behind (west) of the BX Service Station in an area not as visible or trafficked. If trenches and surrounding soils are excavated, base operations could be impacted. Of particular concern would be the excavation of Trench Nos. 2 and 3. To excavate Trench No. 2, it is likely that one lane of First Street would be closed and traffic either rerouted or maintained on one lane and a shoulder. Vapors emitted during excavation may necessitate a detour.

Recovery Trench No. 3 is not located as close to First Street as Trench No. 2. But, it is possible that egress and ingress to the trench area may impact traffic on First Street and the hospital entrance south of the trench. Excavation of Trench Nos. 1 and 4 should not impact base operations (other than pedestrian traffic) unless vapors become a concern. Should soils north of the eastern

leg of Trench No. 4 need to be excavated, the structural integrity of Building 2151 (vacant residence) may be at risk.

Based upon the present maximum amount of mobile free product, it is likely that after cessation of trench operations, trench materials, as well as soils between and surrounding Trench Nos. 1 and 2, would likely be highly contaminated. Therefore, for calculation purposes, it was assumed that these soils would need to be excavated. If highly contaminated soils extend to the east side of Trench No. 2, the possibility exists that the portion of First Street in this area may be impacted in order to excavate underlying soils.

7.4.4 Fire/Explosion Risk

If excavation is performed, hydrocarbon vapors in highly contaminated soils would be allowed to volatilize into the atmosphere as overlying soils are removed. Because excavation would be taking place outdoors, surficial volatiles would likely disperse quickly. However, it is estimated that excavation depth would range from 5 to 10 feet. With such a large vertical depth, volatiles would have to travel to the surface before being dispersed into the atmosphere. Such a deep excavation with "trapped" volatiles could become a fire/explosion risk if a source of ignition is presented. The area should be well marked for this risk and strict precautionary supervision administered.

7.4.5 Cost

Excavation would take place after cessation of trench recovery operations (estimated to be in mid or late 1994). Present worth cost for this alternative if highly contaminated soil is disposed off-site is

$530,000. Present worth cost of this alternative if highly contaminated soil is landfarmed on base is $770,000. The cost of the landfarming alternative is high due to the capital cost of establishment of the landfarm area. The landfarm must be lined and bermed and any material stockpiled must be on a lined and bermed area. Disposal costs were based on quotes from Nu Mex Landfill in Sunland Park approximately 150 miles from Holloman AFB. Disposal costs (not inclusive of transportation) were quoted as $6/CY. Note, costs were derived for an assumed volume of soil to be excavated. Only after test borings are drilled to better define the extent of highly contaminated soil, can costs more accurately be determined.

7.5 Alternative 4 - Soil Venting

7.5.1 Implementation

Prior to implementation of Alternative 4, the area to be remediated (the area containing highly contaminated soil) would need to be defined. This would be accomplished by drilling soil borings and examining soil samples to determine highly contaminated soils from non-highly contaminated soils. The same approach to boring locations as explained in Alternative 3 (Section 7.4.1) would be followed. For cost estimating purposes, it was assumed that 40 borings would be drilled.

During sampling to determine the area to be remediated, it is advised that soil gas samples for CO_2 and O_2 be collected as well as samples for enumeration studies (to determine the present state of biological action). The resulting data would serve as background information with which CO_2, O_2 and enumeration results collected during or after remediation can be compared. The comparison would aid in

determining the effectiveness of passive bioremediation as a result of venting.

After the area to be remediated is defined, a field vapor permeability test (pilot test) would be performed. This test could be performed under current conditions, with trench pumps operating and free product being collected. Tests would be performed on a well screened in the vadose (unsaturated) zone. All existing site wells are screened in the saturated zone. The total screened intervals from site wells range from 3 feet to 20 feet below ground surface (BGS). In all cases, the bottom of screen is 10 feet or greater BGS. Considering the depths (at the trenches) to which trenches can depress the groundwater table (Trench No. 1 to 9 feet, Trench No. 2 to 6 feet, Trench No. 3 to approximately 9.5 feet and Trench No. 4 to 7.5 feet), there are no site wells whose full screened interval would be in the induced vadose zone. Therefore, a new well would need to be installed to a depth certain to be within the vadose zone from which vapors would be extracted. The effects of extraction could be measured from two additional wells (or a combination of wells and pressure monitoring probes) screened in the vadose zone and located at various distances from the extraction well. Additionally, the effects from a venting trench could be investigated during the field vapor permeability test. The effects of a vacuum pulled on a trench could be measured by the installation of two nearby wells (or a combination of wells and pressure monitoring probes) screened in the vadose zone.

Field vapor permeability tests would be performed using the above wells and trench to determine the vapor flow rate through soil and the radius of influence of a well or trench. Evaluation of existing surfaces would be performed to determine whether or not additional

surface seals, to increase the radius of influence of an extraction well or trench, would be advisable. Existing concrete may or may not be adequate. Earthen areas may require a surface seal. Also, evacuated air would be tested to determine if treatment is needed prior to discharge. Also, the effects of passive and forced injection of air on chemical concentrations of evacuated air and the radius of influence of a well would be investigated. Based on this information, an engineered venting system would be designed to remediate the confirmed area of highly contaminated soils. The design of the venting system would include the number, size, location, depth of wells and/or trenches, and points of injection or discharge of air, in addition to operation of the trench pumps and venting pumps. Air collected from the system would have to be monitored to determine if treatment is needed before being discharged to the atmosphere. If treatment is needed, carbon adsorption would likely be used.

The elevation of the groundwater table must be maintained below venting wells or trenches during operation of the venting system. Otherwise, groundwater would be vacuumed into the system and trench recovery of free product disrupted. Should groundwater inadvertently be collected during operation of the venting system, it should be drained from the system and appropriately disposed. Sampling of discharged air on a frequent basis would be desired to determine the system's capability to remove volatile hydrocarbon vapors. There are presently no New Mexico Air Regulations pertaining to off-gas from a remedial venting system. However, treatment is anticipated so that vapors do not become a hazard to base workers and residents.

It is speculated that the venting system would reduce pressure atop the groundwater and could cause a sympathetic rise in groundwater.

Depending on the locations of the venting wells, this could decrease the ability of groundwater (and free product) to flow to trenches. This could increase the amount of time needed for free product recovery. Therefore, a vacuum on the trench recovery manhole could be given consideration to maintain adequate free product recovery. Based upon recent (1992) data, minimal to no free product is present in surrounding wells. Therefore, vacuums on trench recovery manholes are not anticipated and costs for such have not been included in this alternative's cost estimate.

Once the trench systems cease to recover free product, the trench and vacuum pumps should be turned off to allow the groundwater to rise to its natural level. When rising, residual free product remaining atop the groundwater would be adsorbed onto soils. The trench pumps could then be turned on and the groundwater table dropped to below venting well or trench depths. The venting system could be reoperated to remove vapors from resaturated soils. This process could be repeated until monitored vapors are reduced to an acceptable level. By raising and lowering the water table, more non-volatiles previously "caught" in soil lenses or adsorbed to soil may be allowed to move back into the groundwater as free product. Others have witnessed this phenomenon. When free product removal was believed to be complete and pumps turned off, free product appeared again. This could occur at Site SS-17.

After remediation is believed complete, confirmation borings should be drilled within the remediated area and beyond. Samples from borings would be classified as highly contaminated or not highly contaminated. If highly contaminated soils are found within the remediated area, the venting system in conjunction with the depressed water table should continue. If highly contaminated soils

are found beyond the remediated area, the venting system should be extended to cover the additional area. Should the location of an additional area be beyond the radius of influence of existing recovery trenches, new trenches (or incorporation, if possible, of pumps in existing monitoring wells) would be needed in the affected area to depress the groundwater table. When vapors are reduced to acceptable levels in the extended area, confirmation borings should again be drilled.

7.5.2 Effectiveness

It is difficult to predict the effectiveness of this alternative without first performing site studies. The efficiency of any soil venting operation depends on three factors: vapor flowrate, vapor flow path relative to the contaminant distribution, and composition of the contaminant. Highly permeable soils are easily vented. Soils at Site SS-17 consist mostly of silts, fine sands and silty sands. These soils are moderately low in permeability. They can be vented, but not as easily as soils with higher permeabilities. Gasoline in underlying soils at Site SS-17 contains many volatile compounds. These compounds would be volatilized during venting with the intent of reducing the hydrocarbon levels in highly contaminated soils to levels that allow the soil's classification to change (i.e. not highly contaminated).

7.5.3 Impact on Base Operations

Implementation of this alternative would require installation of venting wells and/or trenches in confirmed areas of highly contaminated soil. Concrete may have to be removed to install wells and/or trenches. This would impact activities around the Shopette during construction and to a lesser degree during operation. During construction,

ingress and egress to the Shopette would have to be rerouted. Parking would need to be available elsewhere. Also, should a surface seal be required, the area affected may need to be paved or repaved. Venting blowers and possibly air treatment systems would need to be situated near wells or trenches. Blowers and air treatment systems and wells would become obstacles to pedestrian and vehicular traffic. The degree of impact would depend upon the number and location of wells decided upon in the venting design and whether a horizontal piping system would be used. If wells or a piping system are installed east of Trench No. 2, part of First Street may be closed to vehicular traffic during construction.

7.5.4 Fire/Explosion Risk

Implementation of this alternative would allow volatile hydrocarbons from underlying soils to be released to the atmosphere. Monitoring of discharged air would be needed to determine if treatment is required prior to discharge. Areas surrounding wells in which air is vacuumed from the soil could potentially contain relatively high concentrations of volatile hydrocarbons. Ignition sources in these areas could cause an explosion or fire. Areas should be well posted for no smoking to prevent such occurrences.

7.5.5 Cost

It is difficult to estimate the cost of this alternative without knowing definitively the area to be remediated and the design of the venting system. Assumptions were made however, and are included in Appendix G. Present worth cost is estimated to be $350,000.

7.6 Alternative 5 - Soil Flushing

7.6.1 Implementation

Prior to implementation of Alternative 5, the area to be remediated (the area containing highly contaminated soil) would need to be defined. This would be accomplished by drilling soil borings and examining soil samples to determine highly contaminated soils from non-highly contaminated soils. The same approach to boring locations as explained in Alternative 3 (Section 7.4.1) would be followed. For cost estimating purposes, it was assumed that 40 borings would be drilled.

During sampling to determine the area to be remediated, soil samples would be collected to determine the effectiveness of various surfactants in washing contaminants from soils at Site SS-17. A pilot test using the most effective surfactant would be performed to determine the efficiency of the flushing system to reduce highly contaminated soils to a non-highly contaminated state. This would entail injection of the water/surfactant mixture into a well within the influence of a trench and then sampling of soils near the well once flushing is believed complete. Once the pilot test is complete, an engineered design would be implemented to determine a means of applying water mixed with an adequate amount of surfactant to areas containing highly contaminated soil. This would be implemented while trench operations are recovering free product.

Water with surfactants would need to be applied to the entire confirmed area containing highly contaminated soils through a horizontal piping system and/or vertical injection wells.

Piping would be placed approximately one foot below grade so that pedestrian traffic would not be disrupted. This would entail removal of some concrete (particularly near the Shopette) and temporary parking elsewhere. Water tanks would be placed near piping facility inlets and surfactant metered into the water. Water with surfactant would percolate through the soil washing the soil of contaminants. The water, surfactant and contaminant mixture would percolate to the groundwater table and be collected (along with free product) in the operating trench recovery system.

Design of the horizontal piping system would require consideration of the radius of influence of existing trenches. Percolated water, surfactant and washed contaminants must be collected and not allowed to flow beyond the trench influence. If allowed to do so, previously uncontaminated areas may become contaminated. Also, the rate of water pumped from the trench system must not exceed the treatment capacity of water collected from the sanitary sewer system. Pretreatment of collected groundwater may be needed prior to discharge to the sanitary sewer system. Groundwater collected from the trench recovery system could be analyzed to determine if concentrations of gasoline constituents are decreasing with time and whether adjustments need to be made to the system. Injection wells (rather than horizontal piping) would be needed around the Shopette in order to treat soils beneath the building. Injection of the water/surfactant mixture to reach the entire affected area under the Shopette may be difficult.

After free product can no longer be recovered by the trench systems and concentrations of gasoline constituents in groundwater stabilize at acceptable levels, remediation would be considered complete. Confirmation borings would be drilled within the remediated area and

beyond. Samples from the borings would be classified as highly contaminated or not highly contaminated in accordance with the UST Bureau definition. If highly contaminated soils are found within the remediated area, the flushing system in conjunction with the depressed water table created by trench pumps would continue. The amount and possibly the type of surfactant would be reevaluated. If highly contaminated soils are found beyond the remediated area, the flushing system would be extended to cover the additional area. This may entail drilling of new wells or installation of new trenches to depress the groundwater table (should the area be beyond the influence of existing trenches). Percolated water must be recaptured. Therefore, additional groundwater collection systems may be needed should areas beyond the radius of influence of existing trenches need to be treated. When remediation is again believed complete, confirmation borings would again be drilled.

7.6.2 Effectiveness

It is difficult to predict the effectiveness of soil flushing without first performing preliminary tests on site samples. However, soils at Site SS-17 consist mostly of silts, fine sands and silty sands in the area of suspected highly contaminated soils. Hydraulic conductivity at Site SS-17 was estimated to be 8×10^{-5} cm/sec. Soils at the site can be flushed, but not as easily as soils with higher permeabilities. Considering the types of soils present and the estimated site hydraulic conductivity, percolation of water may be inhibited and thus impede the remediation process. Also, surfactants have a tendency to adhere to soil particles and thus reduce soil permeability and further remediation. Some of the more effective surfactants could inhibit the future natural biodegradation of organic constituents.

7.6.3 Impact on Base Operations

Assuming the area to be remediated is as shown in Figure 7-1, implementation of the soil flushing alternative would impact activities around the Shopette during construction and to a lesser degree during operation. During construction, ingress and egress to the Shopette would have to be rerouted. Parking would need to be available elsewhere. If the piping system is designed to be on the east side of Trench No. 2, part of First Street may be closed to vehicular traffic during construction . Injection wells may be opted here and installed just west of First Street. During operation, in unpaved area, vehicular traffic would be prohibited.

7.6.4 Fire/Explosion Risk

Implementation of this alternative would allow groundwater, surfactants and gasoline constituents washed from soil to enter Trench Nos. 1 and 2 (and any new trench systems installed). Groundwater would contain higher concentrations of dissolved constituents than groundwater currently entering the systems and being discharged to the sanitary sewer system. Groundwater would need to be analyzed to make certain that the treatment capacity of the wastewater system is not exceeded. If it would be exceeded, pretreatment would be necessary. If not, groundwater entering the sanitary sewer system may create a build up of vapors within the sewer which could become a fire/explosion risk. Proper venting of the system would be needed to reduce risks.

7.6.5 Cost

It is difficult to estimate a cost for the soil flushing alternative without knowing definitively the area to be remediated and the design of the flushing system. Assumptions were made, however, and are included in Appendix G. Present worth cost is estimated to be $390,000.

8.0 COMPARISON OF ALTERNATIVES AND SELECTION OF THE PREFERRED ALTERNATIVE

8.0 COMPARISON OF ALTERNATIVES AND SELECTION OF THE PREFERRED ALTERNATIVE

8.1 Comparison of Alternatives

A comparative analysis of the five alternatives for Site SS-17 has been performed to identify the relative advantages and disadvantages of each in satisfying the five selection criteria: implementation, effectiveness, impact on base operations, fire/explosion risks and cost. A summary of the comparison is included on Table 8-1. Based upon this comparison, the preferred alternative has been chosen.

8.1.1 Implementation

Alternative 1, No Action, requires no implementation. With regard to ease of implementation, the remaining alternatives can be ranked from the least difficult to implement to the most difficult to implement as follows:

Least Difficult	Alternative 2 - Limited Action
	Alternatives 4 - Soil Venting
	Alternative 5 - Soil Flushing
Most Difficult	Alternative 3 - Excavation

For Alternative 2, implementation encompasses only well sampling and pumping of existing wells.

Alternative 4, Soil Venting, would require installation of venting wells and/or horizontal piping, start up and mobilization of venting pumps and sampling of discharged air.

TABLE 8-1

SUMMARY OF ALTERNATIVE EVALUATION

SITE SS-17
HOLLOMAN AFB

Criteria	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Excavation	Alternative 4 Soil Venting	Alternative 5 Soil Flushing
Implementation	None	Easily implemented	Difficult to implement	Moderately difficult to implement	Moderately difficult to implement. Requires recapture of water/surfactant mixture.
Effectiveness	None	Effectiveness based upon natural degradation due to time and effectiveness of trenches to remove product.	100% effective in removing identified highly contaminated soil.	Testing required to implement design. Moderate to low soil permeability may create difficulties.	Testing required to implement design. Moderate to low soil permeability may create difficulties. Must be able to capture washed constituents to effectively remediate soils.
Impact on Base Operation	None	None	Extensive: Rerouting of First Street and possible temporary closure of Service Station.	Moderate: Pumps (and possibly air treatment system) would be placed by wells. Wells and equipment may create pedestrian and vehicular obstacles. Should horizontal piping be implemented, vehicular and pedestrian traffic would be impacted during construction.	Moderate: Piping system installation would impact pedestrian and vehicular traffic during construction.
Fire/Explosion Risk					
o During Implementation	No greater than present	No greater than present	Higher risk than present	May require air treatment should vapors become a nuisance.	May require groundwater treatment to reduce risks.
o After Remediation	Less than present only due to natural degradation	Less than present only due to natural degradation	Negligible risk	May have some residual risk	May have some residual risk

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TABLE 8-1

SUMMARY OF ALTERNATIVE EVALUATION

SITE SS-17
HOLLOMAN AFB

Criteria	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Excavation	Alternative 4 Soil Venting	Alternative 5 Soil Flushing
Cost					
o Present Worth	None	$10,000	$530,000 (Disposal) $770,000 (Landfarm)	$350,000	$390,000

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PROJECT MANAGERS–ENGINEERS–CONSTRUCTION MANAGERS
NEW ORLEANS–MOBILE–BATON ROUGE–LITTLE ROCK

Alternative 5, Soil Flushing, would require the construction of a below grade horizontal piping system, water source hook up, set up of a metered tank(s) of surfactants, maintenance of a specified water flow rate and groundwater acceptance rate. Recapture of the water/surfactant mixture must be ensured so as not to contaminate clean areas. This may require the installation of additional confirmatory downgradient wells.

Alternative 5, Excavation, would require rerouting of traffic on First Street and possibly temporary shut down of the Service Station and Shopette.

8.1.2 Effectiveness

Effectiveness is measured according to each alternative's capability to remove highly contaminated soil. Alternative 1, No Action, is not effective in removing highly contaminated soil. The effectiveness of Alternative 2, Limited Action, is unknown. Alternative 3, Excavation, is reasonably considered to be 100 percent effective in removing highly contaminated soils from identified areas. The effectiveness of Soil Flushing (Alternative 5) and Soil Venting (Alternative 4) would be measured by drilling confirmation borings once it is believed that remediation is complete. Samples from borings would be classified as highly contaminated or not highly contaminated. It is believed that both alternatives are capable of reducing soils to a non-highly contaminated state, but that the Soil Venting alternative may be more effective. Soil Venting is believed to be more effective than Soil Flushing due to its relative ease of operation and implementation. Air, as opposed to water and surfactants, is used to remediate the vadose zone. Soil Flushing requires recapture of percolated water with surfactants and desorbed contaminants in order to reduce soils

to a state not considered highly contaminated . This may be difficult to ensure. Also, surfactants have a tendency to adhere to soil particles and thus reduce soil permeability and further remediation. Some surfactants may even inhibit bacterial metabolism and thus biodegradation (EPA, 1991). Therefore, ranking of alternatives from most effective to least effective is as follows:

Most Effective	Alternative 3 - Excavation
	Alternative 4 - Soil Venting
	Alternative 5 - Soil Flushing
	Alternative 2 - Limited Action
Least Effective	Alternative 1 - No Action

8.1.3 Impact on Base Operations

Alternative 1, No Action, requires no implementation and therefore, has no impact upon base operations. Alternative 2, Limited Action, should also have no impact upon base operations. Alternative 4, Soil Venting, could impact base operations both during construction and to a lesser degree during operation. Excavation is required to install venting wells. Should a trench system be opted, excavation could be required over the area to be remediated (at various spaced intervals) in order to install horizontal piping. Also, pumps and possibly treatment systems would be situated near wells and/or trenches. Their presence may impact pedestrian and vehicular traffic in the area. Also, if wells are installed east of Trench No. 2, part of First Street may be closed to vehicular traffic during construction.

Alternative 5, Soil Flushing, would impact activities around the Shopette both during construction and to a lesser degree during operation. Excavation would be required over the entire remediated

area in order to install horizontal piping. Pedestrian and vehicular traffic would be impacted during construction and no vehicular traffic would be allowed over piping in unpaved areas during operation.

Excavation, Alternative 3, would impact base operations more than any other alternative. The excavated area may include a portion or all of First Street, and possibly the entrance across First Street to the hospital. Traffic would have to be reputed. Should hydrocarbon vapors become a problem during excavation, the Service Station and nearby residences may need to be evacuated. Also, trucks would be needed to transport highly contaminated soil off-site and to transport new fill to SS-17 from the base borrow pit. This increase in traffic could impact base activities.

Therefore, ranking alternatives from least impact of base operation to most impact is as follows:

Least Impact	Alternative 1 - No Action
	Alternative 2 - Limited Action
	Alternative 4 - Venting
	Alternative 5 - Soil Flushing
Most Impact	Alternative 3 - Excavation

8.1.4 Fire/Explosion Risks

Fire/explosion risks are considered both during implementation of each alternative as well as after remediation is believed complete. During implementation of each alternative, risks of fire/explosion are present. Ranking alternatives from the least potential risk to most potential risk of fire/explosion during implementation of remediation is as follows:

Least Risk	Alternative 1, 2 - No Action and Limited Action
	Alternative 4 - Soil Venting
	Alternative 5 - Soil Flushing
Most Risk	Alternative 3 - Excavation

Alternative 3 allows hydrocarbons in highly contaminated soil to escape into the atmosphere. Due to the depth of excavation (approximately 10 feet deep), some hydrocarbons may become "trapped" and should an ignition source be allowed to drop into an excavated area, a fire or explosion could result.

Alternative 5, Soil Flushing, allows groundwater collected by the trench recovery system to be discharged into the sanitary sewer system. The groundwater is likely to contain (at least initially) high concentrations of hydrocarbons due to surfactant desorbtion. Should this water be allowed to enter sewer lines, a build up of hydrocarbon vapors may occur in the lines. Should water be pretreated before discharge to the sewer line, the likelihood of hydrocarbon vapor build up is reduced, but residual hydrocarbon vapors may still remain which could present a fire/explosion risk.

Alternative 4, Soil Venting, allows hydrocarbons collected from underlying soils to be released into the atmosphere. These vapors would be released outdoors where wind would quickly disperse them. Should treatment be required, hydrocarbon vapors would not be released to the atmosphere.

Alternatives 2 and 1 do not increase fire/explosion risks since they do not entail any active remediation activities.

After remediation is believed to be complete, some fire/explosion risk may remain due to the possibility that each alternative may or may not have thoroughly removed all highly contaminated soil. With Alternative 3, Excavation, all identified highly contaminated soil is 100 percent remediated. Therefore, no fire/explosion risks remain. There is the potential with Alternatives 4 and 5, that after remediation is believed complete, there may exist (despite confirmation boring), areas containing highly contaminated soil. Thus, fire/explosion risks may remain. Alternatives 1 and 2 do not perform any active remediation. Therefore, reduction of fire/explosion risks would only occur due to the natural degradation of hydrocarbons in highly contaminated soils.

Therefore, after remediation is complete, alternatives can be ranked accordingly as to risks remaining:

Least Risk Remaining	Alternative 3 - Excavation Alternatives 4 and 5 - Soil Venting and Soil Flushing
Most Risk Remaining	Alternatives 1, 2 - No Action and Limited Action

8.1.5 Cost

Present worth costs were calculated for all five alternatives. Assumptions made and calculations are included in Appendix G. Ranking alternatives from least expensive to most expensive is as follows:

Least Expensive	Alternative 1 - No Action
	Alternative 2 - Limited Action
	Alternative 4 - Soil Venting
	Alternative 5 - Soil Flushing
Most Expensive	Alternative 3 - Excavation

8.2 Selection of Preferred Alternative - Alternative 4

Based upon the comparative analysis of alternatives, Alternative 4, Soil Venting, has been chosen as the preferred alternative for Site SS-17. Alternative 2, Limited Action, was eliminated from consideration due to its inability to actively eliminate highly contaminated soil. Alternative 3, Excavation, was eliminated from consideration due to its difficult implementability, extensive impact on base operations, fire/explosion risks created during implementation and high cost. Thus, alternatives were reduced to the choice of Alternative 4, Soil Venting, or Alternative 5, Soil Flushing. Both require testing to implement design and both alternatives could encounter difficulties due to moderately low soil permeabilities at the site. Soil Venting, however, is deemed the preferred alternative for the following reasons:

- It is easier to implement and is believed to be more effective than Soil Flushing. Air, as opposed to water and surfactants, is used to remediate the vadose zone. Soil Flushing requires recapture of percolated water with surfactants and desorbed contaminants in order to reduce soils to a state not considered highly contaminated. Should the water/surfactant mixture with desorbed contaminants not be captured, contamination may spread to non-contaminated areas. Extreme care would be needed in operating the groundwater recovery system. Also, surfactants have a tendency to adhere to soil particles and thus reduce soil permeability. Remediation could be

hindered. Some surfactants may even inhibit bacterial metabolism, while soil venting could accelerate biodegradation.

- Soil Venting installation and operation is likely to have less of an impact on base operations than Soil Flushing.

- Soil Venting removes hydrocarbons from the vadose zone without introduction of additional hydrocarbons (being flushed from the vadose zone) into groundwater. Residual hydrocarbons in groundwater recovered from Soil Flushing activities (despite treatment) could contribute to additional fire/explosion risks when discharged into the sanitary sewer system.

- The estimated cost for Soil Venting is approximately 10% less than the cost for Soil Flushing.

Based upon the above reasons, Alternative 4, Soil Venting, is chosen as the preferred alternative.

8.2.1 Components of the Preferred Alternative - Alternative 4

1) Define area to be remediated - Drill borings to determine area to be remediated. Collect soil samples for enumeration studies and soil gas levels.

2) Field vapor permeability test - Perform pilot test to determine the vapor permeability, influence of an extraction well (or trench) and gasoline constituent concentration of extracted vapors.

3) Engineered design of venting system - Design will be based upon results of component 2 to determine the number, location, configuration and size of venting wells in addition to air flow extraction (and possible injection) rates, and trench pumping rates to maintain an adequate depressed groundwater table.

4) Installation and Operation of System - Installation of the system, start up and operation of the system and periodic monitoring of discharged air.

5) Confirmation Borings - Drilling and sampling of approximately twelve borings in the remediated area to confirm the reduction of soils to a classification of not highly contaminated.

8.3 Conclusions

Alternative 4, Soil Venting has been deemed the preferred remedial alternative for Site SS-17. This alternative could be implemented under current conditions with the trench recovery system in operation. By doing so, two systems would be concurrently remediating Site SS-17 to comply with NM UST Regulation requirements that no floating product be present on the water table and no highly contaminated soils remain in the ground.

APPENDIX A

SCOPE OF SERVICES

CONTRACT NO. DACW45-90-D-0007
REVISED SCOPE OF SERVICES FOR A TANK REMOVAL
DESIGN AND CORRECTIVE ACTION PLAN
AT
SITE SS-17 - BX SERVICE STATION
HOLLOMAN AIR FORCE BASE, NEW MEXICO

REVISED 29 MAY 1991

1. Objective. The primary purpose of this work effort is to develop plans and specifications for the removal of underground storage tanks (UST's), and to examine suitable alternatives for remediation of gasoline contamination at Site SS-17, BX Service Station, Holloman Air Force Base, New Mexico. The best remediation technology(ies) will be selected for future application at this site.

2. Scope of Services. A tank removal design and a Corrective Action Plan (CAP) for Site SS-17, BX Service Station, Holloman Air Force Base, New Mexico will be prepared using guidance found in the State of New Mexico "Underground Storage Tank Regulations" as amended through 26 July 1990. A Decision Document (DD) for this same site will also be prepared under this Scope of Services. The final design, final CAP and final DD are primary A-E deliverables. Other plans and reports are secondary deliverables.

2.1 Upon receiving his Notice to Proceed, the A-E shall immediately begin preparing plans and specifications for the removal of four (4) 10,000-gallon UST's, one (1) 5,000-gallon UST and piping associated with all tanks in accordance with the State of New Mexico regulations. Removal of highly contaminated soil adjacent to these tanks shall be limited to soil above the water table and within ten (10) feet of the tanks. Highly contaminated soil not removed by excavation will be remediated by some method recommended in the decision document. Plans and specifications will adequately cover the proper disposal of tanks, tank contents, piping, and highly contaminated soil. Additional design criteria and design guidance may be found in Appendix 5.

2.2 The final CAP will include:

2.2.1 A thorough performance evaluation of the free product gasoline removal system currently in operation, and recommendations for system improvement. Performance must be measured against State of New Mexico requirements. Effluent currently discharged from this system into the Holloman Air Force Base sanitary sewer will be sampled for dissolved gasoline components as specified in Paragraph 9.3 of this Scope of Services. An investigation shall be performed to determine whether potentially explosive or harmful vapors are present in any building, utility corridor, basement, or other surface or subsurface structure on or adjacent to the release site. See Paragraph 9.4 of this Scope of Services.

2.2.2 A comparative study of proven remediation technologies that are suitable for gasoline contaminated soil and groundwater. Soil excavation

will be considered only for highly contaminated soils within ten (10) feet of the underground storage tanks to be removed. These technologies must be considered using the State of New Mexico standards for soil and groundwater remediation.

2.2.3 An evaluation of suitable remediation alternatives on the basis of ease of implementation, total effectiveness, disruption of normal base traffic patterns, fire/explosion risk and cost.

2.3 The final DD will expound upon the remediation alternative favored by the A-E above all other alternatives under consideration. More than one technology may be specified in the chosen alternative when multiple remediation problems dictate. The selected alternative will be included as the Corrective Action System in the Reclamation Proposal to be forwarded to the New Mexico Environmental Improvement Division.

2.4 Plan Submittal Requirements/Approvals. The A-E, upon receiving his Notice to Proceed, shall prepare the plans discussed below. These plans shall include a detailed discussion of the technical approach the A-E expects to use to implement the requirements specified herein. All plans must be reviewed and approved by the Contracting Officer prior to commencement of that work effort.

2.4.1 A-E Chemical Data Acquisition Plan (CDAP).

2.4.1.1 Available sampling data from existing monitoring wells will be reviewed for completeness and validity. The A-E will perform an additional round of sampling as specified in Paragraph 9 of this Scope of Services. New sampling, not included under this Scope of Services, may be recommended in the Decision Document to fill data gaps and to establish a reliable starting point from which to begin the final remediation effort.

2.4.1.2 The A-E shall submit a Chemical Data Acquisition Plan (CDAP) which shall contain objectives of the sampling effort, a map showing the location of sampling points, field sampling and field analytical procedures, and procedures for collecting and processing QA/QC laboratory samples. The A-E, when preparing the CDAP, shall make maximum use of the general procedures found in the previously approved A-E QCSP for Holloman Air Force Base by Walk, Haydel and Associates, Inc. dated January 14, 1988. The most current version of ER-1110-1-263 will be used as a source reference for the development of the CDAP. Refer also to Appendices 3 and 4 of this Scope of Services.

2.4.2 Site Safety and Health Plan. The A-E shall review the supplied project information and develop a Site Safety and Health Plan (SSHP) which will establish in detail the protocols necessary to protect on-site personnel, the public and the environment from potential physical, chemical and/or biological hazards associated with the activities required by this Scope of Services. Specific requirements are contained in Appendix 1. To prevent duplication of effort, the A-E shall, to the fullest extent possible, utilize information prepared previously by Walk, Haydel, and Associates,

Inc. i.e., the original final plan dated 14 January 1988 with an addendum dated November 1988.

2.5 Defense Priority Model (DPM) Data. The A-E shall compile under separate cover, the input data for the DPM in accordance with the instructions in Appendix 2.

3. Project Management.

3.1 Project Engineer. The A-E shall assign a member or employee who will be known as the Project Engineer or Project Manager. This individual will oversee the correlation of the entire project, administer all instructions from this office, and answer or obtain answers to all questions from this office during and after the work.

3.2 Coordination. During the prosecution of the work under the contract, the A-E shall keep in close liaison with the Corps of Engineers Project Manager (COE PM), who will coordinate the work with the Base Environmental Coordinator and HQ TAC. All requests made by the Air Force shall be referred to the COE Project Manager.

4. Base Support. The A-E shall coordinate all requests for Base support services through the Base Environmental Coordinator. To avoid conflicts and schedule delays, the A-E shall request all Base support services at least 15 days in advance of their anticipated time of need. Likewise, it is anticipated that the Base will provide the following information and support to the A-E in a timely fashion upon request:

4.1 Existing Plans. The Base shall provide the A-E with existing engineering plans, drawings, diagrams, aerial photos, and other information deemed necessary to evaluate the sites being investigated.

4.2 Utilities. The Base Civil Engineer shall locate and mark all underground utilities for the A-E in the vicinity of the site prior to any drilling or digging.

4.3 Permits. The Base Civil Engineer shall issue to the A-E any required/appropriate drilling or digging permits necessary for the completion of the field work.

4.4 Traffic Control. The A-E shall provide personnel who will provide traffic control where/when necessary during any drilling/sampling activities which may occur on or adjacent to road rights-of-way or other high traffic/congested areas.

4.5 Security. The Base shall provide vehicle passes and/or entry permits for all A-E personnel during the field work duration.

4.6 Equipment Storage. The Base shall provide a staging area for the A-E and his subcontractors to store his equipment and supplies.

4.7 Water Supply. The Base shall provide a potable (non-chlorinated) water supply (i.e., hose bib or hydrant) to be used for borehole flushing, equipment cleaning, etc. The A-E shall provide his own equipment to draw, transport and store water taken from hose bibs or hydrants.

4.8 Equipment Cleanup. The Base shall provide an area where the A-E and his subcontractors can clean and decontaminate his drilling equipment. This area shall have readily available a potable water source and a 110/115 VAC electrical outlet within 100 feet. This outlet will be used for steam cleaner hookup.

4.9 Temporary Office. The Base shall provide a temporary office area, not in excess of 200 sq. ft. which will be equipped with a telephone for local and long distance calls and an electrical power supply. The A-E will pay for all hookup fees and monthly charges.

4.10 Refrigerator/Freezer. The A-E shall provide a household-type refrigerator having approximately two cubic feet of freezer space, which will be used daily for freezing blue-ice bags prior to sample shipments.

4.11 Well Locks. The Base shall provide the A-E with one set of keys for all existing monitoring well locks. The A-E shall return the keys when the project field work is completed.

5. Travel and Meetings. The A-E will perform the following travel as part of the contract requirement, and the cost thereof shall be included with the contract cost. Responsible representatives of the A-E's firm from the appropriate disciplines shall attend meetings and/or make the following listed trips:

5.1 Meetings. Attendance by the A-E will be required at the meetings noted below for the reasons stated.

5.1.1 Corrective Action Plan (CAP) Draft Report Review Meeting.

5.1.1.1 Purpose. The purpose of this formal meeting will be to allow the A-E to present the draft report, answer questions and incorporate appropriate comments and corrections into the final document.

5.1.1.2 Location. This meeting will be held at Holloman AFB in a building to be designated by the Base.

5.1.1.3 Attendees. Expected attendees are HQ TAC-PM, Base Environmental Coordinator, Base Commander, Base Civil Engineer, Base Environmental Specialist, Base Environmental Engineer, Federal and State Regulatory Agency Representatives, A-E Project Manager, A-E Project Engineer, A-E Industrial Hygienist, USACE Staff, USACE-PM, Base JAG, Base Public Affairs Representatives, and AFRCE Representative.

5.1.2 Corrective Action Plan (CAP) Final Report Meeting.

5.1.2.1 Purpose. The purpose of this formal meeting will be to allow the A-E to present the Final Report and answer questions from the attendees. This meeting will be held within 14 days after submitting the Final CAP. The A-E shall be responsible for meeting coordinating with the Base, Federal and State Regulatory Agencies and the USACE-PM.

5.1.2.2 Location. This meeting will be held at Holloman AFB in a building to be designated by the Base.

5.1.2.3 Attendees. Expected attendees are HQ TAC-PM, Base Environmental Coordinator, Base Commander, Base Civil Engineer, Base Environmental Specialist, Base Environmental Engineer, Federal and State Regulatory Agency Representatives, A-E Project Manager, A-E Project Engineer, A-E Industrial Hygienist, USACE Staff, USACE-PM, Base JAG, Base Public Affairs Representatives, and AFRCE Representative.

5.2 Travel. All travel required to obtain field data necessary to complete the final CAP Report, the final DD Report and the final design for removal of the UST's.

6. General.

6.1 Review of Progress and Technical Adequacy.

6.1.1 At appropriate times, representatives of the Contracting officer may review the progress and technical adequacy of the A-E's work. Such review shall not relieve the A-E from performing all contract requirements, except as may be waived by written instructions.

6.1.2 The A-E, under this contract, will interpose no objection nor restriction to the Contracting Officer's designation of an A-E for the purpose of reviewing the adequacy and corrections of the work performed under this contract.

6.1.3 The A-E shall submit progress reports to the COE with each request for payment. The progress reports shall indicate work performed, costs, and problems incurred during the payment period.

6.2 Conference Notes and Confirmation Notices.

6.2.1 Conference Notes. The A-E will be responsible for taking notes and preparing the reports of all conferences. Conference notes will be prepared in typed form and the original furnished this office (within five (5) days after date of conference) for concurrence and distribution to all attendees. This report shall include the following items as a minimum:

6.2.1.1 The date and place the conference was held with a list of attendees. The roster of attendees shall include name, organization, and telephone number.

6.2.1.2 Written comments presented by attendees shall be

attached to each report with the conference action noted. Conference action shall be "A" for an Approved comment, "D" for a Disapproved comment, "W" for a comment that has been Withdrawn, and "E" for a comment that has an Exception noted.

6.2.1.3 Comments made during the conference, decisions affecting criteria changes, must be recorded in the basic conference notes. Any augmentation of written comments should be documented by the conference notes.

6.2.2 Confirmation Notices. The A-E will be required to provide a record of all discussions, verbal directions, telephone conversations, etc., participated in by the A-E and/or his representatives on matters relative to this contract and the work. These records, entitled "Confirmation Notices," will be numbered sequentially and shall fully identify participating personnel, subject discussed, and any conclusions reached. The A-E shall forward to the Contracting Officer or his representative as soon as possible (not more than five (5) work days), a reproducible copy of said confirmation notices. Distribution of said confirmation notices will be made by the Government.

6.3 Expert Testimony. All technical consultants required for this Scope of Services will be provided by the A-E and will be qualified to provide expert witness testimony, if required. In the event of litigation, the contract will be modified to compensate the A-E for the additional services required.

7. Reports. The A-E shall develop the following listed reports.

7.1 90% Design Submittal. The A-E shall prioritize the development of plans and specifications for the removal of UST's. When this work is 90% complete, he shall submit plans and specifications for review and comment.

7.2 Final Design Submittal. The A-E shall submit final plans and specifications for UST removal not later than 30 days following the receipt of 90% design review comments.

7.3 Pre-Draft Corrective Action Plan (CAP). Having identified and evaluated suitable remediation alternatives, the A-E shall submit for review and comment a pre-draft of his study. This submittal should represent approximately 60% of the total effort required to produce the Final CAP.

7.4 Draft Corrective Action Plan (CAP). The A-E shall prepare a Draft CAP. This document shall be corrected and resubmitted for regulatory review and comment. This report shall be submitted within 30 days of the A-E's receipt of the USACE Pre-Draft CAP review comments..

7.5 Final Corrective Action Plan (CAP). The A-E shall incorporate all approved comments and suggestions generated during the previous review process into a final document. This document shall be error free. This report shall be submitted within 30 days of the A-E's receipt of Draft CAP review comments.

7.6 Draft Decision Document (DD). A Draft Decision Document (DD) shall be prepared utilizing the "Guidance on Preparing Superfund Decision Documents" (Interim Final, July 1989) and the "Air Force Installation Restoration Program Management Guidance" (1989, Appendix D4). The Draft DD will follow the Final CAP Report within 30 days.

7.7 Final Decision Document (DD). After receipt of all comments from all agencies, the A-E shall prepare the Final DD. Copies of this document will be mailed by overnight mail service within 7 days after receipt of comments.

7.8 A-E Daily Quality Control Reports (A-E DQCR). During any field investigation activities, the A-E will provide Daily Quality Control Reports (DQCR) to the Contracting Officer. These reports should be compiled and sent to the project manager weekly. However, should problems arise, the A-E should notify the Project Manager immediately.

7.9 Quality Control Summary Report (QCSR). This document addresses quality control practices employed and summarizes the DQCR. Issues covered in this report shall include a discussion of all data points which may have been influenced or compromised and their impact on the Data Quality Objectives or remedial decisions. An example of the elements required for this level of effort are presented below, but are not limited to the following items:

7.9.1 Project Description - Elements of this include report organization and site description.

7.9.2 Laboratory Quality Control Activities - Elements are a summary of planned laboratory quality control activities, a summary of any deviations from planned activities, and a summary of the evaluation of the data quality for each analysis and matrix.

7.9.3 Field Quality Control Activities - Elements are a summary of planned field quality control activities, a summary of any deviations from planned activities, and a summary of the evaluation of the quality of the sampling.

7.9.4 Data Presentation and Evaluation - Elements are an assessment of sampling and analysis techniques, an evaluation of the data quality of each matrix and parameter, and an evaluation of the usability of the data.

7.9.5 Lessons Learned - A summary of field or analytical procedures that could be changed or modified to better characterize chemical contamination in future work efforts.

7.9.6 DQCR Consolidation - Daily Quality Control Reports are to be consolidated and mailed to the USACE PM each week. If a problem is encountered the DQCR shall be mailed daily until the problem is resolved.

8. Submittals. A submittal register will be furnished by the Corps' Project

Manager; however, the appropriate submittals will be as outlined at the end of these instructions.

8.1 General Submittal Requirements.

8.1.1 Distribution. See the Document Submittal List for distribution of documents. In general, the A-E is responsible for reproduction and distribution of all documents. Documents shall be mailed to all reviewers via a carrier service that will provide overnight service, such as Express Mail, unless otherwise noted. A Document Submittal List which contains the reviewer's names and addresses will be furnished by the Project Manager.

8.1.2 Partial Submittals. Partial submittals will not be accepted unless prior approval is given.

8.1.3 Cover Letters. A cover letter should accompany each document and indicate the project, project phase, the date comments are due, to whom comments are to be submitted, the date and location of the review conference, etc., as appropriate. (Note that, depending on the recipient, not all letters should be coordinated with the COE Project Manager prior to the submittal date. The cover letter shall not be bound into the document.

8.1.4 Supporting Data and Calculations. The tabulation of criteria, data, calculations, cost estimates, and etc., which are performed but not included in detail in the report shall be assembled as appendices. Criteria information provided by the Omaha District need not be reiterated, although it should be referenced as appropriate. Persons performing and checking calculations are required to put their full names on the first sheet of all supporting calculations, estimates, and etc., and initial the following sheets. These may not be the same individual. Each sheet should be dated. A copy of the Final Scope of Services shall be included as Appendix A in the report.

8.1.5 Reproducibles. One camera-ready, unbound copy of each submittal shall be provided to the COE and to HQ TAC. While all submittals should be error-free, an extra effort shall be made to provide an error-free Final Report.

8.2 Specific Submittal Requirements.

	A	B	C	D	E	F
90% Design Submittal	6	4	4	1	5	
Final Design Submittal	6	13	4	1	5	
Draft A-E SSHP	3	4	1	4	3	1
Final A-E SSHP (changes)	3	4	1	4	3	1
Pre-Draft CAP Report	6	4	1	2	4	
Draft CAP Report	3	4	1	4	3	1
Final CAP Report	3	13	1	4	3	1
Draft DD Report	3	4	1	4	3	1
Final DD Report	3	13	1	4	3	1
Draft A-E CDAP	3	4	1	4	3	1
Final A-E CDAP (changes)	3	4	1	4	3	1
A-E DQCR.	1	1				
A-E QCSR	3				1	1
DPM	2					

A. Mr. Ron Stirling
U.S. Army Corps of Engineers
ATTN: CEMRO-ED-EA
215 North 17th Street
Omaha, NE 68102-4978

B. Ms. Sharon Moore
Acting Base Environmental Coordinator
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C. Mr. James Cedric Adams
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Langley AFB, VA 23665-5001

D. Mr. Ronald Jahns
Project Manager, Environmental
Planning Division
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E. Commander
U.S. Army Corps of Engineers
Missouri River Division
ATTN: CEMRD-EP-C
PO Box 103, Downtown Station
Omaha, NE 68101-0103

F. Mr. David Morgan
Toxic Site Bureau
1190 Saint Francis Drive
Santa Fe, NM 87503

9. Site Specific Scope of Services. The following paragraphs discuss the field and analytical work to be performed at the BX Service Station.

9.1 Soil Borings. Three (3) soil borings shall be drilled in the area of the BX Service Station to determine the amount of soil contamination in the capillary fringe located above the free product plume. Soil samples selected from headspace readings shall be sent away for chemical analysis. These borings shall be located in areas where the thickest product layer has been recorded.

9.1.1 Collection of Analytical Samples. Four (4) split spoon samples shall be collected from each boring and packaged immediately for chemical analysis. Two (2) soil samples, each 1.5 feet long, shall be taken through the lowest three feet (capillary zone). Two (2) additional soil samples shall be taken from above the capillary zone.

9.1.2 Analytical. Soil samples from these borings shall be analyzed for the following:

Total Fuel Hydrocarbons - Light Fraction
Volatile Organic Analysis (VOA)
Total Lead

9.2 Water Sampling and Product Level Measurement. A current round of groundwater sampling and product level measurements shall be taken from the wells previously installed at the site. Wells containing free product shall not have a water sample taken from them; however, the product level thickness shall be measured and recorded.

9.2.1 Collection of Analytical Samples. Each of the wells at the BX Station not containing free product shall be sampled once. All groundwater samples shall be analyzed as specified below.

9.2.2 Analytical. Groundwater samples shall be analyzed for the following:

Total Fuel Hydrocarbons - Light Fraction
Volatile Organic Analysis (VOA)
Total Lead

9.3 Sampling of Water Effluent from Gasoline Recovery System.

9.3.1 A single water sample shall be taken from the effluent immediately before it is discharged into the sanitary sewer. Care should be taken to avoid the inclusion of any floating hydrocarbons in the sample.

9.3.2 Analytical. Effluent samples shall be analyzed for the following:

Total Fuel Hydrocarbons - Light Fraction
Volatile Organic Analysis (VOA)
Total Lead

9.4 Vapors. An investigation shall be performed to determine whether potentially explosive or harmful vapors are present in any building, utility corridor, basement, or other surface or subsurface structure on or adjacent to the release site.

9.4.1 Literature Search. The A-E shall gather all existing information pertaining to the following:

- physical and structural information on underground utilities and other subsurface structures (locations, depths, composition and construction of water lines, sewer lines, telephone cables, electric lines, and natural gas lines; proximity to water table and gasoline plume, etc.),

- any previous incidents related to explosive or harmful vapors (explosion, complaints, etc.),

- performance of any vapor surveys/sampling of utilities, basements, other subsurface structures (dates, instruments, results, etc.),

- any preventative actions taken (evacuation of buildings, precautions for utility workers, etc.),

- any other pertinent information.

9.4.2 Field Work.

9.4.2.1 Monitoring/Sampling Locations. Based on information obtained in the literature search, the A-E shall propose monitoring/sampling locations in utilities and subsurface structures. At least one location outside the influence of release (away from contaminated soil, groundwater or product layer) shall be chosen for a background reading. An area that has been identified for special concern is the sanitary sewer. The A-E shall attempt to determine the effect of discharge from the oil/water separator on vapor concentrations in the sanitary sewer. Therefore, one location shall be selected upgradient of the discharge point, one location at or immediately downgradient from discharge, and possibly a reading/sample in the same location when no discharge is occurring.

9.4.2.2 Monitoring With Survey Instruments. The A-E shall use a combustible gas indicator calibrated for pentane to test for potentially explosive levels of petroleum hydrocarbon vapors. A field instrument equipped with either a photoionization detector (PID) or flame ionization detector (FID) shall be used to test for potentially harmful petroleum hydrocarbon vapors. A PID shall be used in the sanitary sewer in order that the detection of hydrocarbon vapors not be masked by the presence of methane.

9.4.2.3 Sample Collection and Quantitative Analysis. If the survey instrument shows the presence of > 5 ppm total hydrocarbon vapors, a sample shall be collected (grab sample is acceptable) and analyzed by gas chromatograph (GC) to identify and quantify the compounds causing the elevated readings. It is anticipated a portable field GC will be adequate to perform this analysis. Analysis shall be for BETX.

9.4.3 Reporting Requirements. The results of the literature search and the field work shall be reported in the CAP.

TABLE 1
SITE SS-17/HOLLOMAN AFB, NM
GROUNDWATER MONITORING/EFFLUENT WATER SAMPLES/SOIL SAMPLES/TANK SAMPLES

		QUALITY CONTROL SAMPLES							
PARAMETER	NO. OF FIELD SAMPLES	NO. OF DUPS/ SPLITS	NO. OF SAMPLER RINSATES	NO. OF TRIP BLANKS	TOTAL AE SAMPLES	QA DUPS/ SPLITS	QA SAMPLER RINSATES	QA TRIP BLANKS	TOTAL QA SAMPLES
WATER SAMPLES									
TPH-L	10	1	0	1	12	1	0	0	1
VOA (8240)	10	1	0	1	12	1	0	1	2
TOTAL LEAD	10	1	0	0	11	1	0	0	1
SOIL SAMPLES									
TPH-L	12	1	0	0	13	1	0	0	1
VOA (8240)	12	1	0	0	13	1	0	0	1
TOTAL LEAD	12	1	0	0	13	1	0	0	1
EFFLUENT									
TPH-L	1	1	0	1	3	1	0	0	1
VOA (8240)	1	1	0	1	3	1	0	0	1
TOTAL LEAD	1	1	0	0	2	1	0	0	1
TANKS									
FLASHPT.	5	1	0	0	6	1	0	0	1
LEAD	5	1	0	0	6	1	0	0	1

TABLE 2. SOIL SAMPLING SPECIFICATIONS.

PARAMETER	CONTAINER*	SAMPLE RESERVATION	HOLDING TIME
TOTAL LEAD	1-8 OZ GLASS WIDE-MOUTH BOTTLE 3/4 FULL	ICE TO $4^{o}C$	28 DAYS FOR Hq; OTHERS 6 MONTHS
TPH-L	2-40 ML GLASS VOA VIALS NO HEADSPACE	ICE TO $4^{o}C$	ANALYZE IN 14 DAYS <24 HOURS ON SITE
VOLATILE ORGANICS	TWO 40-ML GLASS VOA VIALS NO HEADSPACE	ICE TO $4^{o}C$; pH <2 WITH 1:1 HCL IMMED AFTER SAMPLING	ANALYZE IN 14 DAYS

* All containers shall have Teflon-lined lids (Teflon septa for VOC bottles).

TABLE 3. WATER SAMPLING SPECIFICATIONS.

PARAMETER	CONTAINER*	SAMPLE RESERVATION	HOLDING TIME
TOTAL LEAD	ONE 1-LITER HIGH DENSITY POLYETHYLENE	ICE TO 4°C; pH <2 WITH 1:1 HNO3	28 DAYS Hg OTHERS 6 MOS.
TPH-L	THREE 40-ML VOA VIALS	ICE TO 4°C	ANALYZE IN 14 DAYS
VOLATILE ORGANICS	TWO 40-ML GLASS VOA VIALS NO HEADSPACE	ICE TO 4°C; pH <2 WITH 1:1 HCL IMMED AFTER SAMPLING	ANALYZE IN 14 DAYS

* All containers must have teflon-lined lids except for VOA vials which shall have teflon-lined silicone septa.

Appendix 1 - Health and Safety Instructions.

1. General. The Architect Engineer (AE) responsible for the tasks defined by this scope of work shall review all information provided and develop the necessary documents which contain the health and safety criteria, procedures, and practices sufficient to protect on-site personnel, the environment, and potential off-site receptors from the chemical, physical, and/or biological hazards particular to this site. The AE shall utilize the services of a Certified Industrial Hygienist (CIH) experienced in hazardous waste site operations to oversee the development and implementation of the health and safety documents required by this section. If the information made available is insufficient to allow the AE to develop these documents, a description of all additional information required shall be prepared and submitted to the Contracting Officer (CO).

2. Regulatory Requirements. All site investigation and design activities and health and safety documents required by this scope of work shall comply with and reflect the following regulations and appropriate guidance publications, as a minimum:

2.1 Federal Acquisition Regulation, F.A.R. Clause 52.236-13: Accident Prevention.

2.2 U.S. Army Corps of Engineers (USACE) Safety and Health Requirements Manual, EM 385-1-1 (latest revision).

2.3 Occupational Safety and Health Administration (OSHA) Construction Industry Standards, 29 CFR 1926, and General Industry Standards, 29 CFR 1910; especially 29 CFR 1910.120 - "Hazardous Waste Site Operations and Emergency Response".

2.4 NIOSH/OSHA/USCG/EPA, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities", October 1985.

2.5 Other applicable Federal, State, and local safety and health requirements.

3. Documents. The following health and safety documents are required under this scope of work. The AE shall avoid providing material of a general nature, not specifically related to this project or site. Information readily available in standard texts shall be repeated only to the extent necessary to meet the requirements of this scope. The Safety and Health Program (para. 3.1) will contain general information required by the referenced OSHA standard which is applicable to all hazardous waste activity efforts performed by the contractor. The Site Safety and Health Plan (para. 3.2) should be a brief document addressing only site-specific safety and health requirements and procedures based upon site-specific conditions. Duplication of the general information contained in the Safety and Health Program is unwanted.

3.1 Safety and Health Program. All contractors (AE and their subcontractors) performing on-site activities at hazardous waste sites are required by regulation to develop and maintain a written Safety and Health Program in compliance with OSHA standard 29 CFR 1910.120(b)(1) through (b)(4). Written certification that such a program has been prepared and implemented shall be submitted to the CO as a preface to the required Site Safety and Health Plans (A-E SSHP and Construction SSHP). The program Safety and Health Program shall be made available to the CO in its entirety upon request.

3.2 Architect-Engineer Site Safety and Health Plan (AE-SSHP). If, in the course of conducting design activities pursuant to this scope of work, the A-E and/or his subcontractors must perform on-site work, an Architect-Engineer Site Safety and health Plan (A-E SSHP), as required by 29 CFR 1910.120 (b)(4), shall be prepared by the A-E and submitted to the Contracting Officer for review and approval prior to the commencement of any such activity. The AE-SSHP shall describe the health and safety procedures, practices, and equipment to be implemented and utilized in order to protect affected personnel from the potential hazards associated with the site-specific tasks to be performed. The level of detail provided in the AE-SSHP shall be tailored to the type of work, complexity of operations to be accomplished, and hazards anticipated.

3.2.1 Topics. All topics required by OSHA standard 1910.120(b) (4), and those described in Paragraph 3.3.1 through 3.3.15 below, shall be addressed in the AE-SSHP. Where the use of a specific topic is not applicable to the project, provide a negative declaration to establish that adequate consideration was given the topic, and give a brief justification for its omission.

3.2.2 Revisions, Addenda, and Field Modifications. Review comments issued prior to AE-SSHP approval shall be incorporated by revising and reissuing affected pages. If major revisions are necessary, the entire Plan shall be resubmitted for review and approval. Minor changes affecting only a few pages may be made by addenda sheets and resubmitted. Once on-site, unanticipated field conditions encountered which were not addressed in the approved AE-SSHP shall be immediately reported to the CO. Field activities in such areas shall be halted until the AE-SSHP has been modified to reflect changed conditions and reviewed/approved by the CO.

3.3 Health and Safety Design Analysis (HSDA). The A-E shall prepare and include in the project design analysis a chapter which addresses the site-specific/hazard-specific health and safety considerations and protective measures to be instituted for the tasks/operations to be undertaken during subsequent remedial construction activities at the site. This chapter shall fully describe and justify the safety and health requirements to be specified in the remedial action contract, including the decision logic used in their selection. The HSDA shall include the elements outlined below, as a minimum.

3.3.1 Site Description and Contamination Characterization. Describe the location, topography, and approximate size of the site, the on-site jobs/tasks to be performed, and the duration of planned site activities. Compile a complete list of the contaminants found or known to be present in

site areas to be impacted by the work to be performed. Compilation of this list shall be based on results of previous studies; or if not available, select the likely contaminants based on site history and prior site uses/activities. Include chemical names, concentration ranges, media in which found, locations on-site, and estimated quantities/volumes to be impacted by site work, if known.

3.3.2. Hazard/Risk Analysis. Identify the chemical, physical, biological, and safety hazards of concern for each site task and/or operation to be performed. Selection of chemicals as indicators of hazard shall be based on media concentrations, toxicity, volatility or potential for air entrainment at hazardous levels, and frequency of detection. Describe chemical and physical properties of selected contaminants, sources and pathways of employee exposures, anticipated on and off-site exposure level potentials, and regulatory (including Federal, State, and local) or recommended protective exposure standards. Specify and justify "action levels" based upon airborne exposure hazards and direct skin contact potentials for upgrades/downgrades in levels of personnel protection; for implementation of engineering and/or work practice controls; for emergency evacuation of on-site personnel; and for the prevention and/or minimization of public exposures to hazards created by site activities. Air monitoring/sampling shall be performed in accordance with Paragraph: "Exposure Monitoring/Air Sampling Program" below, resulting data compared with established "action levels", and appropriate corrective actions initiated as necessary.

3.3.3 Accident Prevention. The SSHP (A-E and Construction) will serve as the Accident Prevention Plan (APP) and activity hazard analyses (phase plans), required by F.A.R. Clause 52.236-13, and Paragraphs 01.A.03 through 01.A.06 and Appendix Y of USACE EM 385-1-1. Thus, a separate APP is not necessary. Any additional topics required by EM 385-1-1, but not specifically covered in Paragraph 3.3.1 through 3.3.15 of this scope of work, shall be addressed in an Accident Prevention section of the AE-SSHP. Daily safety and health inspections shall be conducted to determine if operations are being performed in accordance with the AE-SSHP, USACE and OSHA regulations, and contract requirements. In the event of an accident/incident, the AE shall immediately notify the CO. Within two (2) working days of any reportable accident, the AE shall complete and submit to the CO an Accident Report on ENG Form 3394 in accordance with AR 385-40 and USACE Supplements to that regulation.

3.3.4 Staff Organization, Qualifications, and Responsibilities. Discuss the organizational structure, including lines of authority (chain of command), and overall responsibilities of the contractor and all subcontractors for site activities, including supervisor/employee relationships. Summarize the operational and health and safety responsibilities and qualifications of each key person identified. Specifically: (1) A Certified Industrial Hygienist (CIH) with experience in the hazardous waste site operations shall be responsible for the development, implementation, and oversight of the A-E's Safety and Health Program and AE-SSHP. The SSHP shall be signed and dated by the CIH prior to submittal. (2) A fully trained and experienced Site Safety and Health Officer (SSHO), respon-

sible to the contractor and the CIH, may be delegated to implement and continually enforce the safety and health program and site-specific plan elements on-site. (3) At least one person certified in first aid/CPR by the Red Cross, or equivalent agency, shall be continuously present on-site during site operations.

3.3.5 Training. All personnel performing on-site activities shall have completed applicable training in accordance and compliance with 29 CFR 1910.120(e). In addition, site-specific training covering site hazards, procedures, and all contents of the approved AE-SSHP shall be conducted by the SSHO for on-site employees and visitors prior to commencement of work or entering the site. The type, duration, and dates of all employee training performed shall be listed by employee name and certified in the AE-SSHP.

3.3.6 Personal Protective Equipment (PPE). A written Personal Protective Equipment (PPE) program in accordance with 29 CFR 1910.120 (g) (5) and 29 CFR 1910.134 is required. Describe in detail the minimum PPE ensembles (including respirators) and specific materials from which the PPE components are constructed for each site-specific task/operation to be performed, based upon the hazard/risk analysis performed above. Components of levels of protection (A,B,C,D and modifications) must be relevant to site-specific conditions, including heat stress potential and safety hazards. Include site-specific procedures for on-site fit-testing, cleaning, maintenance, inspection, and storage.

3.2.7 Medical Surveillance. All personnel performing on-site activities shall be participants in an ongoing medical surveillance program, meeting the requirements of 29 CFR 1910.120 and ANSI Z-88.2. All medical surveillance protocols and examination results shall be reviewed by a licensed physician who is certified in Occupational Medicine by the American Board of Preventative Medicine, or who, by necessary training and experience, is Board-eligible. In consultation with such an occupational physician, the A-E shall specify the minimum content and frequencies of necessary medical test/examinations/consultations based upon probable site-specific conditions, potential occupational exposures, and required protective equipment. Certification of participation in the medical surveillance program, the date of last examination, and name of reviewing occupational physician shall also be included for each affected employee. The written medical opinion from the attending physician required by 29 CFR 1910.120(f)(7) shall be made available upon request to the CO for any site employee.

3.3.8 Exposure Monitoring/Air Sampling Program. (Personal and Environmental). Where it has been determined that there may be employee exposures to and/or off-site migration potentials of hazardous airborne concentrations of hazardous substances, appropriate direct-reading (real-time) air monitoring and integrated (time-weighted average (TWA)) air sampling shall be conducted in accordance with applicable regulations (OSHA, EPA, State). Both air monitoring and air sampling must accurately represent concentrations of air contaminants encountered on and leaving the site. Sampling and analytical methods following NIOSH (for on-site personnel and site perimeter locations) and/or EPA (for site perimeter or off-site locations) criteria

shall be appropriately utilized. Personnel samples shall be analyzed only by laboratories successfully participating in and meeting the requirements of the American Industrial Hygiene Association's (AIHA) Proficiency Analytical Testing (PAT) or Laboratory Accreditation programs. Meteorological monitoring shall be performed on-site as needed and used as an adjunct in determining perimeter and any off-site monitoring/sampling locations. Where perimeter monitoring/sampling is not deemed necessary, provide a suitable justification for its exclusion. Noise monitoring and radiation monitoring (alpha, beta, gamma) shall be conducted as needed, depending on the site hazard assessment. All monitoring/sampling results shall be compared to "action levels" established pursuant to Paragraph: "Hazard/Risk Analysis", above, to determine acceptability and need for corrective action.

3.3.9 Heat/Cold Stress Monitoring. Heat and/or cold stress monitoring protocols shall be implemented, as appropriate. Work/rest schedules shall be determined based upon ambient temperature, humidity, wind speed (wind chill), solar radiation intensity, duration and intensity of work, and protective equipment ensembles. Minimum required physiological monitoring protocols which will affect work schedules shall be developed. In cases where impervious clothing is worn (full-body), the NIOSH/OSHA/USCG/EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" protocol for prevention of heat stress shall be followed, and heat stress monitoring shall commence at temperatures of 70 degrees Fahrenheit and above. Where impervious clothing is not worn, the most current published ACGIH heat stress standard (TLV) shall be used. For cold stress monitoring to help prevent frostbite and hypothermia, the most current published ACGIH cold stress standard shall be referenced and followed, as a minimum.

3.3.10 Standard Operating Safety Procedures, Engineering Controls and Work Practices. Address the following elements as a minimum: (1) Site rules/prohibitions (buddy system, eat/drink/smoking restrictions, etc.); (2) Material handling procedures (soils, liquids, radioactive materials); (3) Drum/ container handling procedures and precautions (opening, sampling, overpacking); (4) Confined space entry procedures; (5) Hot-work, sources of ignition, and electrical safety (ground-fault protection, overhead power line avoidance, etc.); (6) Excavation safety; (7) Machine guarding; (8) Fall protection; (9) Illumination; (10) Sanitation; (11) Engineering controls.

3.3.11 Site Control Measures. Include a site map containing work zone delineation and access points. Describe on-site and off-site communications, security (physical and procedural), and general site access.

3.3.12 Personal Hygiene and Decontamination. Specify necessary facilities and their locations. Detail standard operating procedures, frequencies, supplies and materials to accomplish decontamination of site personnel.

3.2.13 Equipment Decontamination. Specify necessary facilities, equipment, and their locations. Detail procedures, frequencies, supplies and materials, and methods to determine adequacy for the decontamination of equipment used on-site.

3.2.14 Emergency Equipment and First Aid Requirements. The following items, as appropriate, shall be immediately available for on-site use: (1) First aid equipment and supplies approved by the consulting MD; (2) Emergency eyewashes/showers (comply with ANSI Z-358.1); (3) Emergency respirators (worst-case appropriate); (4) Spill control materials and equipment; and (5) Fire extinguishers (specify type, size, locations).

3.3.15 Emergency Response and Contingency Procedures (On-Site and Off-Site. The A-E shall contact local fire/police/rescue authorities having jurisdiction and nearby medical facilities that would be utilized for emergency treatment of injured personnel in order to notify them of upcoming site activities and potential emergency situations; to ascertain their response capabilities; and to obtain a response commitment. An Emergency Response Plan, which complies with 29 CFR 1910.120(1), shall be developed and implemented which addresses the following elements, as a minimum: (1) Pre-emergency planning and procedures for reporting incidents to appropriate government agencies for potential chemical exposures, personal injuries, fires/explosions, environmental spills and releases, discovery of radioactive materials; (2) Personnel roles, lines of authority, communications; (3) Posted instructions and a list of emergency contacts; (physician, nearby medical facility, fire and police departments, ambulance service, federal/state/local environmental agencies., CIH, Contracting Officer); (4) Emergency recognition and prevention; (5) Site topography, layout, and prevailing weather conditions; (6) Criteria and procedures for site evacuation (emergency alerting procedures/employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, site security and control); (7) Specific procedures for decontamination and medical treatment of injured personnel; (8) Route maps to nearest pre-notified medical facility; (9) Criteria for initiating community alert program, contacts, and responsibilities; and (10) Critique of emergency responses and follow-up.

3.4 Logs, Reports, and Recordkeeping. The following logs, reports, and records shall be developed, maintained, and submitted to the CO at the conclusion of the site work: (1) Training logs (site-specific, visitor); (2) Daily safety inspection logs (may be part of the Daily QC Reports); (3) Employee/visitor register; (4) Environmental and personal exposure monitoring/sampling results.

3.5 Safety, Health, and Emergency Response Specifications. The A-E shall prepare a section of the remedial action contract specifications which describes the minimum safety, health, and emergency response requirements to which the construction/remedial action contractor shall adhere. These specifications shall require that the contractor develop and implement his own Site Safety and Health Plan (Construction-SSHP). The contract requirements shall be fully developed from the Health and Safety Design Analysis (HSDA) and shall be described in a specification section entitled: "Safety, Health, and Emergency Response". All minimum site-specific, task-specific, and hazard-specific procedures, precautions, and equipment as determined necessary and described in the HSDA shall be reflected as clearly biddable and enforceable contractual requirements in this section of the specifications. In addition,

the Site Description and Contamination Characterization portion of the HSDA shall be incorporated for information as an appendix to this specification section.

Appendix 2 - Defense Priority Model (DPM) Instructions.

The A-E shall compile the following information from the RI report and submit it with the Draft RI Report. The information shall include a discussion and written justification for the qualitative items listed below. Sources of quantifiable data shall be provided. The level of confidence for each item shall be discussed, e.g., whether an estimate or a measured parameter is used.

SITE DESCRIPTION

1. Describe location of the site in relation to 100-year and 25-year floodplain.

2. Describe surface erosion potential. Include % surface slope, slope length, description of vegetative cover, surface soil grain size, and evidence of surface erosion (rills, gullies, etc.).

3. Shortest linear distance to nearest installation boundary.

4. Describe the physical state of the waste - solid or adheres to soil particles, semisolid or sludge which may release free liquid upon consolidation or decomposition, or waste as a free liquid.

5. Describe the depth of the waste in the soil and the width of the waste site.

6. Describe any measures taken to reduce migration of contaminants and the effectiveness of such measures.

7. Describe the activities which take place on the site, including excavation or materials handling and vehicular traffic.

METEROROLOGY

8. Net precipitation (average annual precip. minus average annual lake evaporation) in inches, from local meteorological station if possible.

9. Days/year with greater than 0.25 mm precipitation.

10. Maximum one-year, 24-hour rainfall amount.

11. Average soil temperature or annual ambient temperature if unavailable.

12. Annual average wind speed.

13. Percentage of time with high unobstructed wind speed.

VADOSE ZONE

14. Surface soil permeability. Determine through field or laboratory tests, soil percolation rates reported in soil survey reports or soil particle size distribution (to aid in determining the potential for infiltration vs runoff).

15. Surface soil porosity to use in determining the potential for dif-fusion of volatile compounds through the soil.

16. Vadose zone permeability. If not measured, discuss geologic materials comprising vadose zone.

17. Distance between deepest evidence of contamination and high water table.

18. Discuss discrete features in subsurface with potential to short circuit" the pathway to the water table (e.g. closed or open fractures, faults,etc.).

19. Silt content of the soil.

SURFACE WATER

20. Distance to and description of nearest downslope surface water body subject to potential contaminant runoff. Include low areas which contain water only briefly after rainfall events if there is less than 20 in. rainfall yearly.

21. Population (present users only) drinking from surface water potentially impacted by site w/in 3 miles of site, w/in 4 miles of site and w/in 5 miles of site.

22. Describe all uses of surface water bodies w/in 1 mile which are potentially impacted (recreation, food chain or non-food chain agriculture meat or dairy livestock watering, etc.)

23. Describe/show location of both aquatic or terrestrial biota/habitats associated with surface water bodies. Include all wetlands and their sizes within:

- 3 miles downstream or 1 mile in any direction, and
- 4 miles downstream or 1.5 miles in any direction of the site of documented surface water contamination attributable to the site or downstream of a potential point of contaminant entry.

24. Identify areas recognized or managed by federal, state or local government agencies or private organizations as rare, unique, unusually sensitive, or important natural resources (critical environments) within one mile and within 1.5 miles.

25. Describe habitat used by designated endangered species w/in 1 mile and

with in 1.5 miles of the waste site.

26. Give distance from current waste location to the nearest down-gradient surface water body supplying water for human consumption, domestic use, food processing or food chain agriculture within 4 miles downstream of the site of potential discharge of contaminated ground water.

GROUND WATER

27. Describe shallowest aquifer, giving hydraulic conductivity, hydraulic gradient, effective porosity.

28. Describe all uses of apparent aquifer directly below the site.

29. Distance from site to nearest surface water body that is used for human consumption, food processing or food chain agriculture or aquaculture where contaminated ground-water could potentially discharge within 4 mi of the site.

30. Describe the population potentially at risk from groundwater contamination by answering the questions below. Include the size of the population at risk and the degree of vulnerability.

1) Determine the "most likely travel path of ground-water borne contaminants" (the principal path along which ground water flows away from the contaminated site. Due to imprecision of determining ground-water flow direction assume the most likely flow path encompasses all areas within a 90- to 120- degree arc w/the center being the best estimate of flow direction)

2) Determine the number of people obtaining drinking water from

a) Ground-water sources along the most likely flow path of contaminants within 3 miles and within 5 miles of the site.

b) Ground-water sources within 3 miles and 5 miles downgradient of the site but not along most likely flow paths for contaminants. (This might include people who get water from a confined aquifer with an upward gradient where the shallow aquifer discharges to a stream)

c) Surface water downstream from potential groundwater discharge points laying directly on most likely paths of contaminant travels. (Include surface water intakes w/in 3 miles of potential discharge point that is within 3 miles of site.)

d) Ground water sources located within 3 miles of the site but not downgradient of the source.

31. Distance from waste location to habitat or natural area that is a ground water discharge point.

32. Define the sensitivity/importance of biota/habitats that are ground-water discharge points downgradient of the site w/in 1) 3 miles and 2) 4 miles or within 1) 1 mile or 1.5 miles in any direction from the site. Describe the sizes of wetlands and any vegetation irrigated w/groundwater, nursery, nesting or feeding grounds that are regionally important, etc.)

33. Distance from site to nearest down gradient ground-water well for human or agricultural use (using flow time)

ECOLOGY

34. Describe critical environments w/in 1 mile and 1.5 miles of the site. "Critical" includes 1) lands or waters specifically recognized or managed by federal, state, or local government agencies or private organizations as rare, unique, unusually sensitive, or important natural resources, 2) habitat used by any federally designated endangered species on a permanent or seasonal basis.

35. Distance to nearest habitat for an endangered species.

36. Distance to nearest national/state parks, forests, wildlife reserve and residential areas.

37. Distance to nearest 1) coastal or 2) fresh water wetland of 5 acres or larger in size.

DEMOGRAPHICS

38. The number of daytime employees and residents w/in a 1/4 mile radius of the site, 1/2 mile radius of the site, and 1 mile radius of the site each by 45 degree sectors.

39. Determine or estimate the population w/in a radius of 1000 feet of the site and w/in a radius of 1250 feet of the site. Include residential and day time population.

40. Distance to nearest industrial/commercial site.

41. Describe land use and zoning w/in a 1 mile radius of the site - completely remote, residential, commercial/industrial, or agricultural. Mixes of land use/zoning should be described.

42. Tabulate all contaminants and the average and highest concentrations measured in surface soil, surface water, ground- water, ambient air, and fugitive dust.

AIR QUALITY MODELING

43. Width of area source perpendicular to wind (or effective diameter)

44. Waste loading in grams of organic waste per cubic centimeter of soil

45. Soil density

46. Contaminant information.

47. Molecular weight

48. Henry's Law constant

49. Diffusion coefficient in air, cm2/s at reference temp

50. Density

51. Vapor pressure in atm

52. Mass fraction

SITE INFORMATION

Landfills

53. Surface area

54. Thickness of cap

55. Waste bed thickness

56. Porosity of cap

Surface Impoundment

57. Surface area

58. Depth of waste

59. Diffusivity of constituent in water

60. Diffusivity of constituent in air

APPENDIX # 3

GEOLOGY GENERAL SPECIFICATIONS
HOLLOMAN AFB, NEW SITES RIFS

1. Field Investigations (General).

1.1 General Specifications.

1.1.1 Utility Clearances and Permits. The specific locations of soil borings and monitoring wells are as described in the site specific sections or are to be determined by the A-E. The A-E shall be responsible for obtaining the appropriate drilling permits from the Base and shall be responsible for coordinating all utility clearances with the Base and commercial utility companies. The A-E shall be responsible for relocating holes, as necessary for utility clearance, to suitable locations which accomplish the intent of the original location. The distance to the new location shall be as close as possible to the original location and both locations shall be shown on the drill log. The A-E shall take all reasonable precautions to protect persons and property near the drill site.

1.1.2 Disposal of Drill Cuttings. The A-E shall establish background level values for each site. Potentially-hazardous materials generated during field activities shall be placed in properly labeled drums (A-E supplied) that are DOT-approved for transport of hazardous materials. All potentially-hazardous materials shall be segregated in separate drums (i.e., soil, water, tyvek, etc.). Drums shall be secured by banding the drums together and placing on wooden pallets at a designated staging area pending receipt of analytical results. All drums shall be adequately labeled prior to being moved to the staging area. Drums shall not be labeled using a "Magic Marker" or equivalent felt-tip marker. Drums shall not be labeled on the top. At a minimum, drums shall be labeled as to type of material contained, site number and location, boring numbers, and the telephone number for the Base Environmental Coordinator. The eventual disposal of the contents of these drums will be determined by the results of the associated analytical tests for the various sites of this project.

The A-E shall be responsible for providing analytical results to the USACE-PM and the BEC in sufficient detail to enable the BEC to properly prepare a manifest for ultimate shipment of the drums to a disposal facility. The A-E will not be responsible for off-base disposal of any drums that contain contaminated material. However, the A-E shall be responsible for moving the drums (one time only) to a location on-base as specified by the BEC.

Drill cuttings from soil borings that are not found to contain contamination shall be evenly spread out and leveled in the vicinity of the boring unless noted otherwise in site specific paragraphs or directed

otherwise by the BEC. The A-E shall coordinate with the Base on the preferred location at each site where the drill cuttings are to be spread. If a suitable location cannot be found at the site, uncontaminated cuttings shall be removed from the site to a location specified by the Base Environmental Coordinator (BEC).

1.1.2.1 Decontamination Protocol. Decontamination protocol shall be proposed by the A-E for all field activities in the A-E CDAP. These procedures shall ensure that there is no cross-contamination of samples which would result in the compromise of the final analytical results. In general, procedures should include cleaning (i.e., steam cleaning) of the drilling rig and all support equipment prior to initiation of each borehole and before leaving the Base. Critical cleaning of all sampling devices between sampling events shall include a series of cleaning procedures to remove all contaminant classes potentially encountered at the site. At a minimum, sample equipment cleaning shall include scrubbing with a non-phosphate detergent, a tap water rinse, a reagent grade rinse of isopropanol (or similar non-hazardous solvent), and finally a double rinse using distilled water. Generation of decontamination liquids (i.e., water and organic rinses) should be kept to a minimum since these liquids shall be deposed of in an environmentally sound manner. The proper disposal of decontamination liquids shall be prescribed by the Base Environmental Coordinator. All sampling equipment shall be decontaminated before use.

1.1.2.2 Water Source. Water for drilling, steam cleaning and other necessary field activities will be made available by the Base. The A-E shall use a public, potable water source if a suitable source is available. The A-E shall be responsible for collecting and transporting all water to the drilling areas for required uses. The A-E shall use clean containers which will not contaminate the water, and are used only for transporting potable water. This information and documentation of the source of the water (i.e. fire hydrant location and Base well number) which was used and any impact it may have on any of the analytical results performed under this Scope of Services shall be included in the appropriate report documents. The A-E shall be responsible for providing any deionized (DI) water required to perform the work specified in this Scope of Services. The quality of DI water shall be Type II as defined by ASTM 1193-77 and shall be free of organic analytes. Type II reagent water shall be used for preparing trip (travel) blanks.

1.1.2.3 Site Restoration. The A-E shall restore each site to its original state within ten working days of completion of the field investigations. The restoration efforts shall meet the approval of the Base Environmental Coordinator's (BEC) Office. The A-E shall take appropriate photographs both before and after field work activities to document this restoration. Copies of these photos shall be provided to the BEC within 1 week after they are taken.

1.1.2.4 Survey of Borehole Locations.

1.1.2.4.1 All soil borings shall be staked at completion to facilitate subsequent surveying. The location and elevation of the borehole shall be determined to the nearest one foot. The location of each borehole shall be measured from permanent site features which will allow for later relocation of all sampling locations. These measurements shall be shown on a site plan and recorded in the surveying notebook. These items shall be submitted to Omaha District no later than the Draft Report.

1.1.3 Soil Sampling.

1.1.3.1 General. All soil samples shall be taken in accordance with the following general requirements. Additional requirements are given under site specific paragraphs.

1.1.3.2 Drilling Methods and Decontamination. All soil borings shall be drilled by auger methods. The rig, augers, drill rods, and other drilling tools shall be steam cleaned between holes. The rig shall be free of leaks which could contaminate the holes (i.e., hydraulic fluid, oil, gas, etc.). No grease shall be used on drill pipe joints; however, Teflon tape or vegetable oil is acceptable. All sampling equipment shall be decontaminated before use as described in the paragraph "Decontamination Procotol", above.

1.1.3.3 Logs. Each boring shall be logged by a qualified geologist or soils engineer. Logs for soil borings shall meet the same requirements given in the attachment to this scope of services entitled "Borehole Logging Requirements". Boring log forms will be provided by USACE.

1.1.3.4 Backfilling. All borings shall be backfilled with cement grout. The cement grout shall consist of a mixture of portland cement (ASTM C 150) and water in the proportion of not more than seven (7) gallons of clean water per bag of cement (one cubic foot or 94 pounds). Additionally, 3-5% by weight of bentonite powder shall be added if permitted by state regulations. All borings shall be backfilled at the end of the work shift during which sampling of the boring is completed unless saturated conditions have been encountered. A 24-hour ground water level shall be measured in such borings before backfilling. Grout shall be placed by pumping through a tremie pipe which extends to within 10 feet of the bottom of the boring. Pumping shall continue until undiluted grout flows from the boring at the ground surface. If settlement of the grout occurs, the hole shall be topped off with grout or clean cuttings tamped in place.

1.1.3.5 Sampling Techniques.

1.1.3.5.1 General. Borehole sampling shall be performed using a stainless steel split-spoon sampler and in accordance with ASTM D-1586-84. Soil samples for chemical analysis shall be obtained by subsampling the material retrieved in the split spoon. Subsampling shall be done immediately upon opening the split spoon, and shall be done as

soon as possible after the split-spoon sample is taken from the bore hole. The portion of the split-spoon sample which represents slough shall be discarded. All surface soil samples shall be taken using EPA approved methodology as outlined in SW-846. The volume of sample recovered shall be great enough to provide the necessary sample volume for the required chemical analysis. Homogenized samples for laboratory analysis shall be a representative mixture from the remainder of the split spoon. Homogenizing of soil samples shall be performed in a stainless steel bowl using stainless steel stirring devices that have been decontaminated prior to each mixing procedure. This decontamination procedure will be the same as that specified for sampling equipment. Sampling equipment, methods and decontamination procedures shall be clearly indicated by the A-E in the A-E Chemical Data Acquisition Plan (CDAP). Sampling locations and intervals are described in site-specific sections of this Scope of Services.

1.1.3.5.2 Field Screening. The A-E CDAP shall include a procedure to screen split-spoon samples. Samples shall be selected for laboratory chemical analysis based on field screening of volatile organic content, where appropriate, (measured in headspace) as described in site-specific sections of this Scope of Services.

1.1.6 Ground Water Sampling.

1.1.6.1 General. Each of the ground water monitoring wells not containing free product shall be sampled once. Before a sample is collected from a well, the water level and well depth shall be measured and recorded. The method used shall be approved in the A-E CDAP. The well shall then be pumped or bailed with clean equipment to remove a quantity of water equal to at least five times the submerged volume of the casing. If the well does not recharge fast enough to permit removing five (5) casing volumes, the well shall be pumped or bailed dry and sampled as soon as sufficient recharge has occurred. The proper disposal of all purge water shall be prescribed by the Base Environmental Coordinator. The A-E shall use care to avoid cross contamination. The presence of any non-aqueous phase shall be determined and measured (if present) according to Table 1.C. Groundwater samples shall not be taken from the monitoring wells where a non-aqueous phase is present. Special attention shall be given to minimizing any possible contamination of the groundwater samples by any non-aqueous phase. Care shall be taken when acquiring water samples for laboratory analyses. The samples designated for volatile organic analyses shall be taken first. The liquid shall be introduced without excessive agitation which may drive off volatile compounds, as well as preventing any air bubbles from accumulating within the vial. This will prevent migration of these compounds into the airspace; thereby lessening the concentration within the analyzed liquid. The closed vial shall be inverted and tapped to ensure none are present. If there are air bubbles present, the sample shall be retaken. All VOA samples shall be packed into one cooler per sampling day and they shall be accompanied by a trip blank. The A-E shall be required to specify where trip blanks are prepared, and by whom. They shall be prepared in a laboratory by laboratory personnel and brought onsite the day of sampling.

Semivolatile samples shall also be transferred into containers with care so as to prevent any contamination from plastic gloves.

ATTACHMENT #4

Chemistry Input for Scope of Services
Holloman AFB, NM

Analytical Plan.
Site SS-17, BX Service Station

1. General. Sampling activities and chemical analysis for the investi-gation of the Holloman AFB must follow appropriate procedures necessary to obtain defensible data. The following sections refer to the acquisition of good quality data generally found in ER-1110-1-263, October 1, 1990. These sections have been revised where necessary and included here for emphasis. All procedures and activities performed in the acquisition of these data as described below must be included in the Chemical Data Acquisition Plan (CDAP) for approval.

2. Chemical Data Acquisition Elements in the CDAP.

2.1 Definition and Responsibility. Chemical data acquisition (CDA) consists of all field activities, laboratory activities, and contract deliverables related to the acquisition and reporting of chemical data for HTW investigation or remedial activities, which would include applicable activities at Holloman AFB.

Chemical data aquisition as described in the CDAP must be approved by the CO prior to initiation of field work. In the event corrections and comments on the draft are provided by the CO, the changes, documented by written annotated comments shall be incorporated by the authors in a revised plan before final approval is given. It should be noted that the purpose and content of the CDAP are the same as the QAPP required for Superfund investigations by the EPA. Additional requirements by the State of New Mexico shall also be addressed.

2.2 USACE Chemical Quality Data Management. USACE requires that Quality Control (QC) and Quality Assurance (QA) samples be collected and analyzed by the contract laboratory and the USACE QA laboratory, respectively. These QC and QA samples include splits or replicates of field samples. QC samples, help the contractor and contract laboratory to identify and diagnose problems related to sampling and analysis. QA samples, are sent to a USACE QA laboratory by overnight delivery for government monitoring of sampling and contract laboratory performance. The number of QA/QC samples to be taken shall be detailed in the CDAP under Chemical Data Quality Objectives. When the following procedures, performed by the USACE QA laboratory, demonstrate that chemical quality control contract requirements were not met, samples may be reanalyzed and/or re-collected at the expense of the prime contractor:

2.2.1 Inspection of QA samples to insure that sampling procedures correspond to Chemical Data Acquisition with regard to sample containers, preservation, labeling, chain of custody, etc.

2.2.2 Analyses of QA samples.

2.2.3 Evaluation of contractor deliverables specified for the acquisition of data.

2.2.4 Comparison of analytical results obtained by contract laboratory and USACE QA laboratory from split or replicate samples. The procedures for obtaining QA laboratory services are in Appendix E to ER 1110-1-263.

2.3 Contract Laboratory Validation. Any laboratory performing chemical analyses shall be validated by USACE Missouri River Division (MRD). Laboratories are validated for each environmental matrix and each specific analytical method to be employed. If the prime contractor selects a laboratory which has a current (within 1 year) validation for all analytes and matrices specific to its project, additional evaluation will not be necessary. If the prime contractor selects a laboratory which does not have a current validation, the laboratory shall be validated prior to approval of the CDAP. Commercial laboratory validation procedures are in Appendix C to ER 1110-1-263. Samples may not be subcontracted to another laboratory without the approval of CEMRD and unless the second laboratory is validated for the parameters concerned.

2.4 Chemical data acquisition elements of the CDAP include the following as a minimum.

2.4.1 Project Description. This section shall include a description of the work site and any unusual conditions. Anticipated project start and completion dates shall be estimated. This section shall also provide a summary of past and future work at the site including past multimedia chemical data of significance as well as a presentation of the multimedia sampling to be carried out in the present work effort. It is the intent at Holloman AFB to investigate the soil and groundwater at Site SS-17.

2.4.2 Chemical Data Quality Objectives. This section shall include a description of the general scope of work and relevant background information as it relates to the acquisition of chemical analytical data. State the objectives of the project: what questions must be answered and what decisions must be made. Describe the level and extent of chemical data required to answer questions and support decisions during the project: the approach for sample collection, sample analysis, and QA/QC which will result in the required chemical data.

2.4.3 Contractor Project Organization and Functional Area Responsibilities. The project organization for the prime contractor and any sub-contractors shall be clearly defined with a discussion of quality control responsibilities. The prime contractor's Quality Assurance (QA) Officer shall report to a responsible senior officer of the company (i.e., QA management shall be separate from project management). A list of all individuals shall be provided and will include QC officers for the various components (those

responsible for initiating and carrying out corrective actions and those involved in the data reporting sequence) and all analytical laboratory personnel (supervisors, chemists, and technicians). Resumes of all non-laboratory AE/Contractor personnel listing education and experience are required, including personnel collecting samples. List the names of field personnel that will wear monitoring equipment. For laboratory personnel that are not included in the Lab Quality Management Plan, resumes listing education and experience are required.

2.4.4 Field Activities. Briefly summarize types of field activities required by the project.

2.4.5 List of Equipment, Containers, and Supplies to be taken to the Field. This section shall include all sample screening equipment to be used (brand, model, serial number) and a description of its calibration as well as sampling equipment, decontamination supplies and sample containers (specific numbers and types).

2.4.6 Sampling Locations. This section shall provide the location of each sampling point on a site map. These locations shall be identified by the Contractor after a visual inspection if they are not already specified. The rationale for the sampling location and frequency (including QA/QC) shall be addressed in the Section Data Quality Objectives.

2.4.7 Sampling and Preservation Procedures. The CDAP shall include a table, which lists sampling locations, matrix (waste, soil, water, etc.), number of field samples, number of split or replicate samples, etc. Specific sampling, preservation, etc., details shall be included. All details shall meet the requirements of one of the following: (a) EPA SW-846 method; (b) another EPA method; (c) ASTM method; (d) NIOSH method (for air sampling); or (e) another accepted published method. Container and preservation specifications shall meet all appropriate requirement. (see Appendix F to ER 1110-1-263). Each table entry shall include the reference, if any, from which the specifications were taken. Any modifications to the standard methods must be approved by the CO with the concurrence of the QA laboratory prior to their use. All methods should be referenced to the most recent edition of their source. If a standard method is not available, the Contractor or subcontractors shall propose a nonstandard method with validation data for approval by the CO.

2.4.8 Details of Sampling and Preservation Procedures. The composition and volume of sample containers shall be specified along with a description of their preparation and cleaning. Sampling equipment directly contacting the sample shall be stainless steel or Teflon. The CDAP shall describe the cleaning of equipment and precautions for prevention of sample cross contamination during collection. Any field screening methods employed to select samples for analyses shall be discussed in detail. Compositing and homogenizing procedures shall be included where appropriate. Sample containers, volumes, preservatives and holding times for the common analyses in low concentration are presented in Table 2 through 3. A more detailed table is presented in Table E-1 of the Sample Handling Protocol (Appendix F).

2.4.8.1 Soil Sampling Procedure. Using stainless steel or Teflon sampling equipment enough solid is removed from a specified depth to fill the required containers. The volatile organic samples should be removed first with as little mixing as possible. The remaining soil shall be placed in a clean stainless steel bowl and mixed thoroughly with stainless steel implements (spoons, spades, etc.), then divided among the sample containers to be filled and properly preserved. QC and/or QA sample containers shall be filled from the same mixture as one of the samples. If other methodologies are warranted as specified by the Data Quality Objectives they must also be clearly defined in the CDAP.

2.4.8.2 Water Sampling Procedure. An attempt shall be made to obtain the most representative water samples where appropriate, which includes field blanks,etc. Containers to be analyzed for volatiles should be filled first allowing no headspace and with as little disturbance of the water as possible. If preservative is added to the bottles prior to shipment to the field, care must be taken not to overfill the containers and pH must be measured on samples where a value is specified.

2.4.8.3 Other Matrices. Sampling methods and equipment used shall meet the requirements of EPA or NIOSH methods.

2.4.9 Field Documentation. The system for identifying and tracking the samples shall be described, and shall include the recording of field data in permanently bound notebooks along with the method of relating the field data to the proper samples. All field documentation shall be done in indelible ink. Daily Quality Control Reports shall be prepared daily, dated, signed by the site manager, and sent to the CO at a rate approved by the CO. These reports shall include (with respect to chemistry) weather information at the time of sampling, samples taken with reference given to appropriate sections of the CDAP, field instrument measurements and calibra-tions. Any deviations from the CDAP shall be stated.

2.4.10 Sample Chain of Custody and Transportation. All sample labeling, packing, transportation and chain of custody procedures shall follow the USACE Sample Handling Protocol (Appendix F to ER 1110-1-263).

2.4.11 Laboratory Analytical Procedures. Specific laboratory procedural details shall be included. Each method shall be specified exactly and in detail by one of the following: (a) reference to an EPA SW-846 method; (b) reference to another EPA method; (c) reference to an ASTM method; (d) reference to a NIOSH method (for air analysis); (e) reference to another accepted published method; (f) reference to an accepted published method with a description of any deviations from the published procedure; or (g) complete description of the procedure, e.g., copies of laboratory instructions. EPA SW-846 methods shall be used where possible. Generally, nonstandard methods are not allowed. In special cases that require the consideration of nonstandard methods, the contract laboratory shall be prepared to provide validation data. The use of proposed nonstandard methods requires prior approval of the CO. A list of sample preparation and analytical methods most frequently used is

presented in Table D-2 (ER-1110-1-263). A table shall be included which lists for each matrix sample preparation method number, analytical method number, analytes and laboratory quantitation limits.

2.4.12 Preventive Maintenance. The instrument, including manufacturer, model, accessories, etc., shall be specified and preventive maintenance shall be described. Preventive maintenance shall be performed by qualified personnel. Records of repairs, adjustments and calibrations shall be maintained and available for inspection by the CO on request. This includes any field instrumentation.

2.4.13 Instrument Calibration and Frequency. Description of the procedure used for calibration and frequency of checks is required for each instrument or method including field instruments. These shall be consistent with the requirements of the contract and the analytical method.

2.4.14 Analytical Methods. Include the required concentration range and data on the sensitivity (detection limits), precision, and accuracy. Indicate how pre-existing data on sensitivity, precision, and accuracy were determined, and procedures to be used to validate the method. State source and purity of analytical reference materials and laboratory chemicals necessary to perform the analyses. Nominal detection limits for common analytes are given Appendix D Tables D-3 through D-6 of the ER-1110-1-263. DQO's for specific projects will affect the value of required detection limits and goals for precision, accuracy, and completeness.

2.4.15 Method Specific Data Quality Objectives. Provide objectives for precision, accuracy, detection limits, and completeness. DQO's for accuracy and precision established for each measurement parameter will be based on prior knowledge of the specific measurement system used and method validation studies employing replicate analyses, spikes, standards, calibrations, recoveries, control charts and project specific requirements. Completeness refers to the amount of valid data obtainable (by the specific method in the laboratory used with the instrument to be employed) from a measurement system compared to the expected amount of data, and is usually expressed as a percentage.

2.4.16 Quality Control Checks. Quality control checks are necessary to evaluate performance reliability for each measurement parameter. Describe procedures to assess the precision, accuracy and completeness of the measurement. The numbers and types of internal laboratory QC checks and samples proposed (e.g., blanks, duplicates, splits, spikes, surrogates, and reference standards, as applicable) shall be defined clearly. At a minimum these must be run at the rates prescribed in the individual methods. The laboratory's established practice for including control samples among the samples analyzed, and any additional controls required by the present project, shall be described. Describe the feedback systems used to identify problems by means of the results obtained from control samples. Limits of data acceptability shall be included. Results from laboratory internal quality control checks shall be reported with the analytical data.

2.4.17 Corrective Action. Plans for corrective actions to be taken when results appear unusual, questionable, or limits of acceptability are exceeded shall be included. When limits of acceptability are exceeded, information justifying the poor recovery or precision shall be documented. Describe how re-establishment of control is demonstrated.

2.4.18 Data Reduction, Validation, and Documentation. Equations, including units, required to calculate the concentration or value of the measured parameter, shall be included. Describe the data management systems which collect raw data, store data, and document quality control data. If statistical procedures are used for data review before reporting, include descriptions. Data validation procedures and organization shall be specified. The contract laboratory or the prime contractor hold and make available all project raw data for a period of two years after samples have been analyzed.

2.4.19 Chemical Data Quality Control Deliverables. The contractor shall address the frequency and content of chemical data quality control reports that shall be submitted during the project.

2.4.19.1 Daily Quality Control Report (DQCR) during field activities.

2.4.19.2 Daily Quality Control Report from the contract laboratory if appropriate.

2.4.19.3 Non-routine Occurrences. Include problems identified, corrective actions, and verbal/written instructions from USACE personnel for sampling or re-analysis. These reports of significant problems should be sent to the CO within 48 hours of the occurrence.

2.4.19.4 Data Report to the QA Laboratory. The contractor's data must be submitted to the designated quality assurance laboratory for data validation and comparison purposes as soon as it is available. This submittal should include all sample, blank and internal quality control results such as spike and surrogate recoveries and agreement between replicate analyses. Interim data reports may be requested if the project warrants them. The following are minimum data reporting requirements:

2.4.19.4.1 Sample IDs. The contractor shall prepare a tabular presentation which matches contract laboratory sample IDs to QA laboratory sample IDs. This table shall identify all Field Duplicates and Field Blanks as such and match with their corresponding field samples where applicable.

2.4.19.4.2 Sample Receipt. The contractor shall complete and report a "Cooler Receipt Form" for all shipments for purposes of noting problems in sample packaging, chain-of-custody, and sample preservation. An example form is available from the Missouri River Division Laboratory.

2.4.19.4.3 General Organic And Inorganic Reporting. For each analytical method run, the contractor shall report all analytes for each sample as a detected concentration or as less than the specific limits of quantitation. Generally, all samples with out-of-control spike recoveries being blamed on matrix interferences shall be designated as such. All soil samples shall be reported on a dry-weight basis with percent moisture also reported unless otherwise approved. The contractor shall also report dilution factors for each sample as well as the date of extraction (if applicable) and date of analysis.

2.4.19.4.4 Internal Quality Control Reporting at a minimum, internal quality control samples shall be analyzed at rates specified in the specific methods or higher rates if required to meet project specific Data Quality Objectives:

2.4.19.4.4.1 Laboratory Blanks (Method Blanks and Instrument Blanks). All analytes shall be reported for each laboratory blank. All non-blank sample results shall be designated as corresponding to a particular laboratory blank in term of analytical batch processing.

2.4.19.4.4.2 Surrogate Spike Samples. Surrogate Spike Recoveries shall be reported with all organic method reports where appropriate (i.e. when the method requires surrogate spikes). The report shall also specify the control limits for surrogate spike results as well as the spiking concentration. Any out-of-control recoveries as defined in the specified method shall result in the sample being rerun (both sets of data are to be reported) at no additional cost to the government.

2.4.19.4.4.3 Matrix Spike Samples. Matrix Spike Recoveries shall be reported for all organic and inorganic analyses. All general sample results shall be designated as corresponding to a particular matrix spike sample. The report shall indicate what field sample was spiked even if it was not a Corps of Engineers project sample. The report shall also specify the control limits for matrix spike results for each method for each matrix.

2.4.19.4.4.4 Laboratory Duplicates and/or Matrix Spike Duplicate Pairs. Relative Percent Difference shall be reported for all duplicate pairs as well as analyte/matrix specific control limits.

2.5 Quality Control Summary Report (QCSR). This document addresses quality control practices employed and summarizes the DQCR. Issues covered in this report shall include a discussion of all data points which may have been influenced or compromised and their impact on the Data Quality Objectives or remedial decisions. An example of the elements required for this level of effort are presented below, but are not limited to the following items:

2.5.1 Project Description - Elements of this include report organization and site description.

2.5.2 Laboratory Quality Control Activities - Elements are a summary of planned laboratory quality control activities, a summary of any deviations from planned activities, and a summary of the evaluation of the data quality for each analysis and matrix.

2.5.3 Field Quality Control Activities - Elements are a summary of planned field quality control activities, a summary of any deviations from planned activities, and a summary of the evaluation of the quality of the sampling.

2.5.4 Data Presentation and Evaluation - Elements are an assessment of sampling and analysis techniques, an evaluation of the data quality of each matrix and parameter, and an evaluation of the usability of the data.

2.5.5 Lessons Learned - A summary of field or analytical procedures that could be changed or modified to better characterize chemical contamination in future work efforts.

2.5.6 DQCR Consolidation - Daily Quality Control Reports are to be consolidated and summarized.

3. Analytical Requirements. The following matrix-specific analytical methods recommended for the soil samples taken from the SS-17 site along with appropriate digestion methods must be specified in the CDAP unless otherwise approved by the Corps of Engineers. These methods must be EPA-approved and consistent with any applicable current State of New Mexico requirements as well as meeting specific Data Quality Objectives. The objectives and rationale and end data use for these methods must be clearly stated in the CDAP. These methods must be followed explicitly and all quality control procedures detailed in the respective methods unless otherwise authorized by the Corps of Engineers. Analytical and statistical control parameters are outlined in the section of this Scope of Services concerned with chemical data acquisition and must be consistent with the ER-1110-1-263, October 1, 1990.

3.1 Soil. Soil samples taken from the previously documented sites shall be analyzed by approved EPA methods as described in the current edition SW-846, unless otherwise indicated. These methods must be detailed as described above for the CDAP.

3.1.1 Benzene/Toluene/Ethylbenzene/Xylenes shall be analyzed by 8020.

3.1.2 Lead shall be analyzed by 3050/7421.

3.1.3 Total Petroleum Hydrocarbons Light Fraction shall be analyzed by Modified method 8015. The site-specific data quality objectives shall determine the protocol for this methodology. This may include fuel identification, total petroleum hydrocarbons, and limited fingerprint analysis.

3.2 Water. Groundwater samples collected from the previously documented sites shall be analyzed by approved EPA methods as described in the current edition SW-846, unless otherwise indicated. These methods must be detailed as described above for the CDAP.

3.2.1 See 3.1.1.

3.2.2 Lead shall be analyzed by 3020/7421, graphite furnace.

3.2.3 Total Petroleum Hydrocarbons Light Fraction shall be analyzed by Modified method 8015. The site-specific data quality objectives shall determine the protocol for this methodology. This may include fuel identification, total petroleum hydrocarbons, and limited fingerprint analysis.

SCOPE OF SERVICES
FOR
TANK REMOVAL DESIGN PLANS AND SPECIFICATIONS
BX GAS STATION
HOLLOMAN AIR FORCE BASE, NEW MEXICO

1. INTRODUCTION. Upon receiving his Notice to Proceed, the A-E shall immediately begin preparing plans and specifications for the removal of four (4) 10,000-gallon UST's, one (1) 5,000-gallon UST and associated piping where practical in accordance with the State of New Mexico regulations. Removal of highly contaminated soil adjacent to these tanks shall be limited to soil above the water table and within ten (10) feet of the tanks. In the first phase of this design effort, the Architect-Engineer (A-E) shall travel as necessary to perform all tasks required to locate UST's, obtain maps of underground utilities, apply for construction permits, survey available disposal facilities and locate clean fill. The second design phase will address the preparation of final plans and specifications for the removal of UST's. The third phase of this effort will involve reviewing the 100% design and preparing necessary documents for construction advertise and award.

2. PHASE I OF SCOPE OF SERVICES. The literature and information search to be conducted by the A-E shall include but not be limited to the following topics:

2.1 Interviews with facility personnel familiar with the operation of the BX Service Station.

2.2 File search to obtain information regarding the installation and operation of USTs at the site, and evidence relating to the accidental release of automative gasoline to the environment.

2.3 Topographic Data and As-Builds. The A-E shall use available data and drawings supplied by the Corps of Engineers, Holloman Air Force Base and HQ TAC to identify exact locations of tanks, piping and foundations to be removed, and underground utilities to be avoided.

2.4 Utility Clearance and Permits. The A-E shall be responsible for obtaining the appropriate permits and utility clearances from the Installation.

2.5 Underground Storage Tank Confirmation. The A-E shall conduct investigations to confirm the existence of underground storage tanks (UST's) in suspect areas by using literature search and geophysical methods (i.e., magnetometer, electro-magnetic, or ground penetrating radar surveys). Further investigations by excavating with a backhoe tractor may be required to confirm "hits" from the geophysical surveys or the literature search. The ends of the tanks shall be staked after completion to facilitate subsequent surveying.

2.6 A-E Sampling Tank Contents. The Contractor shall be responsible for performing the necessary sampling and analysis of the tank liquid contents and residue to determine the proper method of disposal. The contractor shall analyze the contents of the tanks to comply with disposal or recycling requirements of the intended disposal facility or recycler. The volume of the fluid(s) shall be determined. Any water in the tank will be determined by water finding paste.

2.6.1 Chemistry Methods for UST Removal

Flashpoint	1010
Lead	7421

3. PHASE II OF SCOPE OF SERVICES. The A-E will prepare complete plans and specifications which will enable a cleanup contractor to accomplish the following.

3.1 Excavate soils necessary to remove tanks and piping. Segregate clean and highly contaminated soils. Highly contaminated soils shall be disposed of at an appropriate facility.

3.2 Remove and dispose of underground storage tanks and piping. Removal includes tank cleaning and disposal of tank contents and cleaning water by an approved method.

3.3 Backfill the excavated area, regrade to drain and finish grade all uncontaminated cleanup areas to an aesthetically pleasing and natural state.

3.4 The A-E responsible for the preparation of the design documents and remedial action specifications for this project shall review all project information provided and develop health and safety criteria and practices sufficient to protect on-site personnel, the public, and the environment from physical, chemical, and/or biological hazards particular to this site. If the information made available is insufficient to allow the A-E to develop such health and safety documents, a description of all additional information required will be prepared and submitted to the Contracting Officer.

3.5 Health and safety documents required shall be in accordance with the A-E SSHP requirements found in Appendix 1 of the primary Scope of Services.

3.6 Health and Safety Specifications. The A-E shall prepare a section of the specifications which describes the minimum safety, health, and emergency response requirements for which the Construction Contractor will be made responsible. All points discussed in the Health and Safety Design Analysis shall be reflected as contractual requirements which are clearly biddable and enforceable. In addition, the Site Description and Contamination Characterization portion of the Health and Safety

Design Analysis shall be incorporated for information as an Appendix to these specifications. These specifications shall require the Contractor to prepare and submit a written Site, Safety and Health Plan (SSHP) which describes how the Contractor will implement the health and safety requirements of the specifications.

3.7 Chemical Quality Management.

3.7.1 The design, in general, will involve various and repeated sampling and analytical routines. The A-E shall prepare a detailed program for all such activities for inclusion into the Contractor Chemical Quality Management Section of the specifications. Guidance for specific contents of this item is found in "A-E Guidance for Developing Site Specific Quality Management Details during the Preparation of Plans and Specifications" (revised 19 October 1988).

3.7.2 The final removal specification shall be prepared in such a way that the successful tank removal contractor shall be responsible for analytical sampling of soil and/or water. The A-E shall sample the contents of all tanks to be removed and the tank removal specifications shall clearly show the results, with directions specified. The tank removal contractor will be responsible for the removal of all tank contents, complete tanks and associated piping where practical. The specifications shall indicate that the tanks will be cleaned on site, inspected for leaks and disposed of in a manner consistent with the regulations of the State of New Mexico. The specifications will require the tank removal contractor to provide photographs of the tank being removed and cleaned. The contractor shall provide a complete leak inspection report detailing his inspection of the tanks. The specifications shall contain a recommended outline of the leak inspection report.

4. PHASE III OF SCOPE OF SERVICES.

4.1 Final Design Documents will be submitted for review and will include typed specifications, design analysis, Chemical Quality Management Section, a Final Design Estimate, and a Bid Estimate. After review, the A-E shall make the necessary corrections and submit the necessary documents with reproducibles ready for advertisement. See Document Submittal and Distribution lists for mailing of documents for review.

4.1.1 Copies of the final specification shall be typed and furnished for review as shown on the submittal and distribution sheet. In addition, a magnetic copy (floppy disk) of the Specifications in Wordstar 5.0 shall be furnished.

4.1.2 Specifications for final design documents shall be prepared in accordance with the Architect-Engineer Instruction Manual. The A-E shall make provisions for obtaining borrow material for fill, stockpiling clean fill, and handling and disposing of contaminated materials. Prior to and during the preparation of the contract specifications, all A-E

specification writers shall study Chapter X of the Architect-Engineer Instruction Manual and all questions pertaining to interpretation thereof should be referred by telephone to this office. The Omaha District is responsible for preparation of the draft of the front-end of this specification and will, upon request, provide technical sections of prior specifications if available; however, the A-E will be required to edit and type the entire specification.

4.2 Cost Estimates.

4.2.1 General. An estimate and estimate summary sheet will be required with each design submittal and bid estimate. The estimate format and estimate summary sheet will be similar to that as shown in the Estimating Guide, V3.10, example no. 6. One copy of the quantity takeoff sheets, including cross sections from which earthwork quantities were obtained, will be included with the 90-percent and bid estimate submittals. All work items will be broken down into labor, material and equipment (plant). Show lost effort due to wearing of protective clothing as a separate component for labor, material, and equipment (plant).

4.2.2 90-Percent Design Estimate. All unit prices used in the estimate will have backup as to how the unit prices were developed as shown in the Estimating Guide V3.10, example no. 6. The "Crew and Productivity Work Sheet" in the "Estimating Guide" can be used in developing the unit prices. Use of area cost factors or cost update factors is PROHIBITED. Major material cost items will have quotations included with the estimate localized for the New Mexico area. Obtain at least three (3) price quotes from material and equipment suppliers who would be capable of meeting the specification requirements. Obtain price quotes for all laboratory tests required. Show sales tax on materials as a separate item, if sales tax is required. Use quote sheet in "Estimating Guide" for price quotations. Determine where and how contaminated materials will be disposed, haul distance, and disposal fee. For disposal fee cost, show federal, state, and local taxes as separate items. Determine where the fill will come from, haul distance, and if a royalty will have to be paid for the fill. Labor, material, and equipment (plant) will be current and localized for the New Mexico area. Mechanical and electrical labor will be in man-hours. If work items are subcontracted, include sub overhead and profit as a separate item. Use wage rate calculation worksheet in the "Estimating Guide" for developing the total wage rate which includes labor burden. For all estimate submittals, include prime profit in the estimate. Obtain price quotations for all bonds, insurance, and pollution liability insurance required. Seven (7) copies of the estimate will be required. All Design Estimates must fit the bid schedule and measurement and payment sections in the specifications current at the time of submittal.

4.2.3 Additional Submittals. A revised Final Design Estimate may also be required with the submittal of the checked and corrected final working drawings if there has been a significant change from the previous submittal.

4.2.4 Bid Estimate. The bid estimate will be based on advertised plans and specifications, including amendments. It will include any changes made by the Omaha District during Final Design Review and should reflect current prices for labor, material, and equipment (plant) for the New Mexico area. Use of the area cost factors or cost update factors is prohibited. The bid estimate must fit the specification bid schedule and be submitted to arrive not later than fifteen (15) days prior to the scheduled opening of bids. In the event the amendments cannot be included in the bid estimate so as to arrive no later than fifteen (15) days prior to the scheduled opening of bids, supplemental estimating pages showing the impact of the amendments will be submitted to arrive not later than five (5) days prior to scheduled opening of bids.

4.3 Mailing Design Documents. All design documents shall be mailed to all reviewers via a carrier service that will provide overnight service.

4.4 Construction Time. The A-E shall indicate in the final specifications his recommended construction time required for this cleanup work.

4.5 General.

3.5.1 The following data and criteria will be furnished the A-E for guidance in design. Deviation from the criteria will be permitted only when actual field conditions require such a change. Proposed deviation with justification shall be submitted to the Contracting Officer for approval.

A-E Instruction Manual dated January, 1991
Most Current Estimating Guide, V-3 and 4
A-E Guidance for Developing SSQMP
Omaha District Standard Legend Sheet
Master List of Specification Section
Guide Specifications
- Section 01100 - Special Clauses
- Section 01300 - Environmental Protection
- Section 01400 - Special Safety Requirements
- Clearing and Grubbing
- Grading
- Seeding

Engineer Circular ER 1110-1-263
Engineer Circular ER-385-1-92

4.5.2 Name of Project. The project title shall be included on the specifications as shown on the front page of this appendix.

4.5.3 Project Schedule. The A-E in his proposal shall provide a design completion schedule that will allow design to be 100-percent complete.

4.5.4 Review of Advertised Project Specifications. After submittal of the Final Design Documents, the A-E shall completely review

the advertised project plans and specifications. Any comments or corrections found in this review shall be furnished to the Contracting officer in such form that an amendment can be issued therefrom not later than the midpoint of the advertising period. If the amendment is being prepared by the A-E, all such corrections shall be included therein.

4.5.5 Errors in Design. If in the opinion of the Contracting Officer, an error which is clearly the fault of the A-E is encountered in the design plans during the construction stage of the project, the Contracting Officer may direct the A-E to correct the design. The A-E shall perform such services in the manner directed by the Contracting Officer at no additional cost to the Government and on an expedited schedule. In the event that the A-E should dispute the Contracting Officer's decision in this regard, it shall be considered a dispute concerning a question of fact within the meaning of the Disputes clause of this contract and, pending final decision of the dispute, the A-E shall proceed diligently with the work and services in accordance with the decision of the Contracting Officer.

END OF APPENDIX A

APPENDIX B

GEOTECHNICAL REPORT

SITE SS-17
BX SERVICE STATION
HOLLOMAN AIR FORCE BASE, NEW MEXICO

Prepared For:

WALK, HAYDEL & ASSOCIATES, INC.
600 CARONDELET STREET
NEW ORLEANS, LOUISIANA 70130-3587

ATTENTION: MR. RAY VACHON

Professional Service Industries, Inc.

Professional Service Industries, Inc.

September 12, 1991
PSI Project No. 342-14083

Walk, Haydel & Associates, Inc.
600 Carondelet Street
New Orleans, Louisiana 70130-3587

Attention: Mr. Ray Vachon

Re: Site SS-17
BX Service Station
Holloman Air Force Base, New Mexico

Gentlemen:

Professional Service Industries, Inc. (PSI) is pleased to submit this report of drilling and sampling for the referenced site. Boring logs are being submitted in the report.

PSI appreciates the opportunity to be of service on this project. If there are any questions concerning this report, please contact us at your convenience.

Very truly yours,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Michael J. Del'Ostia
Graduate Engineer

Koi Z. Woodson, P. E.
Senior Division Manager

MJD/KZW/tc

4087 Shilling Way • Dallas, TX 75237 • Phone: 214/330-9211 • Fax: 214/333-2853

PROJECT AUTHORIZATION

PSI has completed drilling and sampling at Site SS-17, BX Service Station at Holloman Air Force Base, New Mexico. Formal authorization to perform the work was in the form of Walk, Haydel & Associates, Inc. (WH&A) Subcontract No. 8889-002, Task Order No. 038, WH&A Job No. 5362.50 which was executed by Mr. Ames S. Albro, Jr. of WH&A on May 9, 1991.

FIELD EXPLORATION

The site activities were performed as directed by a field representative of WH&A. As instructed, PSI performed no engineering evaluation of the data. The field work included drilling four borings. Three of these four borings were filled with a cement/bentonite grout after drilling. The remaining boring was left open so that base personnel could repair a broken water line. Borings were drilled at the approximate locations shown on the site diagram in the attachment.

Soil borings were performed with a truck-mounted CME 55 drill rig equipped with a rotary head and 7¼ inch O.D. hollow stem augers. Soil samples were obtained during drilling at the depths indicated on the boring logs. Sampling was performed with two inch O.D. stainless steel split spoons.

Soil samples obtained during drilling were screened in the field using a photoionization detector (PID) with a benzene calibration. The screening was performed by placing a portion of each soil sample in a glass jar, covering the opening with foil and screwing on the lid. After allowing the soil to sit in the jar for approximately 10 minutes the lid was removed and the tip of the PID inserted through the foil and a reading obtained. The results of the field screening are presented on the boring logs at the corresponding sample depths.

The boring logs include visual soil classifications based on the Unified Soil Classification System, stratifications, water level information, sample types and depths, drilling and sampling equipment, drilling personnel and other pertinent information. The stratification of the soil as shown on the boring logs represents the subsurface conditions encountered at the actual boring locations and variations may occur across the site. The lines of demarcation represent the approximate boundary between the soil types, but the actual transition may be gradual. It should also be noted that groundwater level fluctuations may occur due to seasonal climate variations, land usage and groundcover.

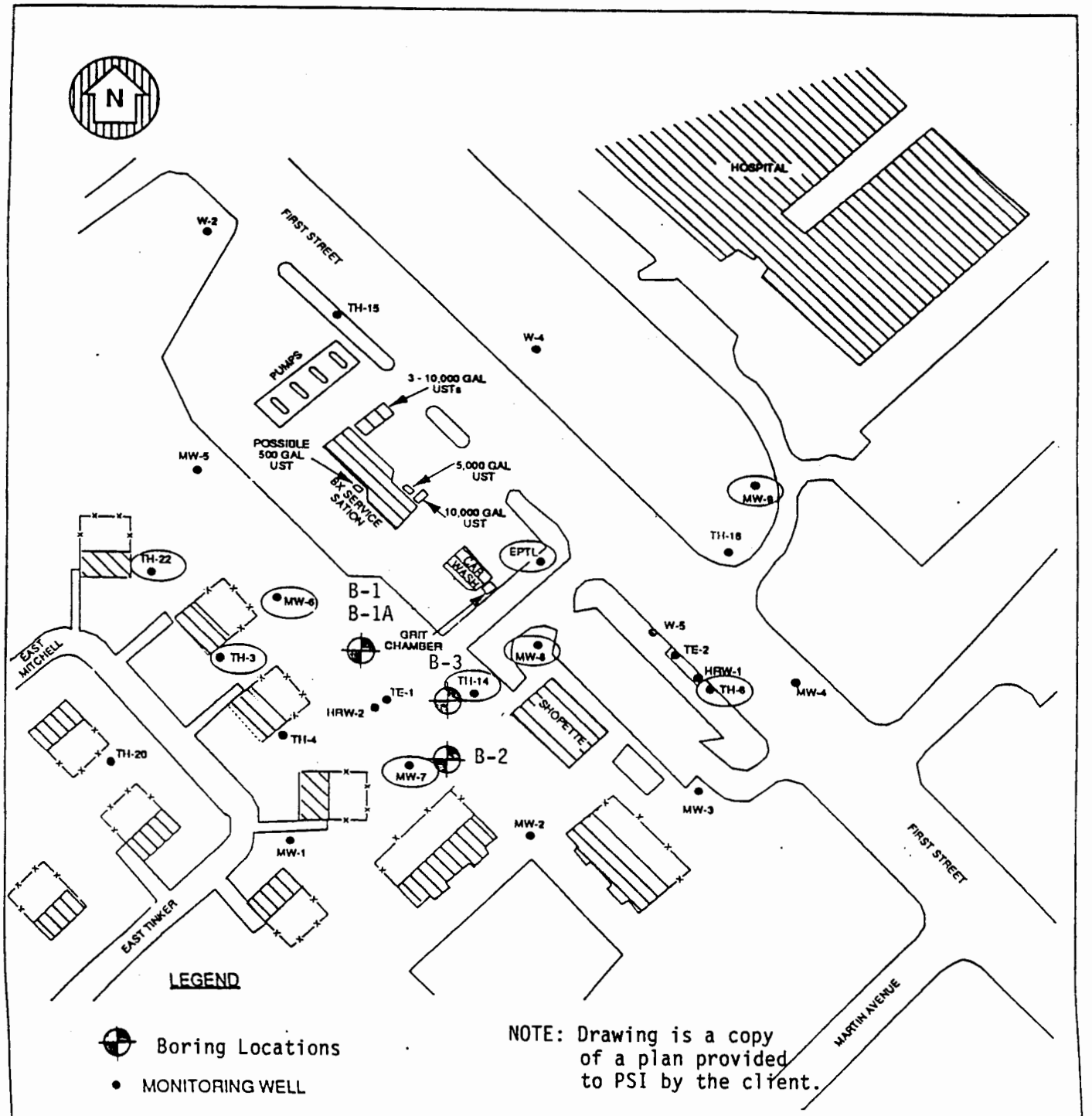
Level D Personal Protective Equipment which included disposable chemical resistant coveralls (tyvek suits), rubber boots with steel toe and shank, nitrile gloves, hard hats and safety glasses were utilized or were on standby for use by PSI personnel during drilling, sampling and

monitor well installation activities. Full-face respirators with twin-cartridge organic filters were also used or were on standby for use by PSI personnel. A combustible gas meter with a pentane calibration and a PID were used during drilling to monitor air quality.

Decontamination of drilling equipment was performed using a hot water, high pressure ("steam cleaner") washer and potable water. Drilling equipment was decontaminated prior to beginning work and between borings. Sampling equipment was decontaminated between samples and at the completion of drilling of each bore hole. Potable water for decontamination was obtained from a hose bib located at the rear of the "Shopette" convenience store located near the drilling locations. This source was designated for use by the WH&A field representative.

The soil cuttings generated during drilling were placed in DOT 55 gallon steel drums. The drums were labeled with the site name and number, boring number and contents and Base Point of Contact (POC). Subsequent to performance of the drilling activities, the drums were moved to a central location designated by the WH&A field representative and stacked on pallets.

ATTACHMENT



LEGEND

Boring Locations

MONITORING WELL

NOTE: Drawing is a copy of a plan provided to PSI by the client.

FLOATING PRODUCT DETECTED AS OF 4/7/91 (WELLS W2, W4, W5, TH15, TH16, TE-2, HRW-1, AND HRW-2 NOT MONITORED)

NOTE: DRAWING NOT TO SCALE

env-197

WALK, HAYDEL & ASSOCIATES, INC.

SITE SS-17
MONITORING WELL & UST LOCATIONS

BX SERVICE STATION
HOLLOMAN AFB, NM

5362.50

WH&A 1012 (REV.3/83)

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS

HTW DRILLING LOG

HOLE NO.	B-1
1. COMPANY NAME	Walk, Haydel & Associates, Inc.
2. DRILLING SUBCONTRACTOR	Professional Service Industries, Inc.
SHEET	1 OF 1 SHEETS
3. PROJECT	Holloman Air Force Base
4. LOCATION	SS-17
5. NAME OF DRILLER	Ival Brick
6. MANUFACTURER'S DESIGNATION OF DRILL	CME 55
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	7¼" O.D. HSA 2" Stainless Steel Split Spoon
8. HOLE LOCATION	See drawing
9. SURFACE ELEVATION	Unknown
10. DATE STARTED	6/13/91
11. DATE COMPLETED	6/13/91
12. OVERBURDEN THICKNESS	N/A
15. DEPTH GROUNDWATER ENCOUNTERED	1.4'
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	1.4' after 15 minutes
14. TOTAL DEPTH OF HOLE	5.5'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
0	X		N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	N/A	N/A	N/A	N/A	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Left open but covered		-	-	Michael Del'Ostia

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
		Brown road base w/gravel	S1 144 ppm				*SS 0.5'-2'
	1	Gray silty SAND (SM)					
	2						
	3	Gray sandy SILT w/discoloration (ML)	S2 170 ppm				*SS 2'-3.5'
	4						
	5	Discoloration increasing - becoming more black	S3 132 ppm				*SS 3.5'-5.5'
	6	Discontinued boring at 5.5' because hit site trench "water" line. The boring was left open so that base personnel could repair the line					
	7						
	8						
	9						

* Split Spoon

PROJECT Holloman Air Force Base

HOLE NO B-1

HTW DRILLING LOG

HOLE NO.	B-1A
1. COMPANY NAME	Walk, Haydel & Associates
2. DRILLING SUBCONTRACTOR	Professional Service Industries, Inc.
SHEET	1 OF 1 SHEETS
3. PROJECT	Holloman Aire Force Base
4. LOCATION	SS-17
5. NAME OF DRILLER	Ival Brick
6. MANUFACTURER'S DESIGNATION OF DRILL	CME 55
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	7¼" O.D. HSA 2" Stainless Steel Split Spoon
8. HOLE LOCATION	See Drawing
9. SURFACE ELEVATION	Unknown
10. DATE STARTED	6/13/91
11. DATE COMPLETED	6/13/91
12. OVERBURDEN THICKNESS	N/A
15. DEPTH GROUNDWATER ENCOUNTERED	7'
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	N/A
14. TOTAL DEPTH OF HOLE	8'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
0	X		N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	N/A	N/A	N/A	N/A	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted 6/13/91	Grout	-	-	Michael Del'Ostia

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	1	Tan sandy SILT (ML)	S1 138 ppm				*SS 0'-2'
	2						
	3		S2 144 ppm				*SS 2'-4'
	4						
	5		S3 196 ppm				*SS 4'-6'
	6						
	7	Gray sandy SILT (ML)	S4 200 ppm				*SS 6'-8'
	8	Boring terminated at 8'					
	9						

* Split Spoon

PROJECT: Holloman Air Force Base

HOLE NO. B-1A

HTW DRILLING LOG

HOLE NO.	B-2
1. COMPANY NAME	Walk, Haydel & Associates, Inc.
2. DRILLING SUBCONTRACTOR	Professional Service Industries, Inc.
SHEET	1 OF 1 SHEETS
3. PROJECT	Holloman Air Force Base
4. LOCATION	SS-17
5. NAME OF DRILLER	Ival Brick
6. MANUFACTURER'S DESIGNATION OF DRILL	CME 55
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	7¼" O.D. HSA; 2" Stainless Steel Split Spoon
8. HOLE LOCATION	See Drawing
9. SURFACE ELEVATION	Unknown
10. DATE STARTED	6/13/91
11. DATE COMPLETED	6/13/91
12. OVERBURDEN THICKNESS	N/A
15. DEPTH GROUNDWATER ENCOUNTERED	7.5'
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	N/A
14. TOTAL DEPTH OF HOLE	8.5'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
0	X		N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	N/A	N/A	N/A	N/A	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted 6/13/91	Grout	-	-	Michael Del'Ostia

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
		Brown silty SAND (SM)	S1 34 ppm				*SS 0.5'-2.5'
	1						
		Gray sandy SILT (ML)					
	2						
		Gray silty SAND (SM)					
	3	Gray sandy SILT (ML)	S2 138 ppm				*SS 2.5'-4.5'
	4						
	5		S3 118 ppm				*SS 4.5'-6.5'
	6						
	7		S4 192 ppm				*SS 6.5'-8.5'
		Dark discolored layer sandy SILT (ML)					
	8	Brown silty SAND (SM)					
	9	Boring terminated at 8.5'					

*Split Spoon

PROJECT: Holloman Air Force Base

HOLE NO: B-2

HTW DRILLING LOG

HOLE NO. B-3

1. COMPANY NAME: Walk, Haydel & Associates, Inc.	2. DRILLING SUBCONTRACTOR: Professional Service Industries, Inc.
SHEET 1 OF 1 SHEETS	
3. PROJECT: Holloman Air Force Base	4. LOCATION: SS-17
5. NAME OF DRILLER: Ival Brick	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 55
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 7¼" O.D. HSA; 2" Stainless Steel Split Spoon	8. HOLE LOCATION: See Drawing
	9. SURFACE ELEVATION: Unknown
	10. DATE STARTED: 6/13/91 — 11. DATE COMPLETED: 6/13/91
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: 6.5'
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A
14. TOTAL DEPTH OF HOLE: 8'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
0	X		N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A	N/A	N/A	N/A	N/A	N/A	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted 6/13/91	Grout	-	-	Michael Del'Ostia

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	1	Brown clayey SAND w/gravel in upper 6" (SC)	S1 5.0 ppm				*SS 0'-2'
	2						
	3	Tan silty SAND (SM)	S2 3.2 ppm				*SS 2'-4'
	4						
	5		S3 2.2 ppm				*SS 4'-6'
	6						
	7		S4 2.8 ppm				*SS 6'-8'
	8	Boring terminated at 8'					
	9						

* Split Spoon

PROJECT: Holloman Air Force Base

HOLE NO. B-3

END OF APPENDIX B

APPENDIX C

ANALYTICAL DATA

WALK, HAYDEL & ASSOCIATES, INC.

DEPARTMENTAL CORRESPONDENCE

Date: **July 11, 1991**

Subject: Holloman Air Force Base, Site SS-17 Analytical Data

From: Molly McGraw

Two groundwater sampling points (MW-2 and W-2) were incorrectly labeled in the field, on the chain of custody (COC) sheets and subsequently on the analytical reports. To correctly identify these points, the field monitoring well data sheets, field log book and EIRA archive files were reviewed. The correct identification of these two points is as follows:

ID On Label, COC & Data	Correct ID
MW-2 sampled on 6/11/91 @1756, Lab ID No. R106NS02	W-2
W-2 sampled on 6/11/91 @1018 Lab No. R106NS03	W-4

These Lab ID Nos. can be found in Lab Episode No. R106NS, Work Order No. 5383, received 6/13/91.

This memo explaining the correction should accompany the data at all times. The original data has not been changed due to legal restraints involving COC procedures.

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 James Drive West, Suite 100
St. Rose, Louisiana 70087
(504) 469-0333

LABORATORY REPORT

Prepared for: WALK HAYDEL & ASSOC.
Attention: MR. RAY VACHON
600 CARONDELET ST.
NEW ORLEANS, LA 70130

Lab Episode Number: R106PM
Work Order Number: 5425
Date Received: 06/14/91

Task Order Number: 063
Job Number: 5362.51
Subcontract Number: 8889-001

NARRATIVE

SAMPLE ID	LAB ID	MATRIX
B-2 0.5-2.5'	R106PM01	SOLID
B-2 2.5-4.5'	R106PM02	SOLID
B-2 4.5-6.5'	R106PM03	SOLID
B-2 6.5-8.5'	R106PM04	SOLID
B-3 0-2'	R106PM05	SOLID
B-3 2-4'	R106PM06	SOLID
B-3 4-6'	R106PM07	SOLID
B-3 6-8'	R106PM08	SOLID
BS-B3 6-8'	R106PM09	SOLID
BD-B3 6-8'	R106PM10	SOLID
MS-B3 6-8'	R106PM11	SOLID
MD-B3 6-8'	R106PM12	SOLID
B1A 0-2'	R106PM13	SOLID
B1A 2-4'	R106PM14	SOLID
B1A 4-6'	R106PM15	SOLID
BS-B1A 4-6'	R106PM16	SOLID
BD-B1A 4-6'	R106PM17	SOLID
MS-B1A 4-6'	R106PM18	SOLID
MD-B1A 4-6'	R106PM19	SOLID
B1A 6-8'	R106PM20	SOLID

The above samples were received for the Holloman AFB Site SS-17 Project, and the samples were assigned the lab identification numbers as indicated. This Lab Episode is one of three belonging to this project: R106NP received 06/12/91, R106NS received 06/13/91 and R106PM received 06/14/91.

The samples were analyzed for Volatile Organics by Method 8240, Total Petroleum Hydrocarbons by Modified Method 8015, and Total Lead by Method 3050/7421 according to the assignment of tests on the attached chain of custody record. The presence of a "QC" in a Sample I.D. on the chain of custody record was interpreted as signifying a set of Blank Spike, Blank Spike Duplicate, Matrix Spike and Matrix Spike Duplicate samples were to be prepared and analyzed for the tests indicated. Such samples are indicated by the prefixes BS, BD, MS and MD above.

In the Quality Control results for the Lead determinations in the Matrix Spike and Matrix Spike Duplicate samples, the recoveries are listed as DO, i.e. Diluted Out. The amount of lead native to the sample was so large that the quantity of lead added was too small by comparison to be accurately measured.

One recovery for Total Petroleum Hydrocarbons in the Matrix Spike QC Results Summary is slightly below the QC Range provided. It is noted that this range is advisory, and deviations do not require corrective action by the analyst. Good

Lab Number: R106PM
Page Number: 2

Narrative Continued -

recoveries were obtained for the corresponding Blank Spikes.

The chain of custody record is included with this report.

If you have any questions regarding this analysis, please contact the Project Coordinator.

Technical Review/Clerical Accuracy/Report Completeness Certified By:

Richard C. Koch, PhD
Project Coordinator

7-2-91
Date

Method Compliance Certified/Data Released By:

John R. Troost
V.P./Operations General Manager

7/1/
Date

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Lab Number: R106PM
Page Number: 3

GENERAL CHEMISTRY RESULTS

B-2 0.5-2.5'
DATE/TIME SAMPLED: 06/13/91 11:41:00

Test	Concentration	Units	POL	DF
Lead (graphite furnace)	2.3	mg/kg(ppm)	0.35	-
Total Solids	84	%	1	-

B-2 2.5-4.5'
DATE/TIME SAMPLED: 06/13/91 11:47:00

Test	Concentration	Units	POL	DF
Lead (graphite furnace)	0.86	mg/kg(ppm)	0.35	-
Total Solids	85	%	1	-

B-2 4.5-6.5'
DATE/TIME SAMPLED: 06/13/91 11:52:00

Test	Concentration	Units	POL	DF
Lead (graphite furnace)	1.2	mg/kg(ppm)	0.40	2
Total Solids	82	%	1	-

B-2 6.5-8.5'
DATE/TIME SAMPLED: 06/13/91 12:04:00

Test	Concentration	Units	POL	DF
Lead (graphite furnace)	1.6	mg/kg(ppm)	0.40	2
Total Solids	75	%	1	-

B-3 0-2'
DATE/TIME SAMPLED: 06/13/91 12:47:00

Test	Concentration	Units	POL	DF
Lead (graphite furnace)	5.9	mg/kg(ppm)	.30	-
Total Solids	91	%	1	-

B-3 2-4'
DATE/TIME SAMPLED: 06/13/91 12:51:00

Test	Concentration	Units	POL	DF
Lead (graphite furnace)	0.81	mg/kg(ppm)	0.35	-
Total Solids	87	%	1	-

Lab Number: R106PM
Page Number: 4

B-3 4-6'
DATE/TIME SAMPLED: 06/13/91 12:58:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	2.2	mg/kg(ppm)	0.35	-
Total Solids	86	%	1	-

B-3 6-8'
DATE/TIME SAMPLED: 06/13/91 13:05:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	0.89	mg/kg(ppm)	0.40	2
Total Solids	77	%	1	-

B1A 0-2'
DATE/TIME SAMPLED: 06/13/91 14:02:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	2.1	mg/kg(ppm)	0.35	-
Total Solids	80	%	1	-

B1A 2-4'
DATE/TIME SAMPLED: 06/13/91 14:07:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	4.6	mg/kg(ppm)	0.50	2
Total Solids	84	%	1	-

B1A 4-6'
DATE/TIME SAMPLED: 06/13/91 14:16:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	24.7	mg/kg(ppm)	1.9	8
Total Solids	85	%	1	-

BLANK SPIKE B1A 4-6'

Test	% Recovery	SL	Units
Lead (graphite furnace)	92	3.2	mg/kg(ppm)

Lab Number: R106PM
Page Number: 5

BLANK SPIKE DUPLICATE B1A 4-6'

Test	% Recovery	SL	Units
Lead (graphite furnace)	92	3.2	mg/kg(ppm)

MATRIX SPIKE B1A 4-6'

Test	% Recovery	SL	Units
Lead (graphite furnace)	DO	3.2	mg/kg(ppm)

MATRIX SPIKE DUPLICATE B1A 4-6'

Test	% Recovery	SL	Units
Lead (graphite furnace)	DO	3.2	mg/kg(ppm)

B1A 6-8'
DATE/TIME SAMPLED: 06/13/91 14:23:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	3.5	mg/kg(ppm)	0.40	2
Total Solids	78	%	1	-

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	PQL
Lead (graphite furnace)	BQL	mg/kg(ppm)	0.25

BQL: Below Quantitation Limit
DF: Dilution Factor
DRY: Sample Results are Based on Dry Weight Where Units are mg/kg or per lb.
PQL: Practical Quantitation Limit
SL: Spike Level
DO: Diluted Out

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Lab Number: R106PM
Page Number: 6

QC REPORT

BLANK SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% Recovery	Dup. % Recovery	QC Range	RPD	RPD Limit
Lead (Graphite Furnace)	06PM15	3.2 mg/kg	92	92	80-120	20	0

MATRIX SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% Recovery	Dup. % Recovery	QC Range	RPD	RPD Limit
Lead (Graphite Furnace)	06PM15	3.2 mg/kg	DO	DO	80-120	20	-

DO: Diluted Out
RPD: Relative Percent Difference
NOTE: A set of blank spikes is analyzed after every twentieth sample. Blank spike recoveries exceeding an established "QC Range" or "RPD Limit" trigger reanalysis of all samples in the batch. Results of matrix spikes, performed in duplicate on the twentieth field sample in a batch, exceeding "ADVSY Range" or "ADVSY RPD", are generally reported without remediation. Established ranges and limits are actual registers of the precision and accuracy capabilities of the methods on clean matrices and genuine field samples.

Client: WALK HAYDEL & ASSOC.
Sample: B-2 0.5'-2.5'
Lab ID: R106PM01
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/25/91
Date Sampled: 06/13/91
Data File ID: RA176D

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	59.
Acrylonitrile		BQL	59.
Chloromethane		BQL	12.
Bromomethane		BQL	12.
Vinyl Chloride		BQL	12.
Chloroethane		BQL	12.
Methylene Chloride		BQL	6.
1,1-Dichloroethene		BQL	6.
1,1-Dichloroethane		BQL	6.
1,2-Dichloroethene (total)		BQL	6.
Trichlorofluoromethane		BQL	6.
Chloroform		BQL	6.
1,2-Dichloroethane		BQL	6.
1,1,1-Trichloroethane		BQL	6.
Carbon Tetrachloride		BQL	6.
Bromodichloromethane		BQL	6.
1,2-Dichloropropane		BQL	6.
trans-1,3-Dichloropropene		BQL	6.
Trichloroethene		BQL	6.
Dibromochloromethane		BQL	6.
1,1,2-Trichloroethane		BQL	6.
Benzene		BQL	6.
cis-1,3-Dichloropropene		BQL	6.
Bromoform		BQL	6.
Tetrachloroethene		BQL	6.
1,1,2,2-Tetrachloroethane		BQL	6.
Toluene		BQL	6.
Chlorobenzene		BQL	6.
Ethylbenzene		BQL	6.
2-Chloroethylvinyl ether (1)		BQL	12.
Acetone		BQL	12.
Carbon Disulfide		BQL	6.
2-Butanone		BQL	12.
Vinyl Acetate		BQL	12.
2-Hexanone		BQL	12.
4-Methyl-2-Pentanone		BQL	12.
Styrene		BQL	6.
Xylene (total)		BQL	6.

(1) Known to Hydrolyze in Presence of Dilute Acid

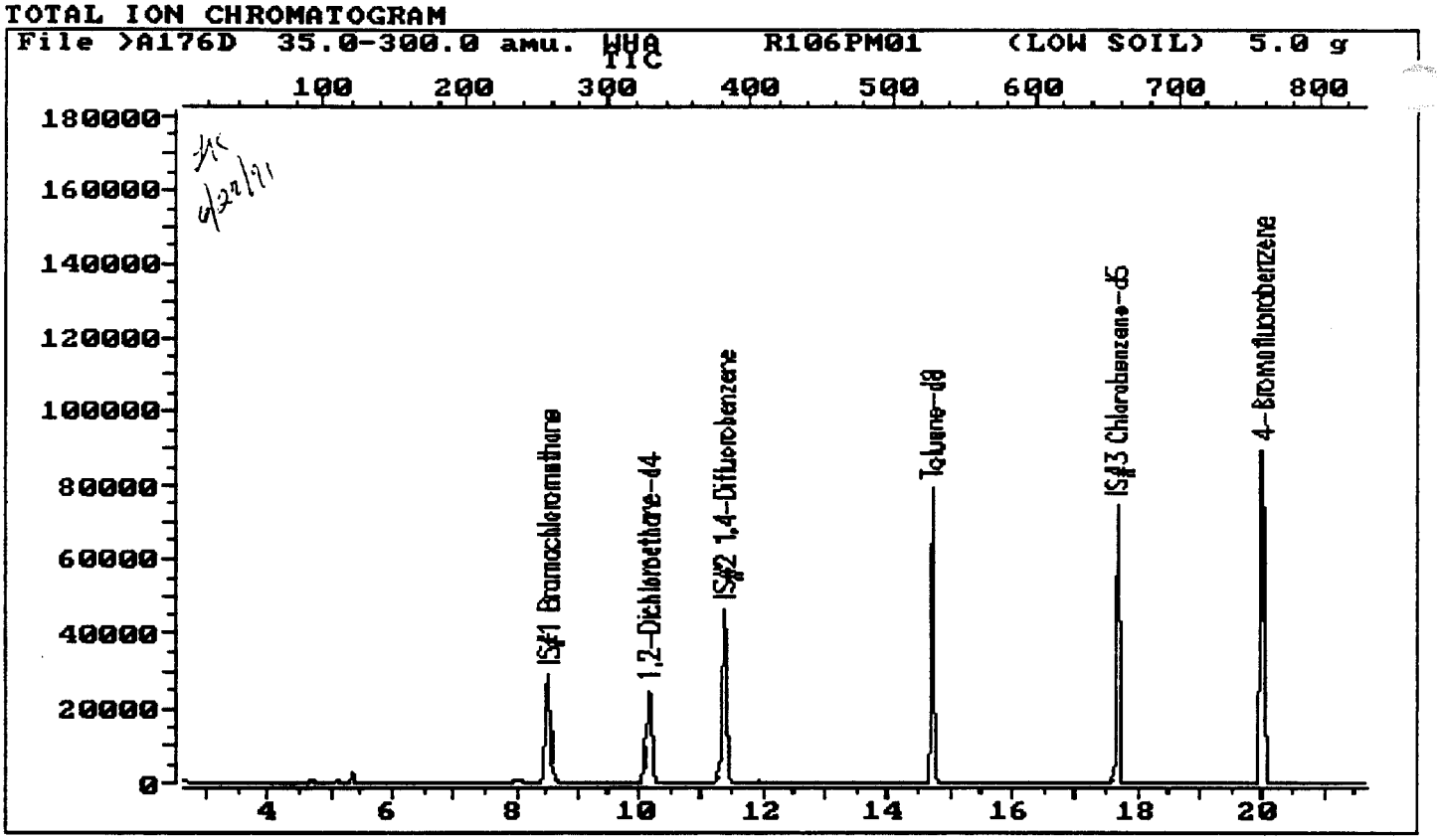
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	116	70-121
Toluene-d8	114	84-138
4-Bromofluorobenzene	112	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 59 ug/kg
Associated Blank: VOA RA176C

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A176D::D4 Quant Output File: ^A176D::QT
Name: WHA R106PM01
Misc: (LOW SOIL) 5.0 g B-2 0.5-2.5' INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910625 07:48

Operator ID: LYNN
Quant Time: 910625 09:23
Injected at: 910625 08:59

Client: WALK HAYDEL & ASSOC.
Sample: B-2 2.5'-4.5'
Lab ID: R106PM02
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/25/91
Date Sampled: 06/13/91
Data File ID: RA176E

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	59.
Acrylonitrile		BQL	59.
Chloromethane		BQL	12.
Bromomethane		BQL	12.
Vinyl Chloride		BQL	12.
Chloroethane		BQL	12.
Methylene Chloride		BQL	6.
1,1-Dichloroethene		BQL	6.
1,1-Dichloroethane		BQL	6.
1,2-Dichloroethene (total)		BQL	6.
Trichlorofluoromethane		BQL	6.
Chloroform		BQL	6.
1,2-Dichloroethane		BQL	6.
1,1,1-Trichloroethane		BQL	6.
Carbon Tetrachloride		BQL	6.
Bromodichloromethane		BQL	6.
1,2-Dichloropropane		BQL	6.
trans-1,3-Dichloropropene		BQL	6.
Trichloroethene		BQL	6.
Dibromochloromethane		BQL	6.
1,1,2-Trichloroethane		BQL	6.
Benzene		BQL	6.
cis-1,3-Dichloropropene		BQL	6.
Bromoform		BQL	6.
Tetrachloroethene		BQL	6.
1,1,2,2-Tetrachloroethane		BQL	6.
Toluene		BQL	6.
Chlorobenzene		BQL	6.
Ethylbenzene	17.89	65.	6.
2-Chloroethylvinyl ether (1)		BQL	12.
Acetone	4.63	74.	12.
Carbon Disulfide		BQL	6.
2-Butanone		BQL	12.
Vinyl Acetate		BQL	12.
2-Hexanone		BQL	12.
4-Methyl-2-Pentanone		BQL	12.
Styrene		BQL	6.
Xylene (total)	18.14-18.92	490.	6.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	110	70-121
Toluene-d8	90	84-138
4-Bromofluorobenzene	105	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 59 ug/kg
Associated Blank: VOA RA176C

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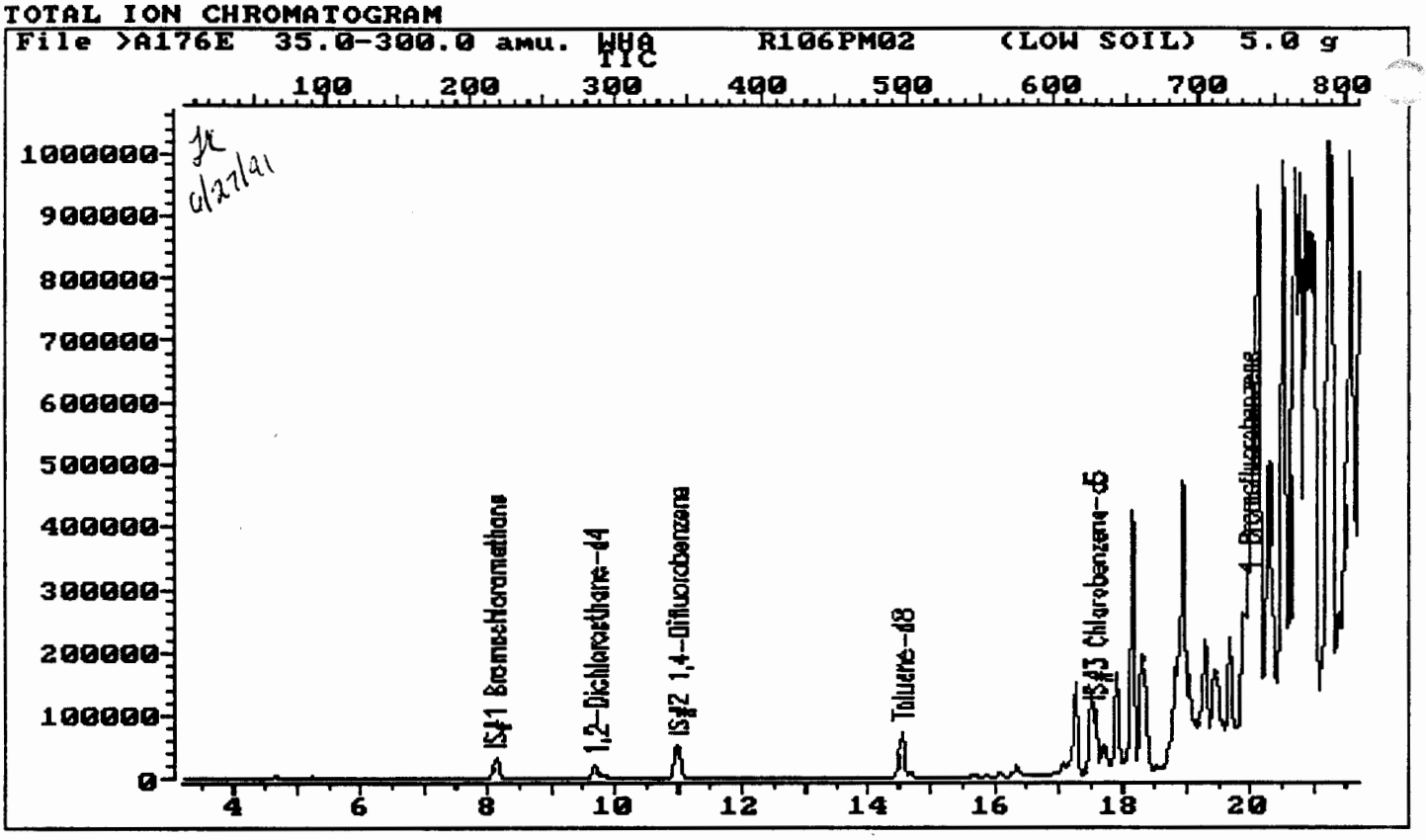
TOTAL ION CHROMATOGRAM



Data File: >A176E::D4 Quant Output File: ^A176E::QT
Name: WHA R106PM02
Misc: (LOW SOIL) 5.0 g B-2 2.5-4.5' INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910625 07:48

Operator ID: LYNN
Quant Time: 910625 10:10
Injected at: 910625 09:47

Client: WALK HAYDEL & ASSOC.
Sample: B-2 4.5'-6.5'
Lab ID: R106PM03
Method: SW 846-8240

Date Extracted: 06/25/91
Date Analyzed: 06/26/91
Date Sampled: 06/13/91
Data File ID: RA177L

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/g)	PQL (ug/g)
Acrolein		BQL	6.1
Acrylonitrile		BQL	6.1
Chloromethane		BQL	1.2
Bromomethane		BQL	1.2
Vinyl Chloride		BQL	1.2
Chloroethane		BQL	1.2
Methylene Chloride	5.29	0.6 (B=1)	0.6
1,1-Dichloroethene		BQL	0.6
1,1-Dichloroethane		BQL	0.6
1,2-Dichloroethene (total)		BQL	0.6
Trichlorofluoromethane		BQL	0.6
Chloroform		BQL	0.6
1,2-Dichloroethane		BQL	0.6
1,1,1-Trichloroethane		BQL	0.6
Carbon Tetrachloride		BQL	0.6
Bromodichloromethane		BQL	0.6
1,2-Dichloropropane		BQL	0.6
trans-1,3-Dichloropropene		BQL	0.6
Trichloroethene		BQL	0.6
Dibromochloromethane		BQL	0.6
1,1,2-Trichloroethane		BQL	0.6
Benzene		BQL	0.6
cis-1,3-Dichloropropene		BQL	0.6
Bromoform		BQL	0.6
Tetrachloroethene		BQL	0.6
1,1,2,2-Tetrachloroethane		BQL	0.6
Toluene		BQL	0.6
Chlorobenzene		BQL	0.6
Ethylbenzene	18.07	4.	0.6
2-Chloroethylvinyl ether (1)		BQL	1.2
Acetone	4.70	1. (B=1)	1.2
Carbon Disulfide		BQL	0.6
2-Butanone	7.86	4. (B=4)	1.2
Vinyl Acetate		BQL	1.2
2-Hexanone		BQL	1.2
4-Methyl-2-Pentanone		BQL	1.2
Styrene		BQL	0.6
Xylene (total)	18.30-19.10	19.	0.6

(1) Known to Hydrolyze in Presence of Dilute Acid

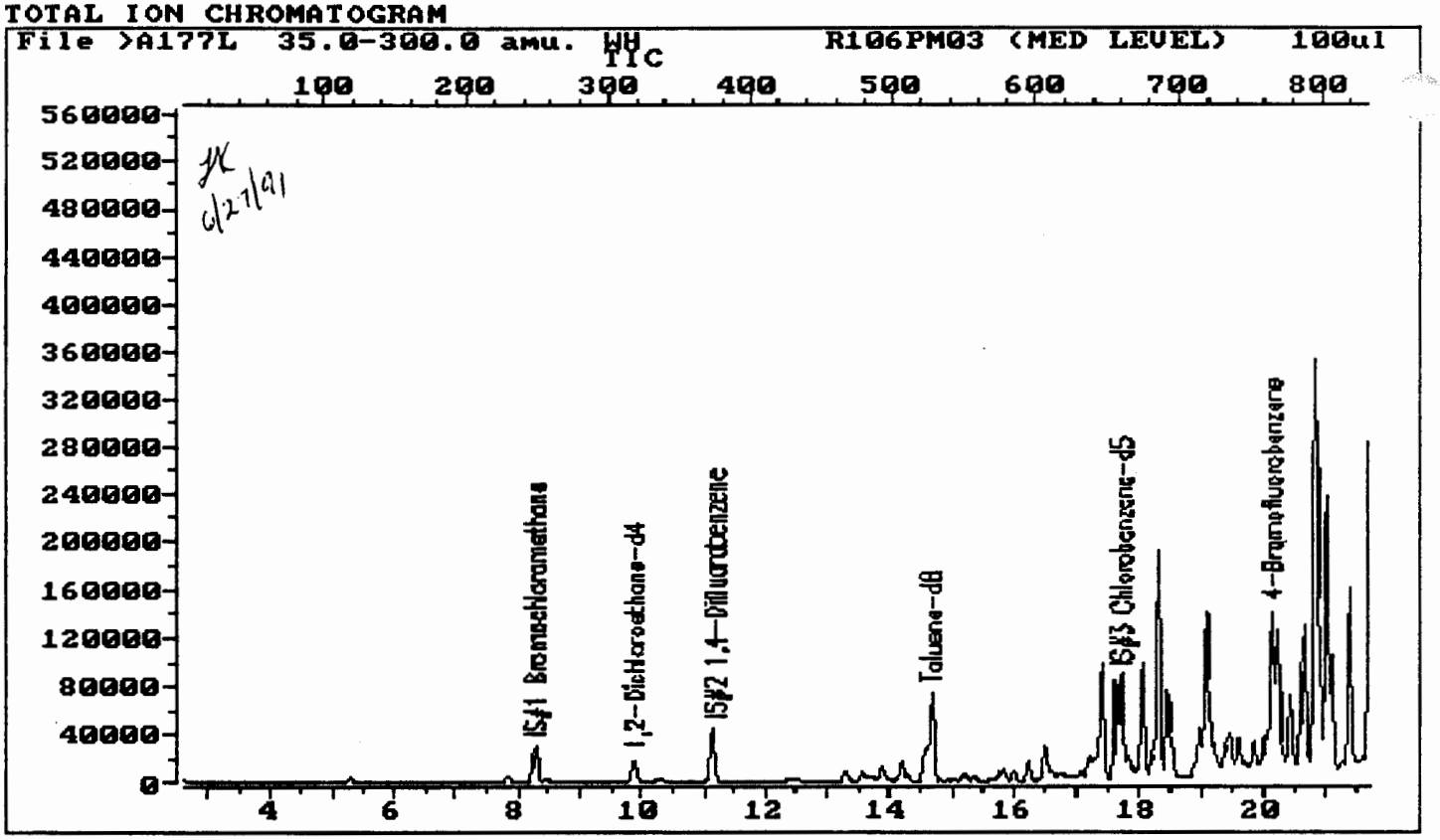
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	109	70-121
Toluene-d8	92	84-138
4-Bromofluorobenzene	108	59-113

Surrogate Spike Level: 6 ug/g
Associated Blank: VOA RA177K

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A177L::D4 Quant Output File: ^A177L::QT
Name: WH R106PM03
Misc: (MED LEVEL) 100ul B-2 4.5-6.5' INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910626 14:03

Operator ID: JOHN
Quant Time: 910626 18:08
Injected at: 910626 17:45

Client: WALK HAYDEL & ASSOC.
Sample: B-2 6.5'-8.5'
Lab ID: R106PM04
Method: SW 846-8240

Date Extracted: 06/25/91
Date Analyzed: 06/27/91
Date Sampled: 06/13/91
Data File ID: RE178M

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/g)	PQL (ug/g)
Acrolein		BQL	13.
Acrylonitrile		BQL	13.
Chloromethane		BQL	3.
Bromomethane		BQL	3.
Vinyl Chloride		BQL	3.
Chloroethane		BQL	3.
Methylene Chloride		BQL	1.
1,1-Dichloroethene		BQL	1.
1,1-Dichloroethane		BQL	1.
1,2-Dichloroethene (total)		BQL	1.
Trichlorofluoromethane		BQL	1.
Chloroform		BQL	1.
1,2-Dichloroethane		BQL	1.
1,1,1-Trichloroethane		BQL	1.
Carbon Tetrachloride		BQL	1.
Bromodichloromethane		BQL	1.
1,2-Dichloropropane		BQL	1.
trans-1,3-Dichloropropene		BQL	1.
Trichloroethene		BQL	1.
Dibromochloromethane		BQL	1.
1,1,2-Trichloroethane		BQL	1.
Benzene	11.25	3.	1.
cis-1,3-Dichloropropene		BQL	1.
Bromoform		BQL	1.
Tetrachloroethene		BQL	1.
1,1,2,2-Tetrachloroethane		BQL	1.
Toluene	15.35	18.	1.
Chlorobenzene		BQL	1.
Ethylbenzene	18.17	37.	1.
2-Chloroethylvinyl ether (1)		BQL	3.
Acetone		BQL	3.
Carbon Disulfide		BQL	1.
2-Butanone	9.42	9. (B=10)	3.
Vinyl Acetate		BQL	3.
2-Hexanone		BQL	3.
4-Methyl-2-Pentanone		BQL	3.
Styrene		BQL	1.
Xylene (total)	18.38-19.09	110.	1.

(1) Known to Hydrolyze in Presence of Dilute Acid

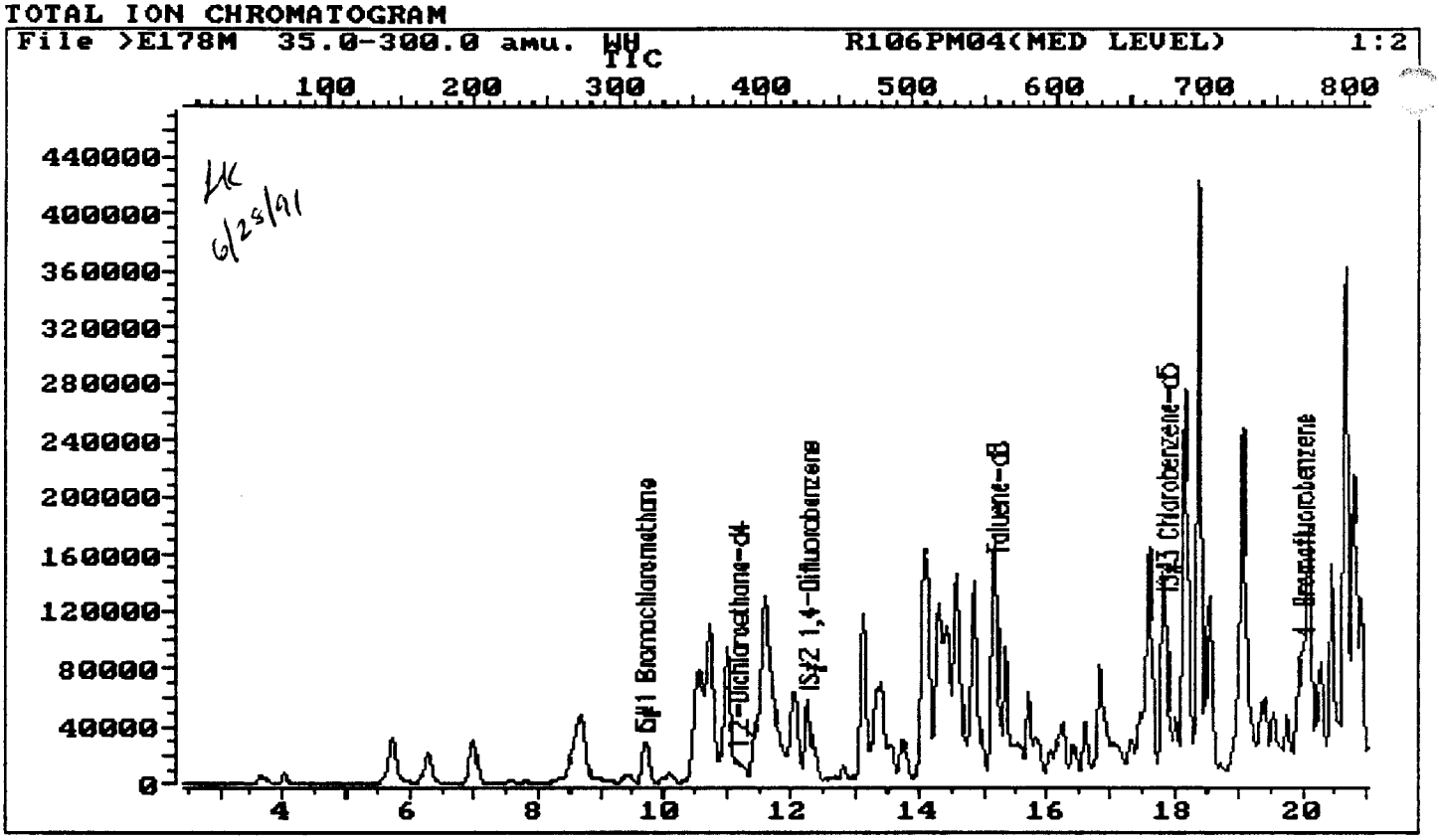
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	93	70-121
Toluene-d8	112	84-138
4-Bromofluorobenzene	102	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 7 ug/g
Associated Blank: VOA RE178L

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E178M::D3 Quant Output File: ^E178M::QT
Name: WH R106PM04
Misc: (MED LEVEL) 1:2dil B-2 6.5'-8.5' INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910627 16:53

Operator ID: JOHN
Quant Time: 910627 18:10
Injected at: 910627 17:49

Client: WALK HAYDEL & ASSOC.
Sample: B-3 0'-2'
Lab ID: R106PM05
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/25/91
Date Sampled: 06/13/91
Data File ID: RA176I

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	55.
Acrylonitrile		BQL	55.
Chloromethane		BQL	11.
Bromomethane		BQL	11.
Vinyl Chloride		BQL	11.
Chloroethane		BQL	11.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	11.
Acetone	4.57	20.	11.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	11.
Vinyl Acetate		BQL	11.
2-Hexanone		BQL	11.
4-Methyl-2-Pentanone		BQL	11.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

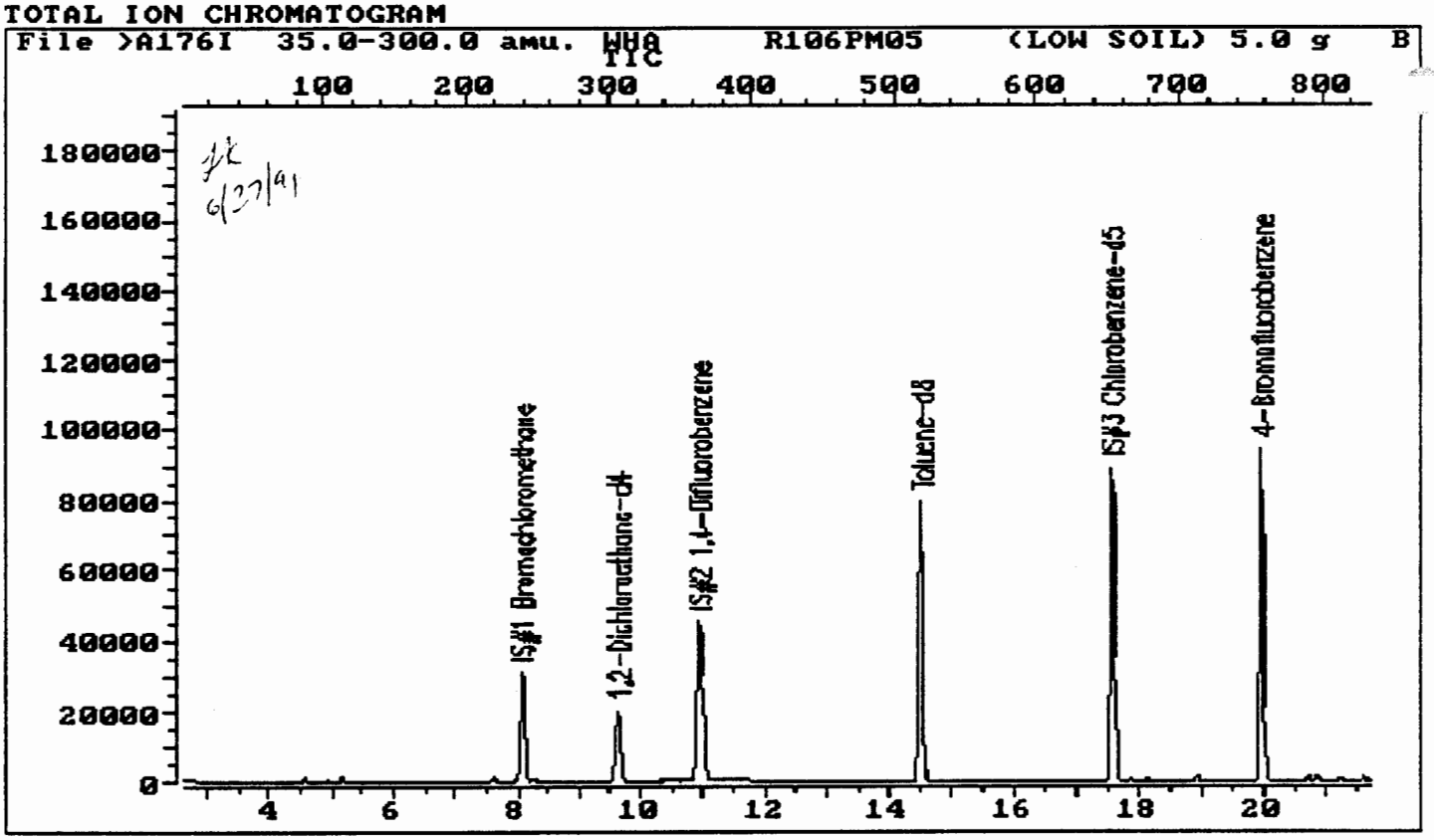
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	99	70-121
Toluene-d8	104	84-138
4-Bromofluorobenzene	102	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 55 ug/kg
Associated Blank: VOA RA176C

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A176I::D4 Quant Output File: ^A176I::QT
Name: WHA R106PM05
Misc: (LOW SOIL) 5.0 g B-3 0'-2' INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910625 07:48

Operator ID: LYNN
Quant Time: 910625 13:45
Injected at: 910625 13:22

Client: WALK HAYDEL & ASSOC.
Sample: B-3 2'-4'
Lab ID: R106PM06
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/25/91
Date Sampled: 06/13/91
Data File ID: RA1760

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	57.
Acrylonitrile		BQL	57.
Chloromethane		BQL	11.
Bromomethane		BQL	11.
Vinyl Chloride		BQL	11.
Chloroethane		BQL	11.
Methylene Chloride	5.18	8.	6.
1.1-Dichloroethene		BQL	6.
1.1-Dichloroethane		BQL	6.
1.2-Dichloroethene (total)		BQL	6.
Trichlorofluoromethane		BQL	6.
Chloroform		BQL	6.
1.2-Dichloroethane		BQL	6.
1.1.1-Trichloroethane		BQL	6.
Carbon Tetrachloride		BQL	6.
Bromodichloromethane		BQL	6.
1.2-Dichloropropane		BQL	6.
trans-1.3-Dichloropropene		BQL	6.
Trichloroethene		BQL	6.
Dibromochloromethane		BQL	6.
1.1.2-Trichloroethane		BQL	6.
Benzene		BQL	6.
cis-1.3-Dichloropropene		BQL	6.
Bromoform		BQL	6.
Tetrachloroethene		BQL	6.
1.1.2.2-Tetrachloroethane		BQL	6.
Toluene		BQL	6.
Chlorobenzene		BQL	6.
Ethylbenzene		BQL	6.
2-Chloroethylvinyl ether (1)		BQL	11.
Acetone		BQL	11.
Carbon Disulfide		BQL	6.
2-Butanone		BQL	11.
Vinyl Acetate		BQL	11.
2-Hexanone		BQL	11.
4-Methyl-2-Pentanone		BQL	11.
Styrene		BQL	6.
Xylene (total)		BQL	6.

(1) Known to Hydrolyze in Presence of Dilute Acid

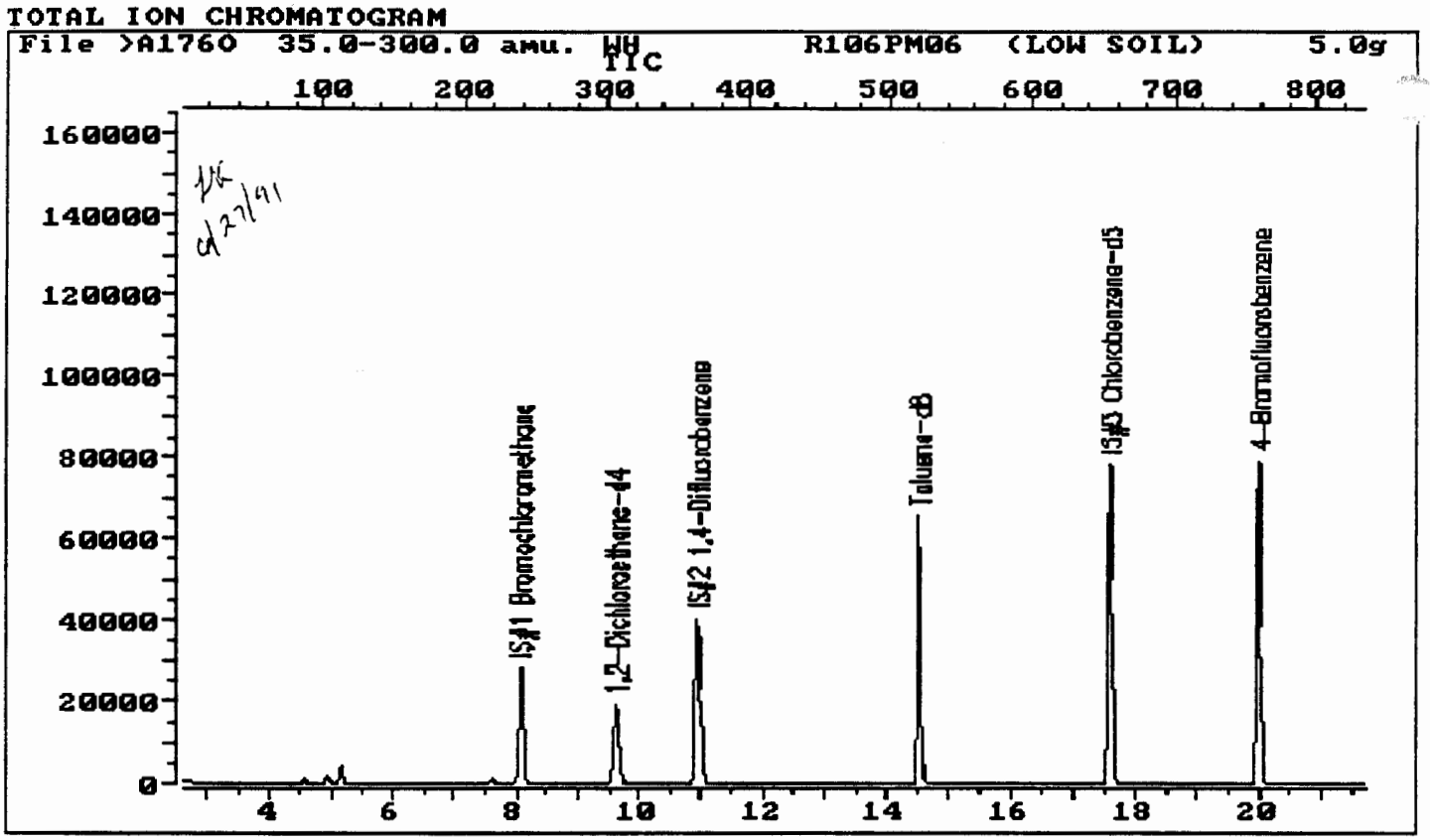
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	100	70-121
Toluene-d8	98	84-138
4-Bromofluorobenzene	94	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 57 ug/kg
Associated Blank: VOA RA176N

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A1760::D4 Quant Output File: ^A1760::QT
Name: WH R106PM06
Misc: (LOW SOIL) 5.0g B-3 2-4' INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910625 17:22

Operator ID: JOHN
Quant Time: 910625 19:18
Injected at: 910625 18:42

Client: WALK HAYDEL & ASSOC.
Sample: B-3 4'-6'
Lab ID: R106PM07
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/25/91
Date Sampled: 06/13/91
Data File ID: RA176P

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	58.
Acrylonitrile		BQL	58.
Chloromethane		BQL	12.
Bromomethane		BQL	12.
Vinyl Chloride		BQL	12.
Chloroethane		BQL	12.
Methylene Chloride	5.09	8.	6.
1,1-Dichloroethene		BQL	6.
1,1-Dichloroethane		BQL	6.
1,2-Dichloroethene (total)		BQL	6.
Trichlorofluoromethane		BQL	6.
Chloroform		BQL	6.
1,2-Dichloroethane		BQL	6.
1,1,1-Trichloroethane		BQL	6.
Carbon Tetrachloride		BQL	6.
Bromodichloromethane		BQL	6.
1,2-Dichloropropane		BQL	6.
trans-1,3-Dichloropropene		BQL	6.
Trichloroethene		BQL	6.
Dibromochloromethane		BQL	6.
1,1,2-Trichloroethane		BQL	6.
Benzene		BQL	6.
cis-1,3-Dichloropropene		BQL	6.
Bromoform		BQL	6.
Tetrachloroethene		BQL	6.
1,1,2,2-Tetrachloroethane		BQL	6.
Toluene		BQL	6.
Chlorobenzene		BQL	6.
Ethylbenzene		BQL	6.
2-Chloroethylvinyl ether (1)		BQL	12.
Acetone		BQL	12.
Carbon Disulfide		BQL	6.
2-Butanone		BQL	12.
Vinyl Acetate		BQL	12.
2-Hexanone		BQL	12.
4-Methyl-2-Pentanone		BQL	12.
Styrene		BQL	6.
Xylene (total)		BQL	6.

(1) Known to Hydrolyze in Presence of Dilute Acid

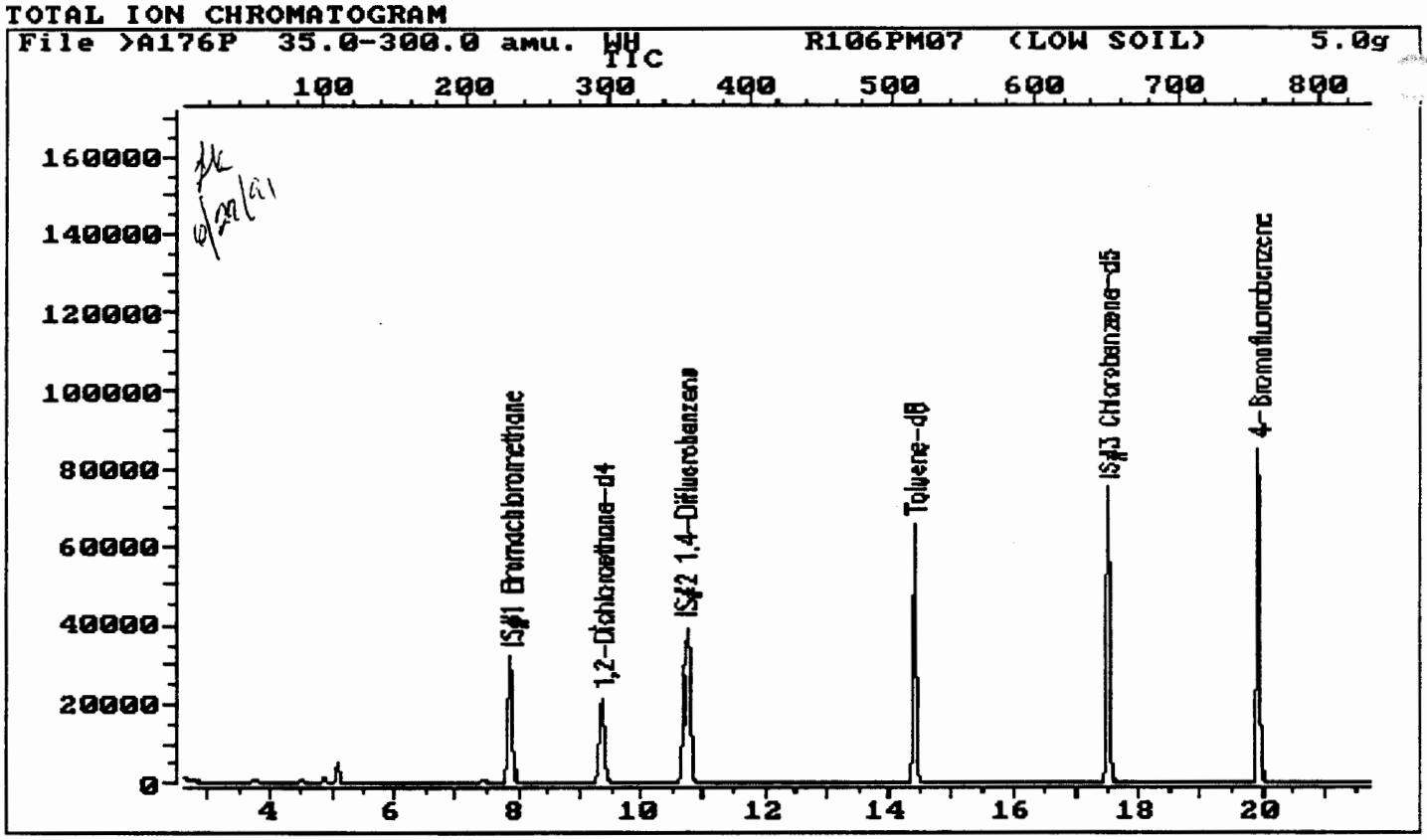
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	98	70-121
Toluene-d8	97	84-138
4-Bromofluorobenzene	95	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 58 ug/kg
Associated Blank: VOA RA176N

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A176P::D4 Quant Output File: ^A176P::QT
Name: WH R106PM07
Misc: (LOW SOIL) 5.0g B-3 4-6' INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910625 17:22

Operator ID: JOHN
Quant Time: 910625 20:07
Injected at: 910625 19:45

Client: WALK HAYDEL & ASSOC.
Sample: B-3 6'-8'
Lab ID: R106PM08
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/26/91
Date Sampled: 06/13/91
Data File ID: RE177K

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	POL (ug/kg)
Acrolein		BQL	65.
Acrylonitrile		BQL	65.
Chloromethane		BQL	13.
Bromomethane		BQL	13.
Vinyl Chloride		BQL	13.
Chloroethane		BQL	13.
Methylene Chloride	5.77	7.	6.
1,1-Dichloroethene		BQL	6.
1,1-Dichloroethane		BQL	6.
1,2-Dichloroethene (total)		BQL	6.
Trichlorofluoromethane		BQL	6.
Chloroform		BQL	6.
1,2-Dichloroethane	11.45	6.	6.
1,1,1-Trichloroethane		BQL	6.
Carbon Tetrachloride		BQL	6.
Bromodichloromethane		BQL	6.
1,2-Dichloropropane		BQL	6.
trans-1,3-Dichloropropene		BQL	6.
Trichloroethene		BQL	6.
Dibromochloromethane		BQL	6.
1,1,2-Trichloroethane		BQL	6.
Benzene		BQL	6.
cis-1,3-Dichloropropene		BQL	6.
Bromoform		BQL	6.
Tetrachloroethene		BQL	6.
1,1,2,2-Tetrachloroethane		BQL	6.
Toluene		BQL	6.
Chlorobenzene		BQL	6.
Ethylbenzene		BQL	6.
2-Chloroethylvinyl ether (1)		BQL	13.
Acetone	5.01	28.	13.
Carbon Disulfide		BQL	6.
2-Butanone		BQL	13.
Vinyl Acetate		BQL	13.
2-Hexanone		BQL	13.
4-Methyl-2-Pentanone		BQL	13.
Styrene		BQL	6.
Xylene (total)		BQL	6.

(1) Known to Hydrolyze in Presence of Dilute Acid

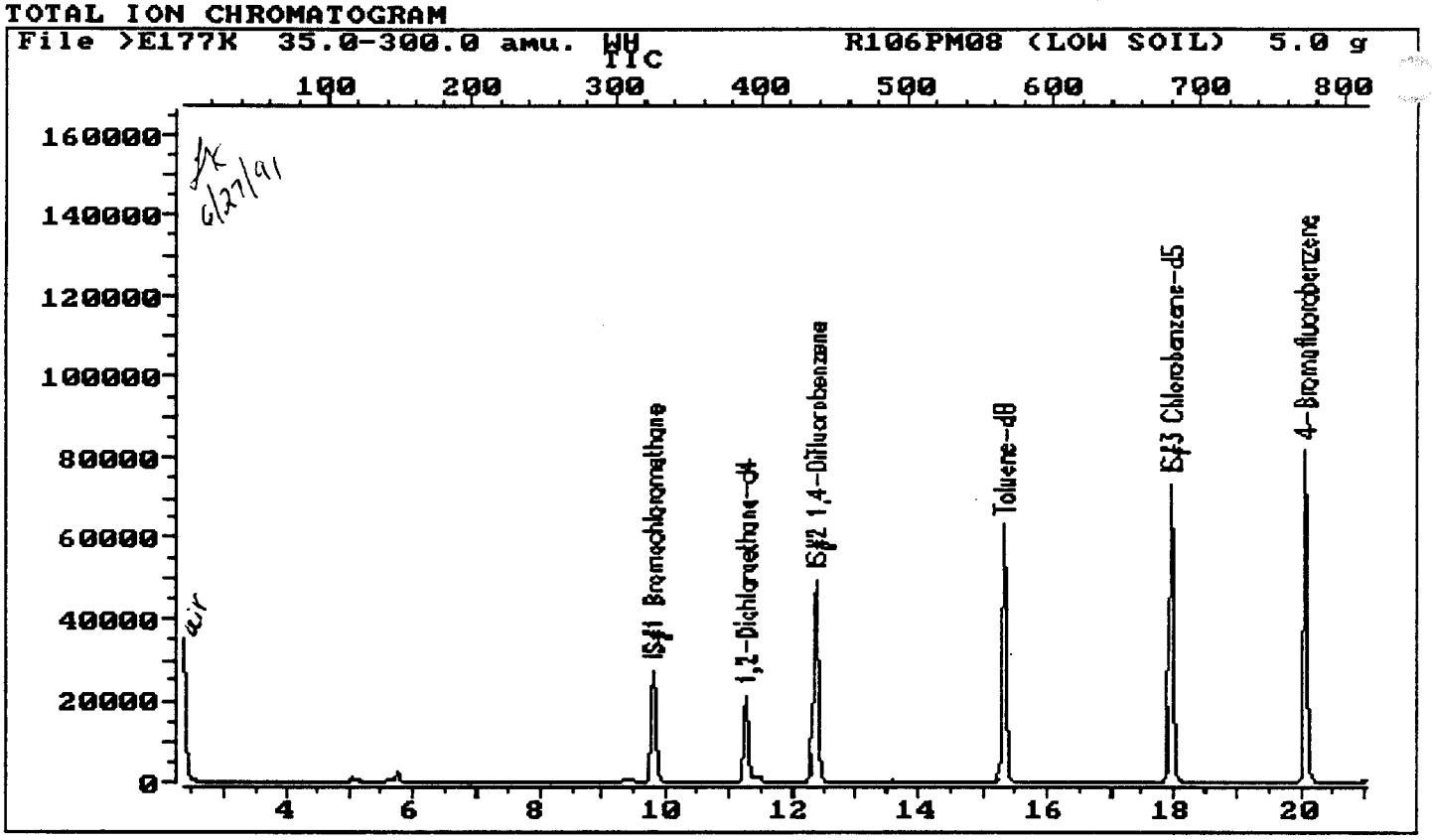
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	94	70-121
Toluene-d8	94	84-138
4-Bromofluorobenzene	96	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 65 ug/kg
Associated Blank: VOA RE177J

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E177K::D3 Quant Output File: ^E177K::QT
Name: WH R106PM08
Misc: (LOW SOIL) 5.0 g B-3 6-8' INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910626 15:04

Operator ID: BRUCE
Quant Time: 910626 16:31
Injected at: 910626 16:09

Client: WALK HAYDEL & ASSOC.
Sample: VOA BLANK SPIKE E1770
Lab ID: BS06PM09
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/26/91
Date Sampled: NA
Data File ID: RE1770

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene	4.86	134% MS Recovery	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene	13.23	83% MS Recovery	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene	11.67	90% MS Recovery	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene	15.84	93% MS Recovery	5.
Chlorobenzene	18.43	96% MS Recovery	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

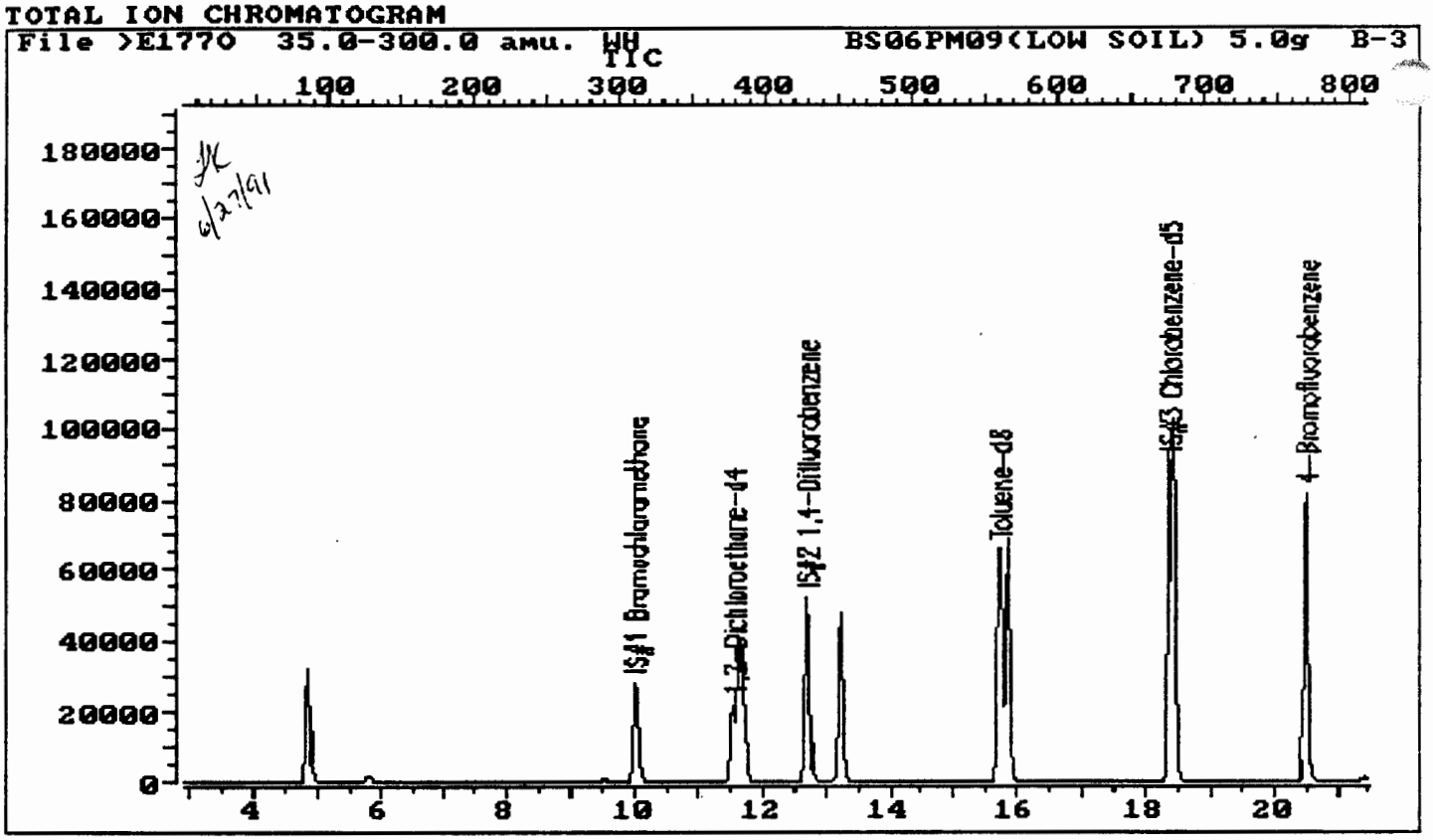
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	93	70-121
Toluene-d8	91	84-138
4-Bromofluorobenzene	93	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 50 ug/kg

Surrogate Spike Level: 50 ug/kg
Associated Blank: VOA RE177J

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E1770::D3 Quant Output File: ^E1770::QT
Name: WH BS06PM09
Misc: (LOW SOIL) 5.0g B-3 6-8' VOA BLANK SPIKE E1770 INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910626 15:04

Operator ID: JOHN
Quant Time: 910626 20:35
Injected at: 910626 19:55

Client: WALK HAYDEL & ASSOC.
Sample: VOA BLANK SPIKE DUP. E177P
Lab ID: BD06PM10
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/26/91
Date Sampled: NA
Data File ID: RE177P

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene	4.81	128% MS Recovery	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene	12.85	81% MS Recovery	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene	11.39	87% MS Recovery	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene	15.42	92% MS Recovery	5.
Chlorobenzene	17.99	93% MS Recovery	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	89	70-121
Toluene-d8	88	84-138
4-Bromofluorobenzene	91	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 50 ug/kg

Surrogate Spike Level: 50 ug/kg
Associated Blank: VOA RE177J

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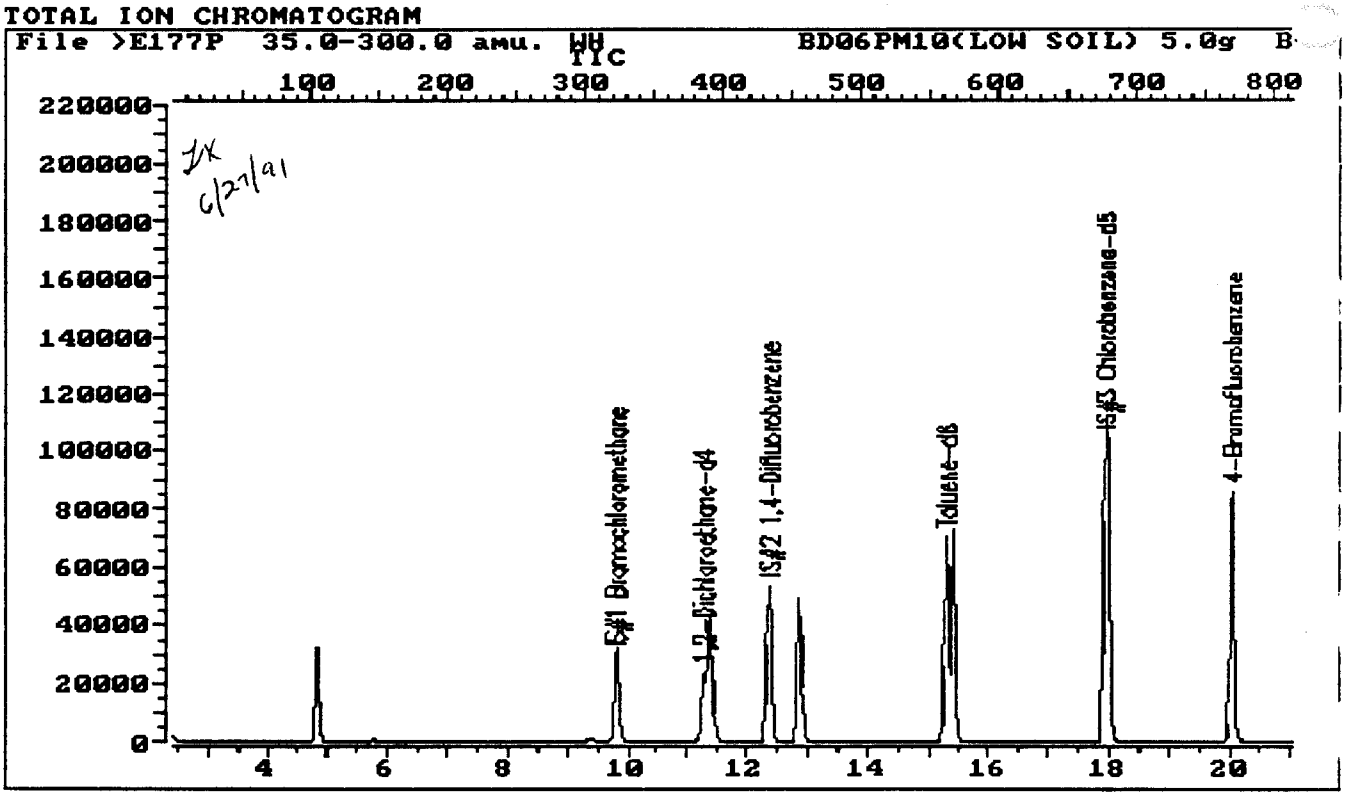
TOTAL ION CHROMATOGRAM



Data File: >E177P::D3 Quant Output File: ^E177P::QT
Name: WH BD06PM10
Misc: (LOW SOIL) 5.0g B-3 6-8' VOA BLK.SPK.DUP. E177P INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910626 15:04

Operator ID: JOHN
Quant Time: 910626 21:20
Injected at: 910626 20:52

Client: WALK HAYDEL & ASSOC.
Sample: B-3 6'-8' MATRIX SPIKE
Lab ID: MS06PM11
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/26/91
Date Sampled: 06/13/91
Data File ID: RE177L

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	65.
Acrylonitrile		BQL	65.
Chloromethane		BQL	13.
Bromomethane		BQL	13.
Vinyl Chloride		BQL	13.
Chloroethane		BQL	13.
Methylene Chloride	5.78	7.	6.
1,1-Dichloroethene	4.81	146% MS Recovery	6.
1,1-Dichloroethane		BQL	6.
1,2-Dichloroethene (total)		BQL	6.
Trichlorofluoromethane		BQL	6.
Chloroform		BQL	6.
1,2-Dichloroethane	11.48	8.	6.
1,1,1-Trichloroethane		BQL	6.
Carbon Tetrachloride		BQL	6.
Bromodichloromethane		BQL	6.
1,2-Dichloropropane		BQL	6.
trans-1,3-Dichloropropene		BQL	6.
Trichloroethene	12.88	80% MS Recovery	6.
Dibromochloromethane		BQL	6.
1,1,2-Trichloroethane		BQL	6.
Benzene	11.39	87% MS Recovery	6.
cis-1,3-Dichloropropene		BQL	6.
Bromoform		BQL	6.
Tetrachloroethene		BQL	6.
1,1,2,2-Tetrachloroethane		BQL	6.
Toluene	15.45	93% MS Recovery	6.
Chlorobenzene	18.00	90% MS Recovery	6.
Ethylbenzene		BQL	6.
2-Chloroethylvinyl ether (1)		BQL	13.
Acetone	4.97	15.	13.
Carbon Disulfide		BQL	6.
2-Butanone		BQL	13.
Vinyl Acetate		BQL	13.
2-Hexanone		BQL	13.
4-Methyl-2-Pentanone		BQL	13.
Styrene		BQL	6.
Xylene (total)		BQL	6.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	92	70-121
Toluene-d8	89	84-138
4-Bromofluorobenzene	88	59-113

Surrogate Spike Level: 65 ug/kg
Associated Blank: VOA RE177J

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 65 ug/kg

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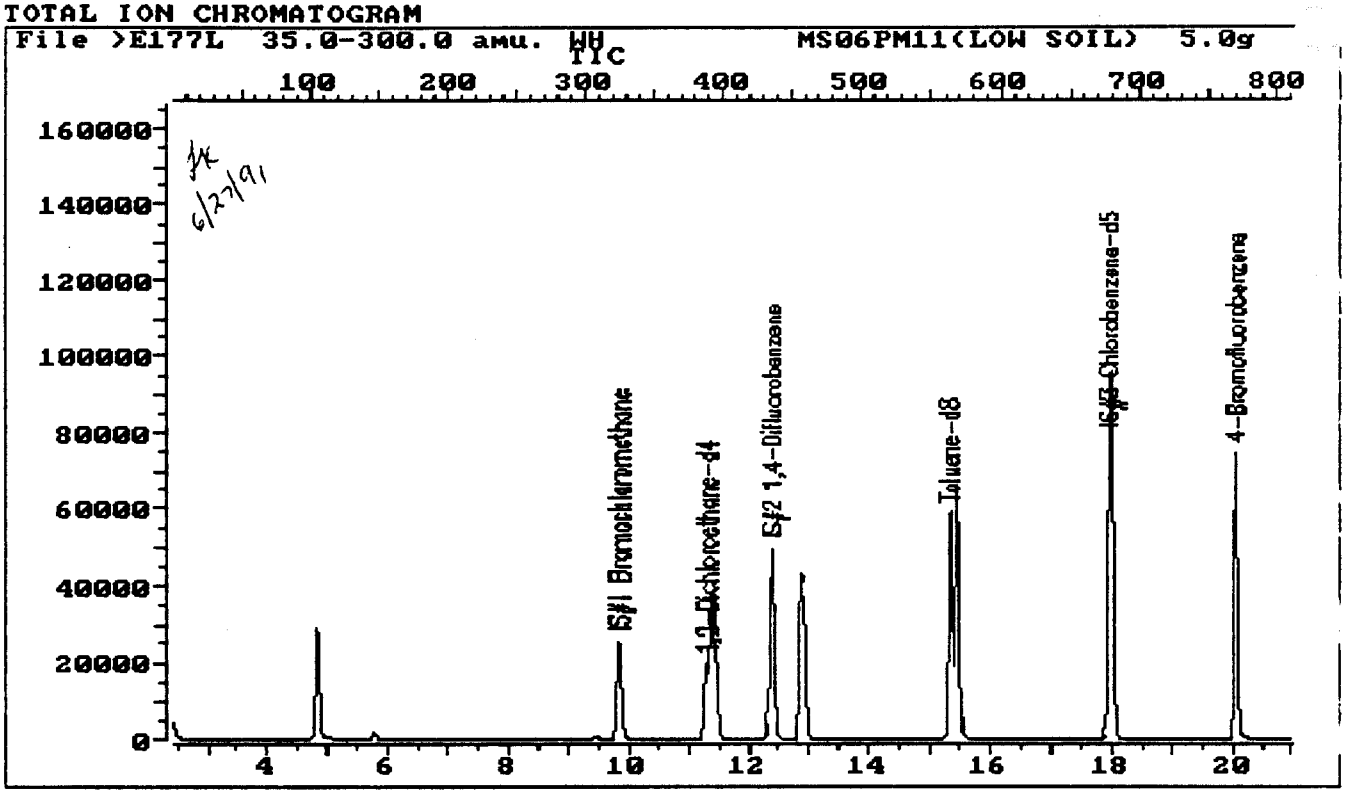
TOTAL ION CHROMATOGRAM



Data File: >E177L::D3 Quant Output File: ^E177L::QT
Name: WH MS06PM11
Misc: (LOW SOIL) 5.0g B-3 6-8' MATRIX SPIKE INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910626 15:04

Operator ID: JOHN
Quant Time: 910626 18:08
Injected at: 910626 17:33

Client: WALK HAYDEL & ASSOC.
Sample: B-3 6'-8' MATRIX SPIKE DUP.
Lab ID: MD06PM12
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/26/91
Date Sampled: 06/13/91
Data File ID: RE177N

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	65.
Acrylonitrile		BQL	65.
Chloromethane		BQL	13.
Bromomethane		BQL	13.
Vinyl Chloride		BQL	13.
Chloroethane		BQL	13.
Methylene Chloride	5.75	7.	6.
1,1-Dichloroethene	4.81	128% MS Recovery	6.
1,1-Dichloroethane		BQL	6.
1,2-Dichloroethene (total)		BQL	6.
Trichlorofluoromethane		BQL	6.
Chloroform		BQL	6.
1,2-Dichloroethane	11.44	4. **	6.
1,1,1-Trichloroethane		BQL	6.
Carbon Tetrachloride		BQL	6.
Bromodichloromethane		BQL	6.
1,2-Dichloropropane		BQL	6.
trans-1,3-Dichloropropene		BQL	6.
Trichloroethene	12.86	78% MS Recovery	6.
Dibromochloromethane		BQL	6.
1,1,2-Trichloroethane		BQL	6.
Benzene	11.34	85% MS Recovery	6.
cis-1,3-Dichloropropene		BQL	6.
Bromoform		BQL	6.
Tetrachloroethene		BQL	6.
1,1,2,2-Tetrachloroethane		BQL	6.
Toluene	15.43	90% MS Recovery	6.
Chlorobenzene	17.97	89% MS Recovery	6.
Ethylbenzene		BQL	6.
2-Chloroethylvinyl ether (1)		BQL	13.
Acetone	5.02	12. **	13.
Carbon Disulfide		BQL	6.
2-Butanone		BQL	13.
Vinyl Acetate		BQL	13.
2-Hexanone		BQL	13.
4-Methyl-2-Pentanone		BQL	13.
Styrene		BQL	6.
Xylene (total)		BQL	6.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	95	70-121
Toluene-d8	91	84-138
4-Bromofluorobenzene	95	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 65 ug/kg

Surrogate Spike Level: 65 ug/kg
Associated Blank: VOA RE177J

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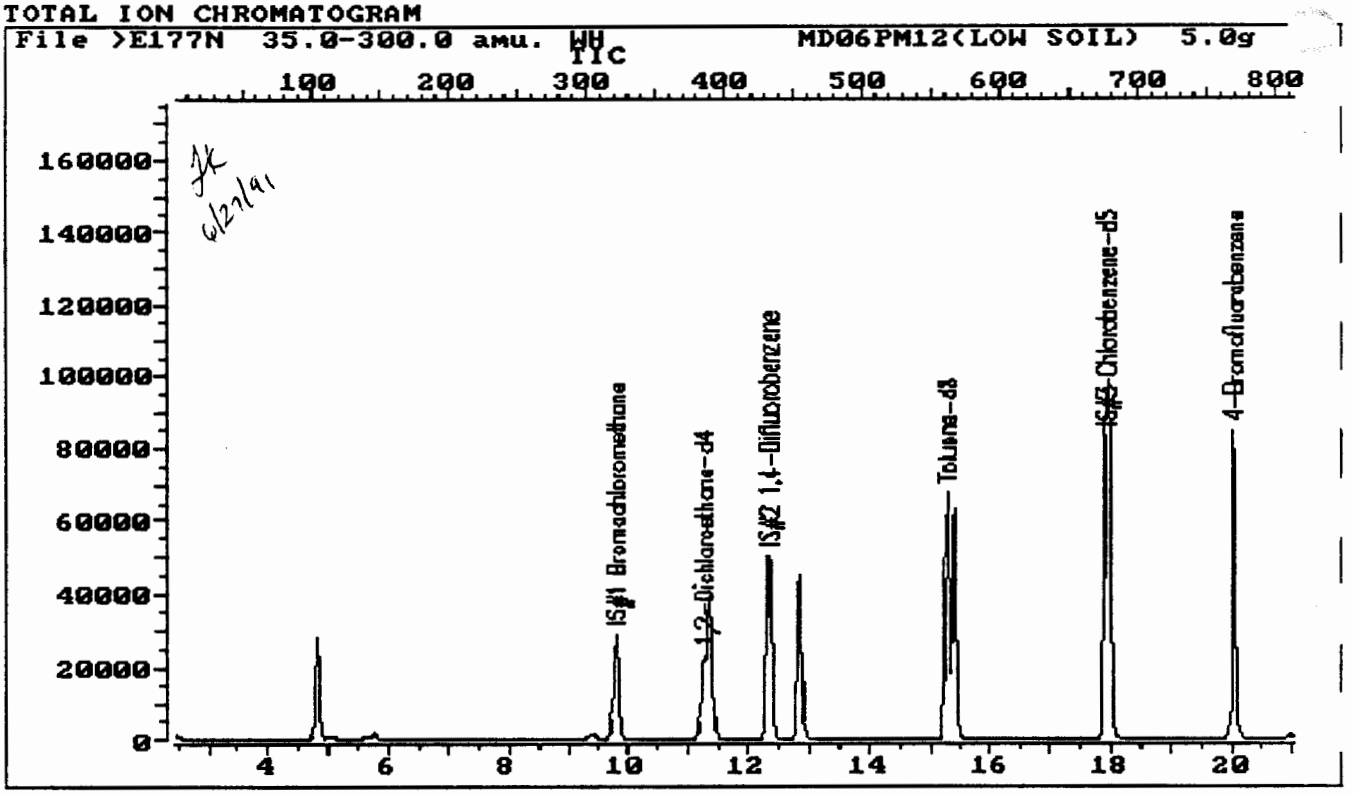
TOTAL ION CHROMATOGRAM



Data File: >E177N::D3 Quant Output File: ^E177N::QT
Name: WH MD06PM12
Misc: (LOW SOIL) 5.0g B-3 6-8' MATRIX SPIKE DUP. INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910626 15:04

Operator ID: JOHN
Quant Time: 910626 19:56
Injected at: 910626 19:15

Client: WALK HAYDEL & ASSOC.
Sample: B1A 0'-2'
Lab ID: R106PM13
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/25/91
Date Sampled: 06/13/91
Data File ID: RA176Q

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	63.
Acrylonitrile		BQL	63.
Chloromethane		BQL	13.
Bromomethane		BQL	13.
Vinyl Chloride		BQL	13.
Chloroethane		BQL	13.
Methylene Chloride		BQL	6.
1,1-Dichloroethene		BQL	6.
1,1-Dichloroethane		BQL	6.
1,2-Dichloroethene (total)		BQL	6.
Trichlorofluoromethane		BQL	6.
Chloroform		BQL	6.
1,2-Dichloroethane		BQL	6.
1,1,1-Trichloroethane		BQL	6.
Carbon Tetrachloride		BQL	6.
Bromodichloromethane		BQL	6.
1,2-Dichloropropane		BQL	6.
trans-1,3-Dichloropropene		BQL	6.
Trichloroethene		BQL	6.
Dibromochloromethane		BQL	6.
1,1,2-Trichloroethane		BQL	6.
Benzene		BQL	6.
cis-1,3-Dichloropropene		BQL	6.
Bromoform		BQL	6.
Tetrachloroethene		BQL	6.
1,1,2,2-Tetrachloroethane		BQL	6.
Toluene		BQL	6.
Chlorobenzene		BQL	6.
Ethylbenzene		BQL	6.
2-Chloroethylvinyl ether (1)		BQL	13.
Acetone	4.62	95.	13.
Carbon Disulfide		BQL	6.
2-Butanone		BQL	13.
Vinyl Acetate		BQL	13.
2-Hexanone		BQL	13.
4-Methyl-2-Pentanone		BQL	13.
Styrene		BQL	6.
Xylene (total)	18.19-18.99	17.	6.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	100	70-121
Toluene-d8	94	84-138
4-Bromofluorobenzene	94	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 63 ug/kg
Associated Blank: VOA RA176N

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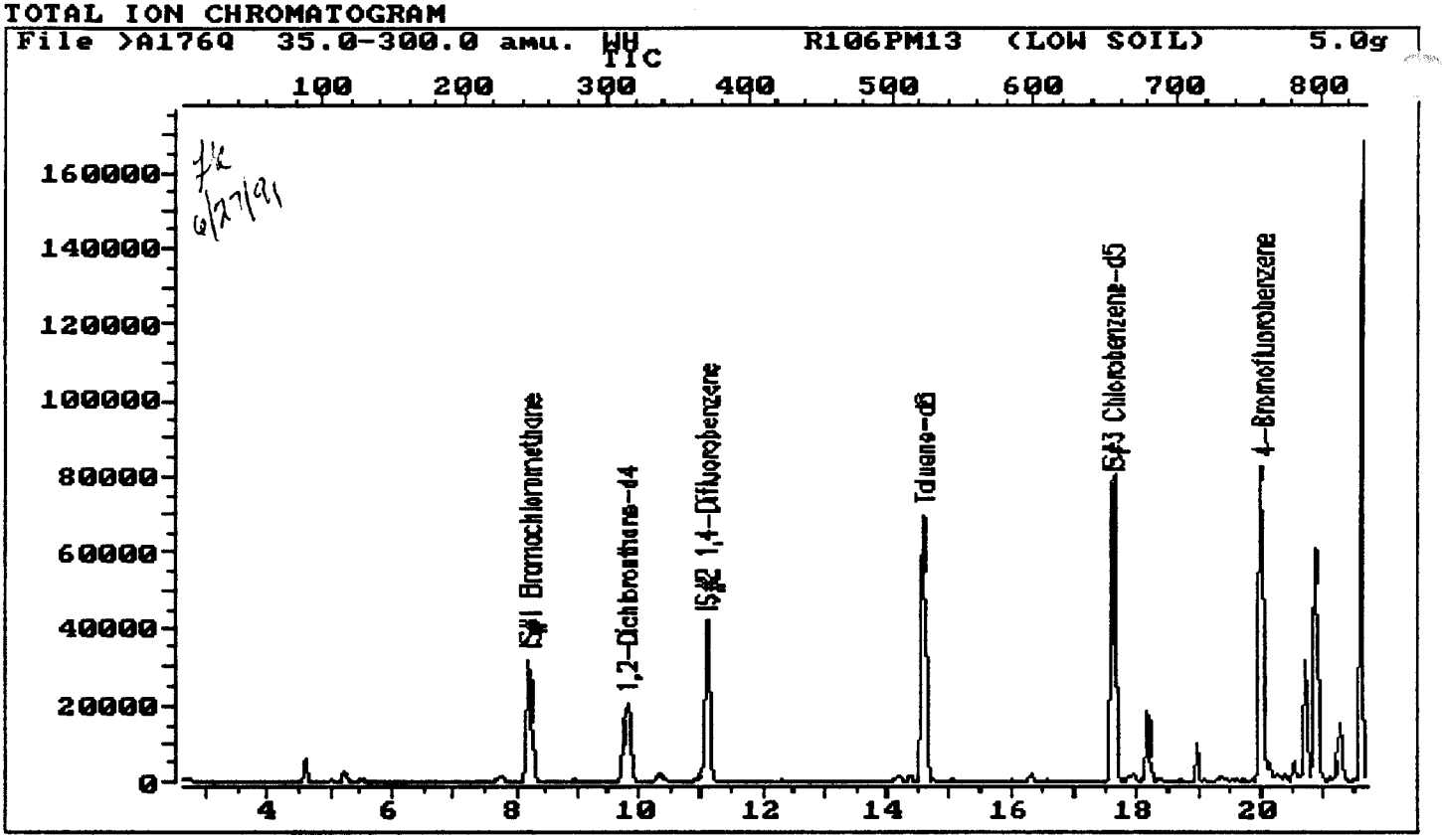
TOTAL ION CHROMATOGRAM



Data File: >A176Q::D4 Quant Output File: ^A176Q::QT
Name: WH R106PM13
Misc: (LOW SOIL) 5.0g B1A 0-2' INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910625 17:22

Operator ID: JOHN
Quant Time: 910625 20:59
Injected at: 910625 20:30

Client: WALK HAYDEL & ASSOC.
Sample: B1A 2'-4'
Lab ID: R106PM14
Method: SW 846-8240

Date Extracted: 06/25/91
Date Analyzed: 06/26/91
Date Sampled: 06/13/91
Data File ID: RA177M

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/g)	PQL (ug/g)
Acrolein		BQL	6.0
Acrylonitrile		BQL	6.0
Chloromethane		BQL	1.2
Bromomethane		BQL	1.2
Vinyl Chloride		BQL	1.2
Chloroethane		BQL	1.2
Methylene Chloride	5.39	0.6 (B-1)	0.6
1,1-Dichloroethene		BQL	0.6
1,1-Dichloroethane		BQL	0.6
1,2-Dichloroethene (total)		BQL	0.6
Trichlorofluoromethane		BQL	0.6
Chloroform		BQL	0.6
1,2-Dichloroethane		BQL	0.6
1,1,1-Trichloroethane		BQL	0.6
Carbon Tetrachloride		BQL	0.6
Bromodichloromethane		BQL	0.6
1,2-Dichloropropane		BQL	0.6
trans-1,3-Dichloropropene		BQL	0.6
Trichloroethene		BQL	0.6
Dibromochloromethane		BQL	0.6
1,1,2-Trichloroethane		BQL	0.6
Benzene		BQL	0.6
cis-1,3-Dichloropropene		BQL	0.6
Bromoform		BQL	0.6
Tetrachloroethene		BQL	0.6
1,1,2,2-Tetrachloroethane		BQL	0.6
Toluene		BQL	0.6
Chlorobenzene		BQL	0.6
Ethylbenzene	18.09	3.	0.6
2-Chloroethylvinyl ether (1)		BQL	1.2
Acetone	4.77	2. (B-1)	1.2
Carbon Disulfide		BQL	0.6
2-Butanone	8.02	4. (B-4)	1.2
Vinyl Acetate		BQL	1.2
2-Hexanone		BQL	1.2
4-Methyl-2-Pentanone		BQL	1.2
Styrene		BQL	0.6
Xylene (total)	18.34-19.12	27.	0.6

(1) Known to Hydrolyze in Presence of Dilute Acid

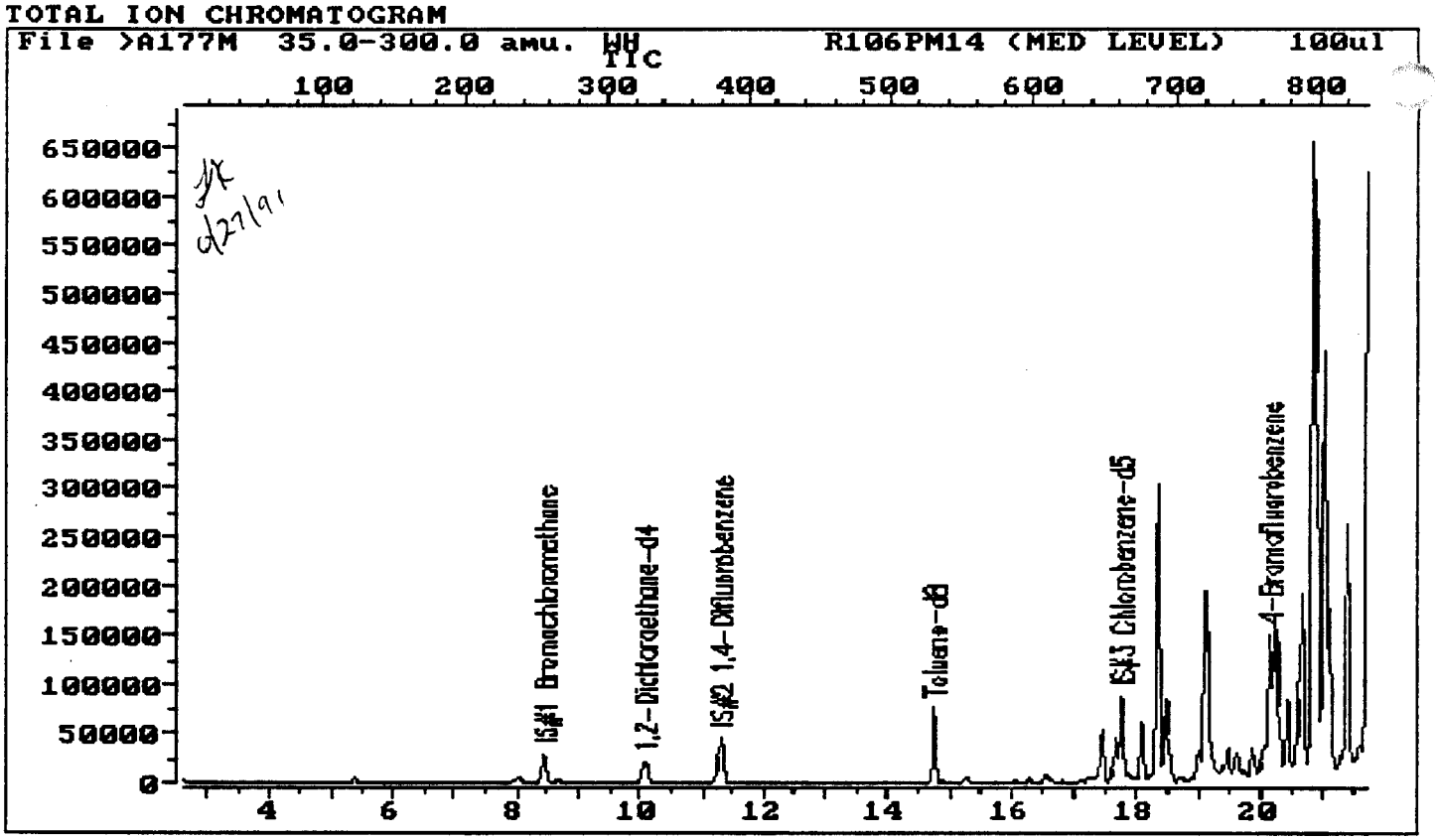
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	110	70-121
Toluene-d8	94	84-138
4-Bromofluorobenzene	112	59-113

Surrogate Spike Level: 6 ug/g
Associated Blank: VOA RA177K

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A177M::D4 Quant Output File: ^A177M::QT
Name: WH R106PM14
Misc: (MED LEVEL) 100ul B1A 2-4' INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910626 14:03

Operator ID: JOHN
Quant Time: 910626 19:05
Injected at: 910626 18:42

Client: WALK HAYDEL & ASSOC.
Sample: B1A 4'-6'
Lab ID: R106PM15
Method: SW 846-8240

Date Extracted: 06/25/91
Date Analyzed: 06/27/91
Date Sampled: 06/13/91
Data File ID: RE178N

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/g)	PQL (ug/g)
Acrolein		BQL	12.
Acrylonitrile		BQL	12.
Chloromethane		BQL	2.
Bromomethane		BQL	2.
Vinyl Chloride		BQL	2.
Chloroethane		BQL	2.
Methylene Chloride		BQL	1.
1,1-Dichloroethene		BQL	1.
1,1-Dichloroethane		BQL	1.
1,2-Dichloroethene (total)		BQL	1.
Trichlorofluoromethane		BQL	1.
Chloroform		BQL	1.
1,2-Dichloroethane		BQL	1.
1,1,1-Trichloroethane		BQL	1.
Carbon Tetrachloride		BQL	1.
Bromodichloromethane		BQL	1.
1,2-Dichloropropane		BQL	1.
trans-1,3-Dichloropropene		BQL	1.
Trichloroethene		BQL	1.
Dibromochloromethane		BQL	1.
1,1,2-Trichloroethane		BQL	1.
Benzene		BQL	1.
cis-1,3-Dichloropropene		BQL	1.
Bromoform		BQL	1.
Tetrachloroethene		BQL	1.
1,1,2,2-Tetrachloroethane		BQL	1.
Toluene		BQL	1.
Chlorobenzene		BQL	1.
Ethylbenzene	18.03	8.	1.
2-Chloroethylvinyl ether (1)		BQL	2.
Acetone		BQL	2.
Carbon Disulfide		BQL	1.
2-Butanone	9.44	9. (B=9)	2.
Vinyl Acetate		BQL	2.
2-Hexanone		BQL	2.
4-Methyl-2-Pentanone		BQL	2.
Styrene		BQL	1.
Xylene (total)	18.26-18.97	81.	1.

(1) Known to Hydrolyze in Presence of Dilute Acid

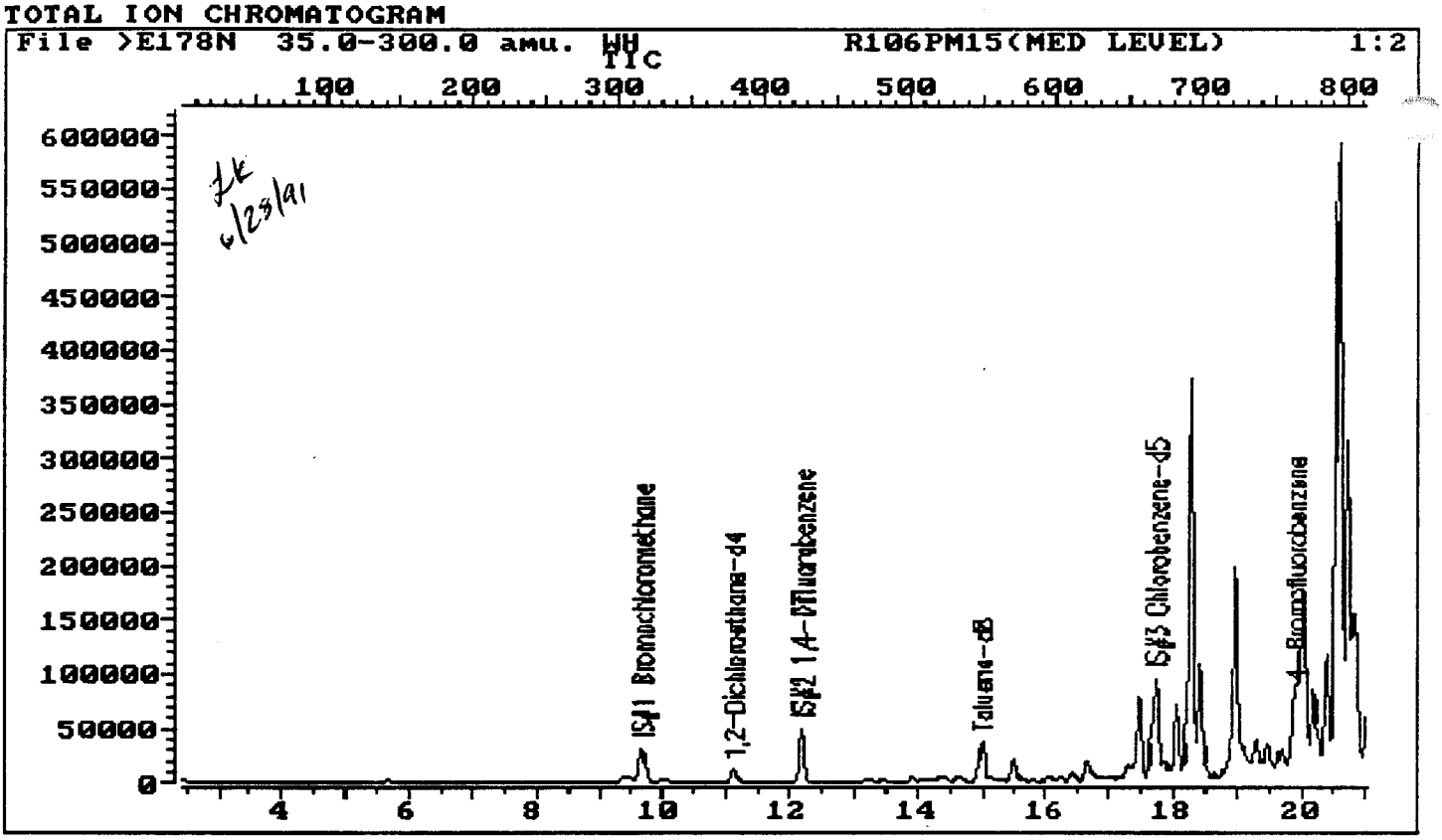
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	94	70-121
Toluene-d8	101	84-138
4-Bromofluorobenzene	104	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 6 ug/g
Associated Blank: VOA RE178L

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E178N::D3 Quant Output File: ^E178N::QT
Name: WH R106PM15
Misc: (MED LEVEL) 1:2dil B1A 4-6' INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910627 16:53

Operator ID: JOHN
Quant Time: 910627 18:55
Injected at: 910627 18:33

Client: WALK HAYDEL & ASSOC.
Sample: B1A 6'-8'
Lab ID: R106PM20
Method: SW 846-8240

Date Extracted: 06/25/91
Date Analyzed: 06/27/91
Date Sampled: 06/13/91
Data File ID: RE178O

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/g)	PQL (ug/g)
Acrolein		BQL	32.
Acrylonitrile		BQL	32.
Chloromethane		BQL	6.
Bromomethane		BQL	6.
Vinyl Chloride		BQL	6.
Chloroethane		BQL	6.
Methylene Chloride		BQL	3.
1,1-Dichloroethene		BQL	3.
1,1-Dichloroethane		BQL	3.
1,2-Dichloroethene (total)		BQL	3.
Trichlorofluoromethane		BQL	3.
Chloroform		BQL	3.
1,2-Dichloroethane		BQL	3.
1,1,1-Trichloroethane		BQL	3.
Carbon Tetrachloride		BQL	3.
Bromodichloromethane		BQL	3.
1,2-Dichloropropane		BQL	3.
trans-1,3-Dichloropropene		BQL	3.
Trichloroethene		BQL	3.
Dibromochloromethane		BQL	3.
1,1,2-Trichloroethane		BQL	3.
Benzene	11.23	10.	3.
cis-1,3-Dichloropropene		BQL	3.
Bromoform		BQL	3.
Tetrachloroethene		BQL	3.
1,1,2,2-Tetrachloroethane		BQL	3.
Toluene	15.28	78.	3.
Chlorobenzene		BQL	3.
Ethylbenzene	18.12	38.	3.
2-Chloroethylvinyl ether (1)		BQL	6.
Acetone		BQL	6.
Carbon Disulfide		BQL	3.
2-Butanone	9.39	24. (B=23)	6.
Vinyl Acetate		BQL	6.
2-Hexanone		BQL	6.
4-Methyl-2-Pentanone		BQL	6.
Styrene		BQL	3.
Xylene (total)	18.35-19.04	230.	3.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	88	70-121
Toluene-d8	99	84-138
4-Bromofluorobenzene	105	59-113

Surrogate Spike Level: 6 ug/g
Associated Blank: VOA RE178L

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

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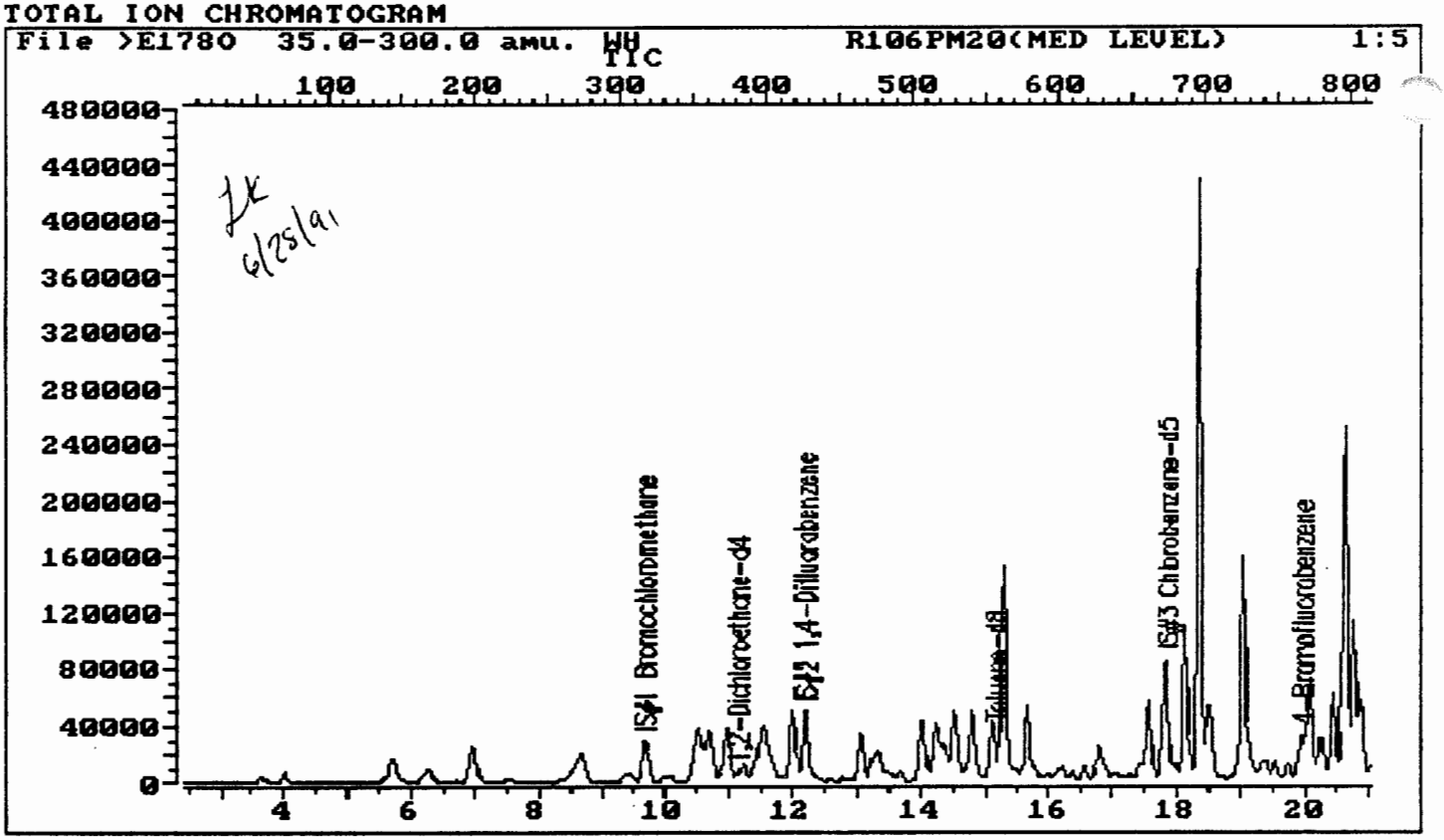
TOTAL ION CHROMATOGRAM



Data File: >E1780::D3 Quant Output File: ^E1780::QT
Name: WH R106PM20
Misc: (MED LEVEL) 1:5dil B1A 6'-8' INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910627 16:53

Operator ID: JOHN
Quant Time: 910627 19:42
Injected at: 910627 19:20

Client: WALK HAYDEL & ASSOC.
Sample: VOA LAB BLANK RA176C
Lab ID: R106PM
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/25/91
Date Sampled: NA
Data File ID: RA176C

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	102	70-121
Toluene-d8	100	84-138
4-Bromofluorobenzene	98	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 50 ug/kg
Associated Blank: NA

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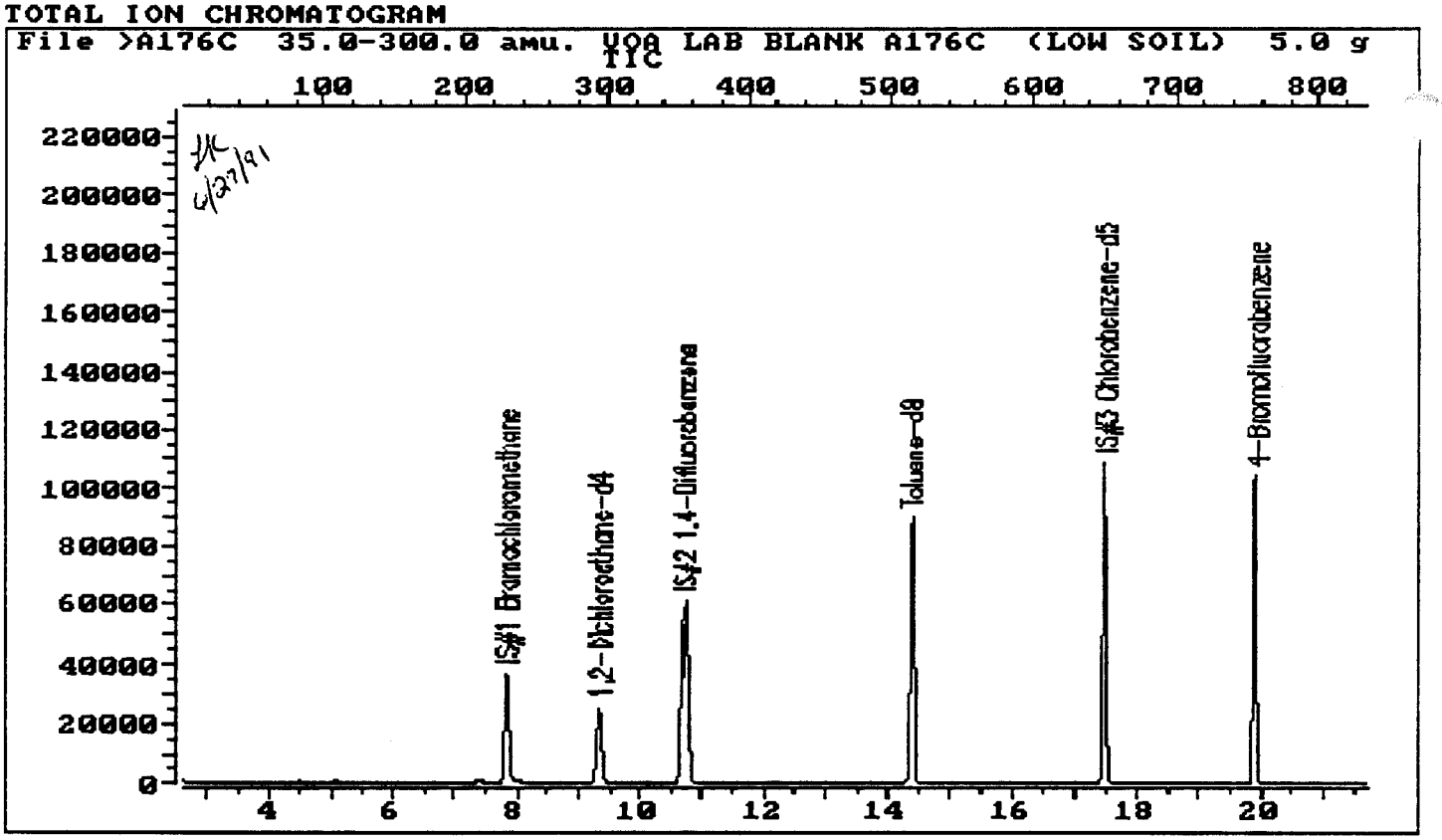
TOTAL ION CHROMATOGRAM



Data File: >A176C::D4 Quant Output File: ^A176C::QT
Name: VOA LAB BLANK A176C
Misc: (LOW SOIL) 5.0 g INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910625 07:48

Operator ID: JOE
Quant Time: 910625 08:34
Injected at: 910625 08:11

Client: WALK HAYDEL & ASSOC.
Sample: VOA LAB BLANK RA176N
Lab ID: R106PM
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/25/91
Date Sampled: NA
Data File ID: RA176N

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	100	70-121
Toluene-d8	99	84-138
4-Bromofluorobenzene	96	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 50 ug/kg
Associated Blank: NA

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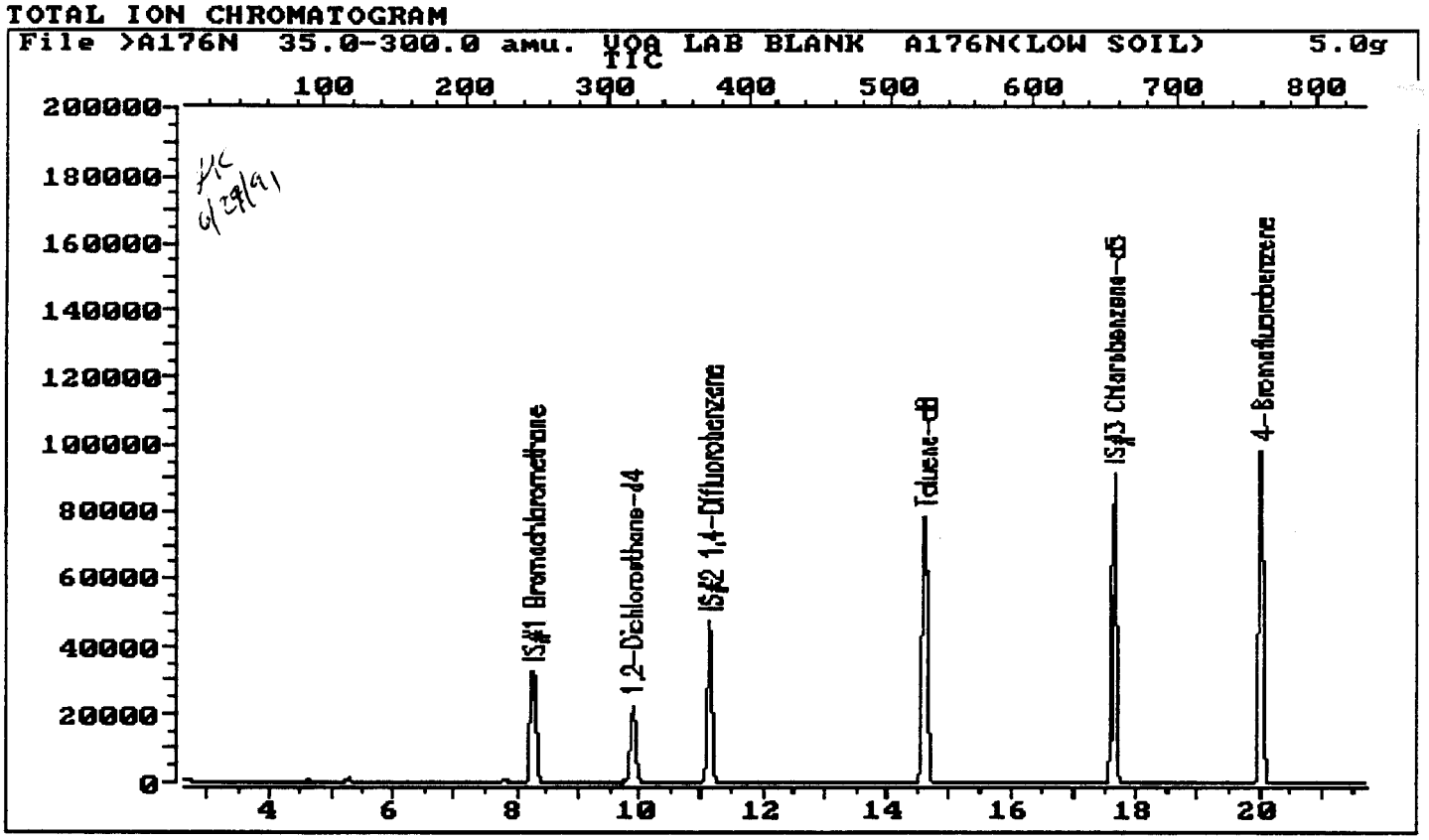
TOTAL ION CHROMATOGRAM



Data File: >A176N::D4 Quant Output File: ^A176N::QT
Name: VOA LAB BLANK A176N
Misc: (LOW SOIL) 5.0g INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910625 17:22

Operator ID: JOHN
Quant Time: 910625 18:13
Injected at: 910625 17:48

Client: WALK HAYDEL & ASSOC.
Sample: VOA LAB BLANK RE177J
Lab ID: R106PM
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/26/91
Date Sampled: NA
Data File ID: RE177J

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/kg)	PQL (ug/kg)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	100	70-121
Toluene-d8	98	84-138
4-Bromofluorobenzene	95	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 50 ug/kg
Associated Blank: NA

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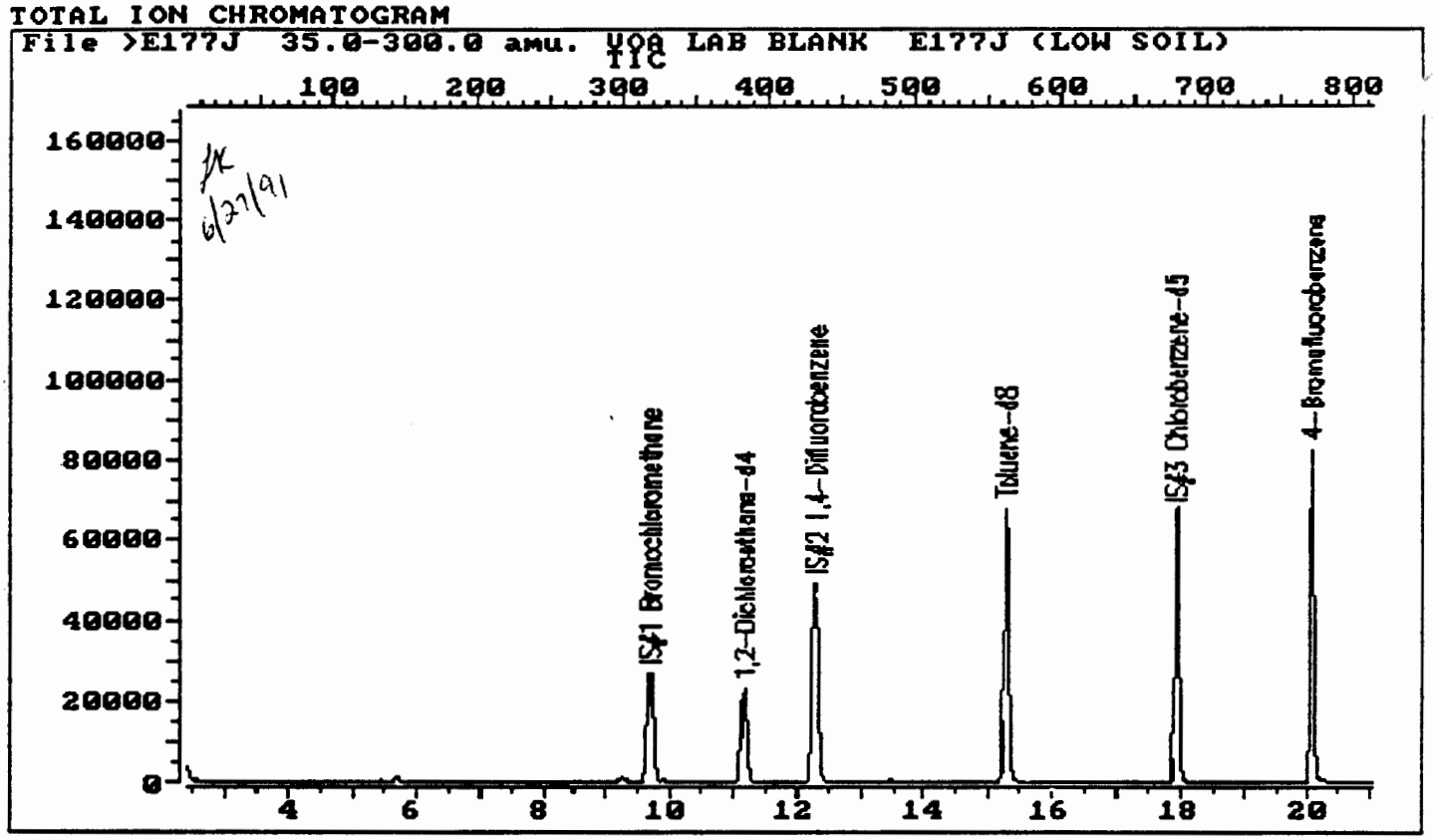
TOTAL ION CHROMATOGRAM



Data File: >E177J::D3 Quant Output File: ^E177J::QT
Name: VOA LAB BLANK E177J
Misc: (LOW SOIL) 5.0 g INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910626 15:04

Operator ID: BRUCE
Quant Time: 910626 15:56
Injected at: 910626 15:34

Client: WALK HAYDEL & ASSOC.
Sample: VOA LAB BLANK RA177K
Lab ID: R106PM
Method: SW 846-8240

Date Extracted: 06/25/91
Date Analyzed: 06/26/91
Date Sampled: NA
Data File ID: RA177K

GC/MS

VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/g)	PQL (ug/g)
Acrolein		BQL	5.0
Acrylonitrile		BQL	5.0
Chloromethane		BQL	1.0
Bromomethane		BQL	1.0
Vinyl Chloride		BQL	1.0
Chloroethane		BQL	1.0
Methylene Chloride	5.34	0.5	0.5
1.1-Dichloroethene		BQL	0.5
1.1-Dichloroethane		BQL	0.5
1.2-Dichloroethene (total)		BQL	0.5
Trichlorofluoromethane		BQL	0.5
Chloroform		BQL	0.5
1.2-Dichloroethane		BQL	0.5
1.1.1-Trichloroethane		BQL	0.5
Carbon Tetrachloride		BQL	0.5
Bromodichloromethane		BQL	0.5
1.2-Dichloropropane		BQL	0.5
trans-1.3-Dichloropropene		BQL	0.5
Trichloroethene		BQL	0.5
Dibromochloromethane		BQL	0.5
1.1.2-Trichloroethane		BQL	0.5
Benzene		BQL	0.5
cis-1.3-Dichloropropene		BQL	0.5
Bromoform		BQL	0.5
Tetrachloroethene		BQL	0.5
1.1.2.2-Tetrachloroethane		BQL	0.5
Toluene		BQL	0.5
Chlorobenzene		BQL	0.5
Ethylbenzene		BQL	0.5
2-Chloroethylvinyl ether (1)		BQL	1.0
Acetone	4.77	1.	1.0
Carbon Disulfide		BQL	0.5
2-Butanone	8.00	3.	1.0
Vinyl Acetate		BQL	1.0
2-Hexanone		BQL	1.0
4-Methyl-2-Pentanone		BQL	1.0
Styrene		BQL	0.5
Xylene (total)		BQL	0.5

(1) Known to Hydrolyze in Presence of Dilute Acid

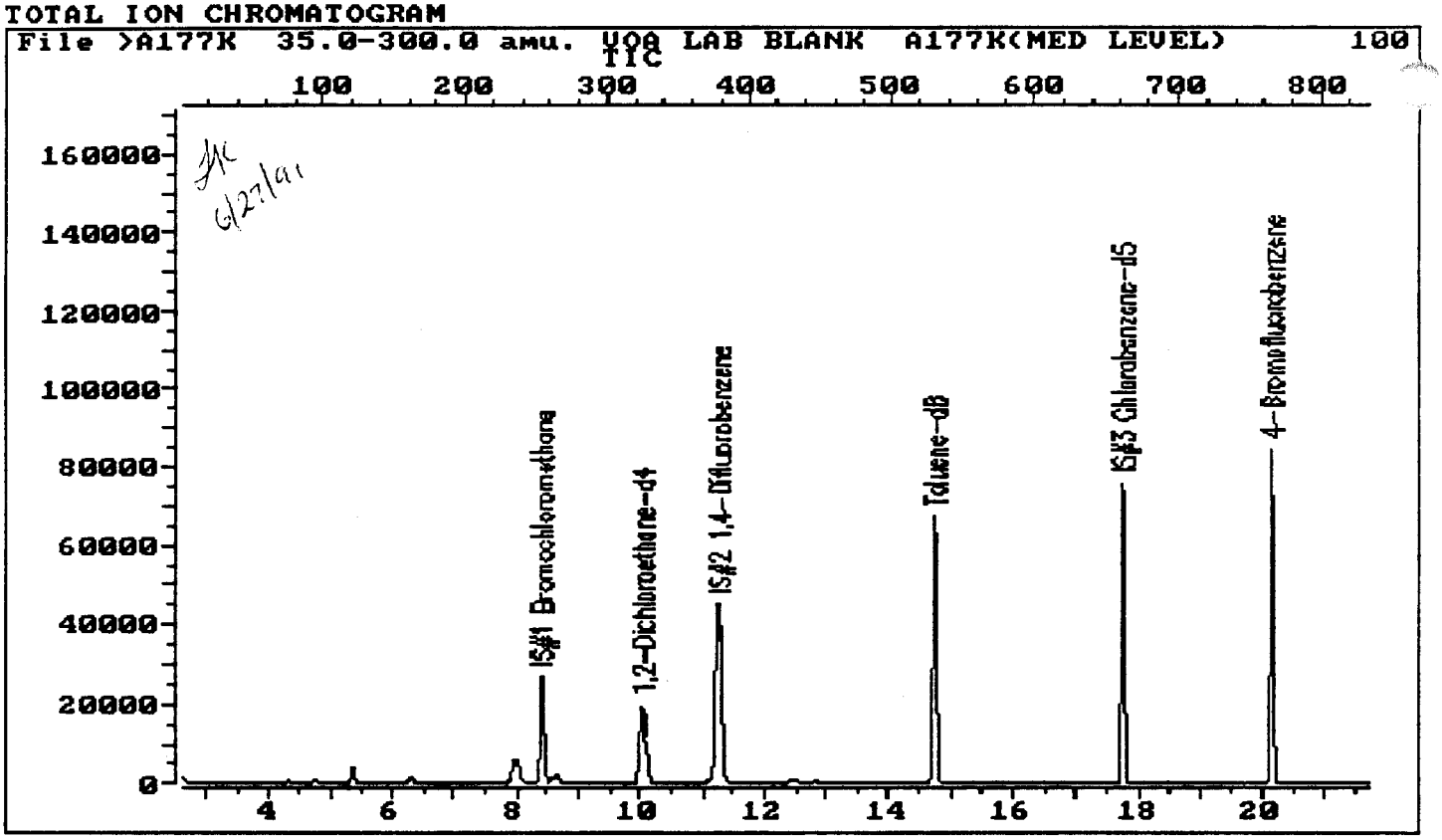
SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	104	70-121
Toluene-d8	98	84-138
4-Bromofluorobenzene	106	59-113

Surrogate Spike Level: 5 ug/g
Associated Blank: NA

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A177K::D4 Quant Output File: ^A177K::QT
Name: VOA LAB BLANK A177K
Misc: (MED LEVEL) 100ul INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910626 14:03

Operator ID: JOHN
Quant Time: 910626 17:21
Injected at: 910626 16:58

Client: WALK HAYDEL & ASSOC.
Sample: VOA LAB BLANK RE178L
Lab ID: R106PM
Method: SW 846-8240

Date Extracted: 06/25/91
Date Analyzed: 06/27/91
Date Sampled: NA
Data File ID: RE178L

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

DRY X WET ___ WEIGHT

Compound	Chromatographic Retention Time (min.)	Concentration (ug/g)	PQL (ug/g)
Acrolein		BQL	5.0
Acrylonitrile		BQL	5.0
Chloromethane		BQL	1.0
Bromomethane		BQL	1.0
Vinyl Chloride		BQL	1.0
Chloroethane		BQL	1.0
Methylene Chloride		BQL	0.5
1,1-Dichloroethene		BQL	0.5
1,1-Dichloroethane		BQL	0.5
1,2-Dichloroethene (total)		BQL	0.5
Trichlorofluoromethane		BQL	0.5
Chloroform		BQL	0.5
1,2-Dichloroethane		BQL	0.5
1,1,1-Trichloroethane		BQL	0.5
Carbon Tetrachloride		BQL	0.5
Bromodichloromethane		BQL	0.5
1,2-Dichloropropane		BQL	0.5
trans-1,3-Dichloropropene		BQL	0.5
Trichloroethene		BQL	0.5
Dibromochloromethane		BQL	0.5
1,1,2-Trichloroethane		BQL	0.5
Benzene		BQL	0.5
cis-1,3-Dichloropropene		BQL	0.5
Bromoform		BQL	0.5
Tetrachloroethene		BQL	0.5
1,1,2,2-Tetrachloroethane		BQL	0.5
Toluene		BQL	0.5
Chlorobenzene		BQL	0.5
Ethylbenzene		BQL	0.5
2-Chloroethylvinyl ether (1)		BQL	1.0
Acetone		BQL	1.0
Carbon Disulfide		BQL	0.5
2-Butanone	9.44	4.	1.0
Vinyl Acetate		BQL	1.0
2-Hexanone		BQL	1.0
4-Methyl-2-Pentanone		BQL	1.0
Styrene		BQL	0.5
Xylene (total)		BQL	0.5

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	100	70-121
Toluene-d8	102	84-138
4-Bromofluorobenzene	101	59-113

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

Surrogate Spike Level: 5 ug/g
Associated Blank: NA

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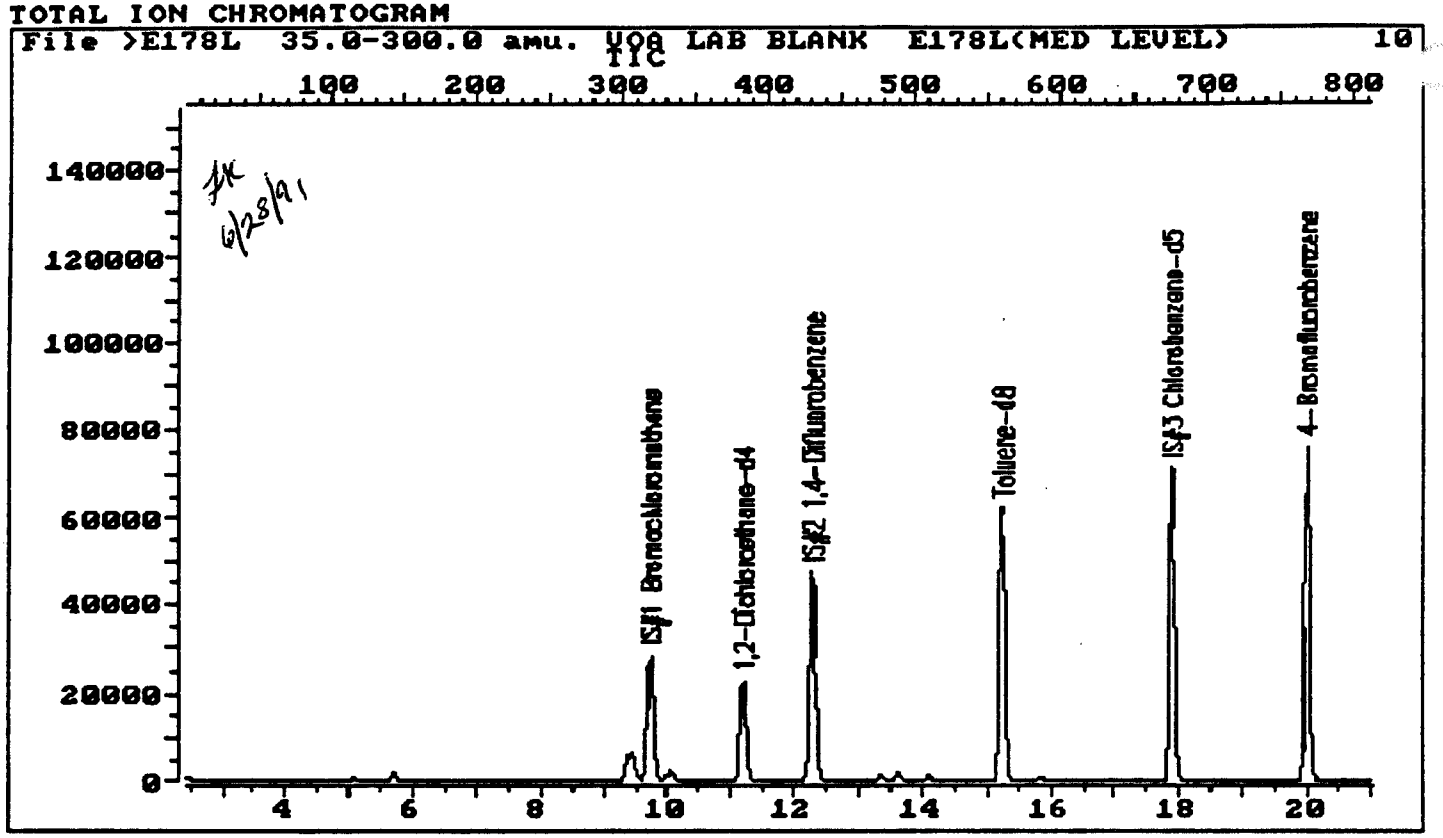
TOTAL ION CHROMATOGRAM



Data File: >E178L::D3 Quant Output File: ^E178L::QT
Name: VOA LAB BLANK E178L
Misc: (MED LEVEL) 100ul INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910627 16:53

Operator ID: JOHN
Quant Time: 910627 17:36
Injected at: 910627 17:14

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 James Drive West, Suite 100
St Rose, Louisiana 70087
(504) 469-0333

QC REPORT

VOA BLANK SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% RECOVERY	DUP. % RECOVERY	QC RANGE	RPD	RPD LIMIT
1,1 Dichloroethene	06PM10	50 ug/kg	134%	128%	59-172	5	22
Trichloroethene	06PM10	50 ug/kg	83%	81%	62-137	3	24
Benzene	06PM10	50 ug/kg	90%	87%	66-142	3	21
Toluene	06PM10	50 ug/kg	93%	92%	59-172	1	21
Chlorobenzene	06PM10	50 ug/kg	96%	93%	60-133	4	21

VOA MATRIX SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% RECOVERY	DUP. % RECOVERY	QC RANGE	RPD	RPD LIMIT
1,1 Dichloroethene	06PM11	65 ug/kg	146%	128%	59-172	14	22
Trichloroethene	06PM11	65 ug/kg	80%	78%	62-137	2	24
Benzene	06PM11	65 ug/kg	87%	85%	66-142	2	21
Toluene	06PM11	65 ug/kg	93%	90%	59-172	3	21
Chlorobenzene	06PM11	65 ug/kg	90%	89%	60-133	1	21

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES,INC.
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St Rose, Louisiana 70087
(504) 469-0333

QC REPORT

VOA BLANK SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% RECOVERY	DUP. % RECOVERY	QC RANGE	RPD	RPD LIMIT
1,1 Dichloroethene	12KE05	5 ug/g	97%	91%	59-172	6	22
Trichloroethene	12KE05	5 ug/g	74%	74%	62-137	0	24
Benzene	12KE05	5 ug/g	104%	101%	66-142	2	21
Toluene	12KE05	5 ug/g	108%	106%	59-172	2	21
Chlorobenzene	12KE05	5 ug/g	112%	110%	60-133	2	21

Client: Walk Haydel and Assoc.
Sample: B-2 0.5-2.5'

Lab ID: R106PM01
File ID: D176A050

Date Extracted: 06/20/91
Date Analyzed: 06/25/91
Time Analyzed: 15:04
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)	23.51	7400	794

Surrogate Pentacosane (C-25) Recovery: 95%

Corresponding Blank: D176A049

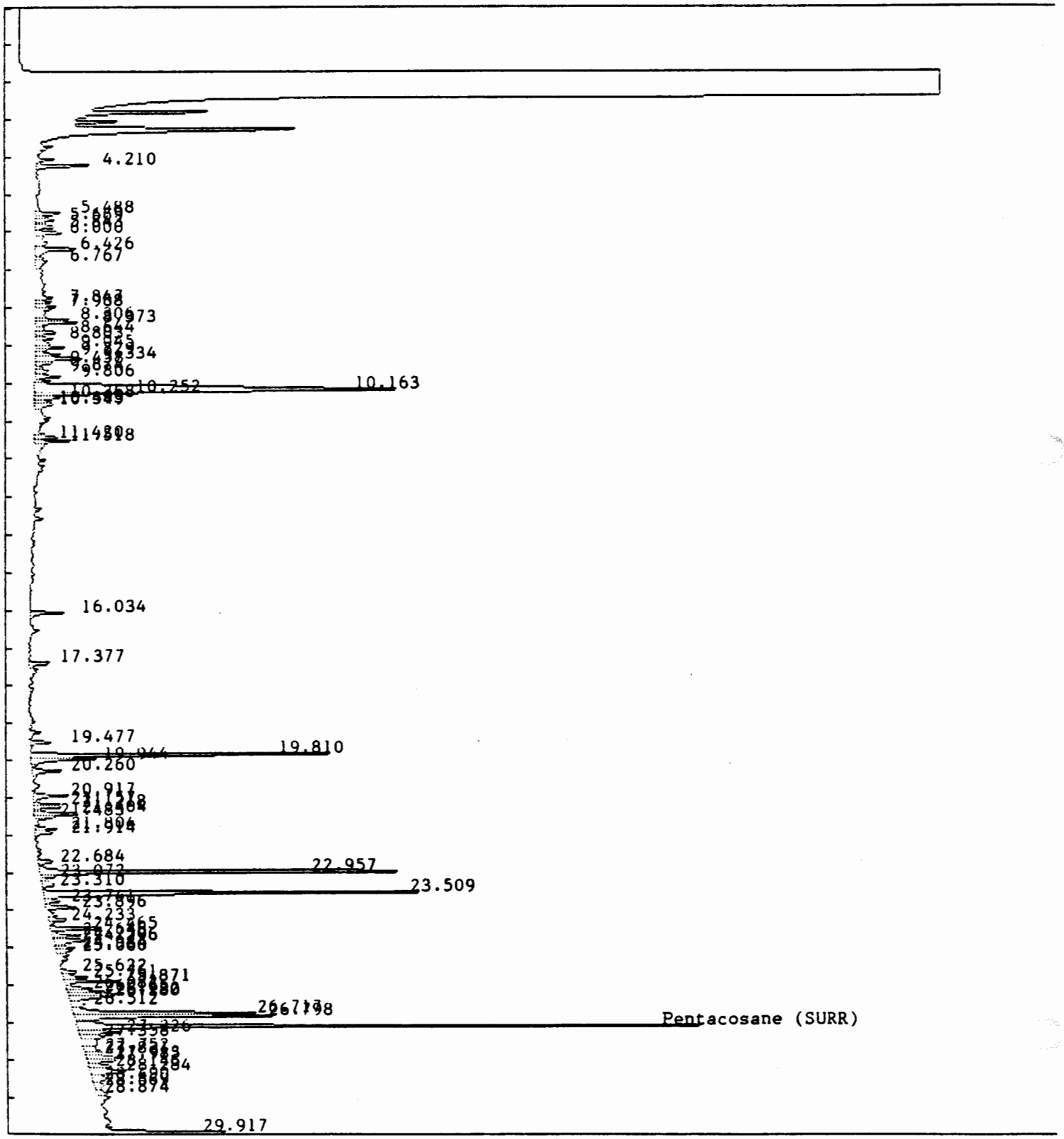
NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106PM01** **B-2 0.5′ - 2.5′**

File ID: /DATA/LOOP/RESULT/D176A050.RES
Date Analyzed: 1504 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/ 6
Bottle : 50
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: B-2 2.5-4.5'

Lab ID: R106PM02
File ID: D176A071

Date Extracted: 06/20/91
Date Analyzed: 06/26/91
Time Analyzed: 13:55
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/kg)	POL (ug/kg)
TPH (as Diesel Oil)	9.93		599000	15700

Surrogate Pentacosane (C-25) Recovery: 127%

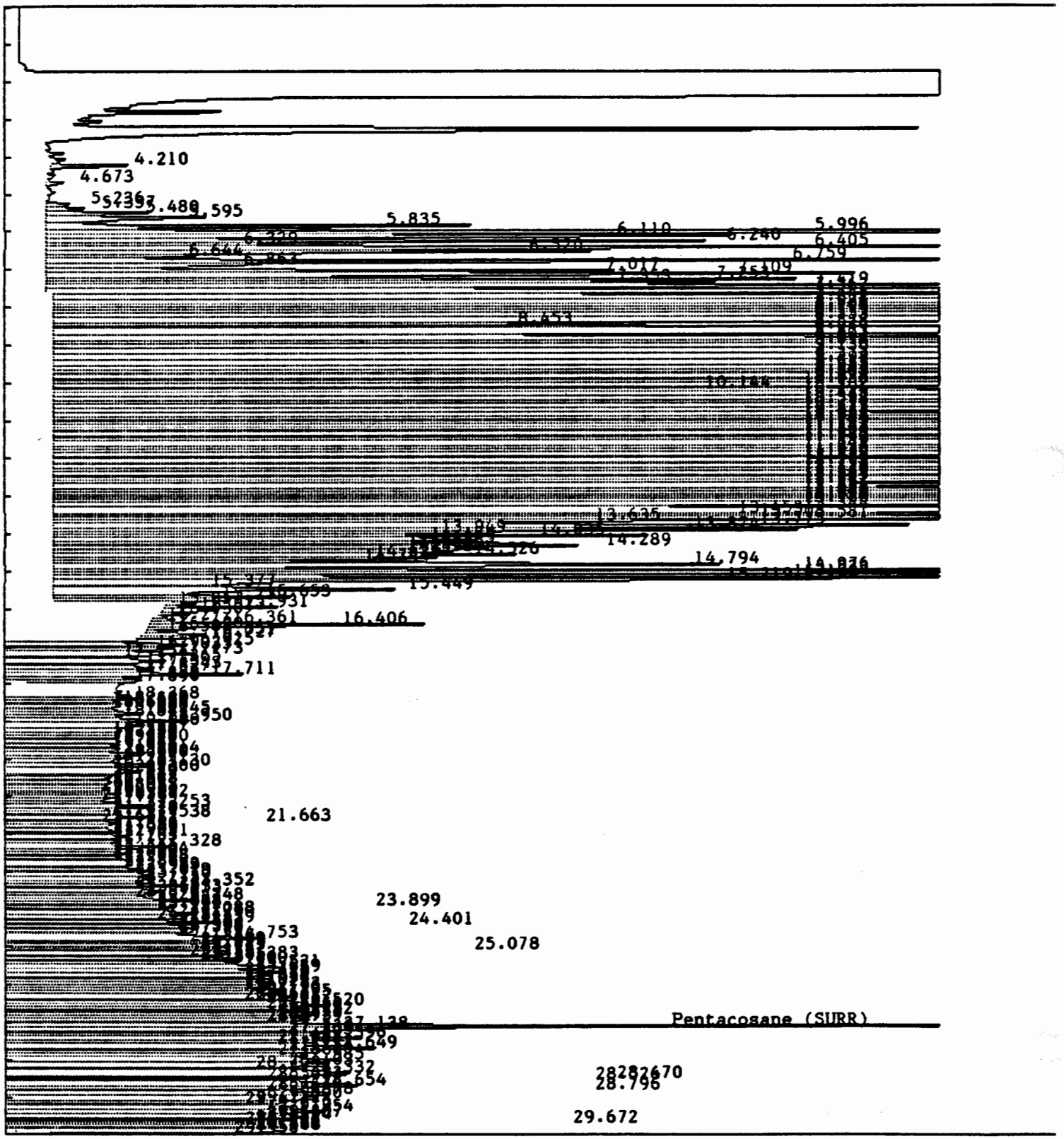
Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM02 B-2 2.5' - 4.5'

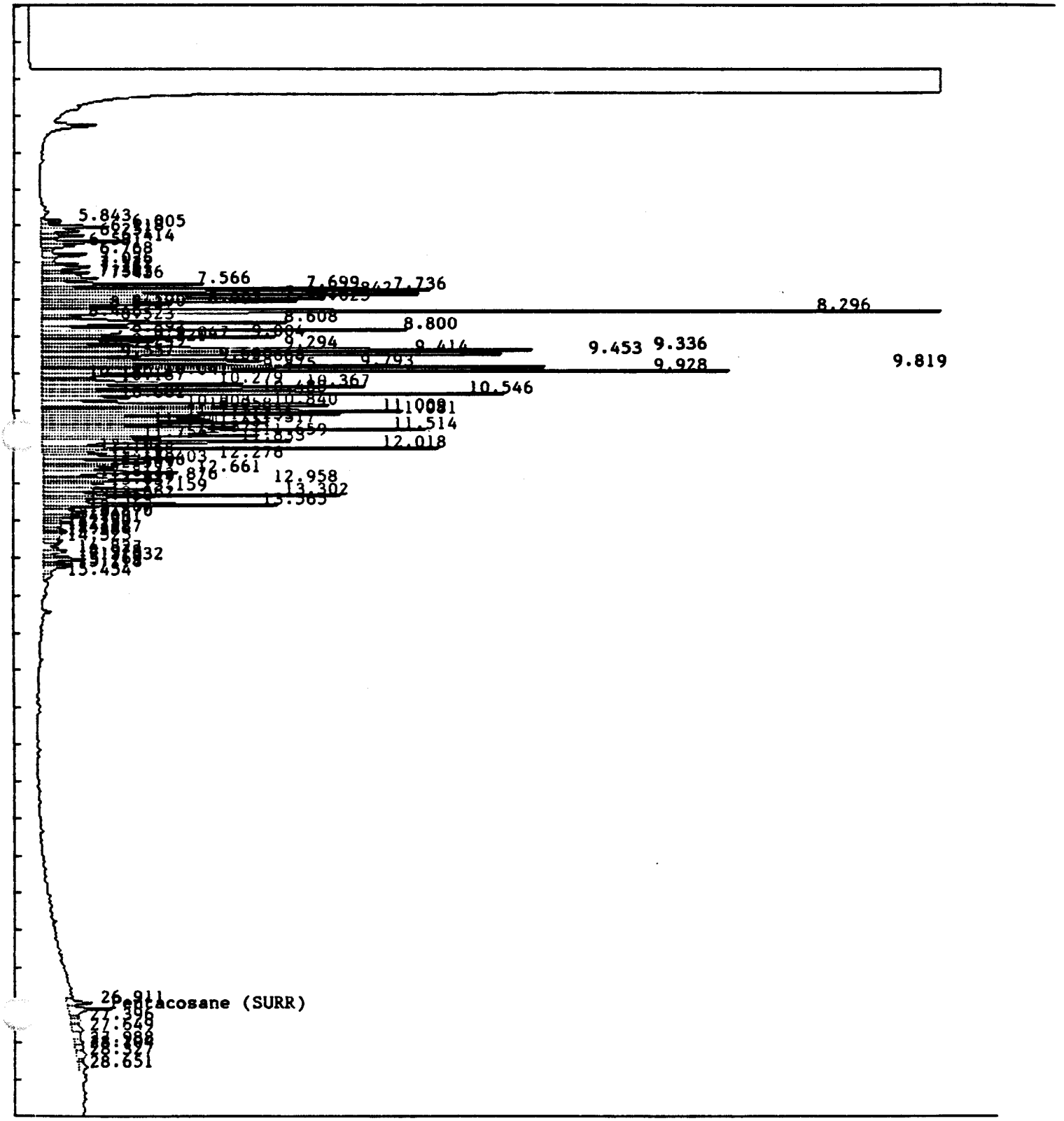
File ID: /DATA/LOOP/RESULT/D176A051.RES
Date Analyzed: 1547 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: 1
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/ 7
Bottle : 51
Run Time: 30.00 min.



Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM02 B-2 2.5'-4.5' (1:20 Dilution)

File ID:	/DATA/LOOP/RESULT/D176A071.RES	Dil. Factor:	20
Date Analyzed:	1432 26Jun1991	Instrument:	GC-D (HP 5890A)
Column:	30 M x 0.32 mm DB-1 (FSCC)	Seq/Smpl:	1/27
Detector:	Flame Ionization (FID)	Bottle :	71
Inj. Volume:	2.0 uL	Run Time:	30.00 min.



Client: Walk Haydel and Assoc.
Sample: B-2 4.5-6.5'

Lab ID: R106PM03
File ID: D176A072

Date Extracted: 06/20/91
Date Analyzed: 06/26/91
Time Analyzed: 15:09
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)	9.93	594000	16300

Surrogate Pentacosane (C-25) Recovery: 75%

Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

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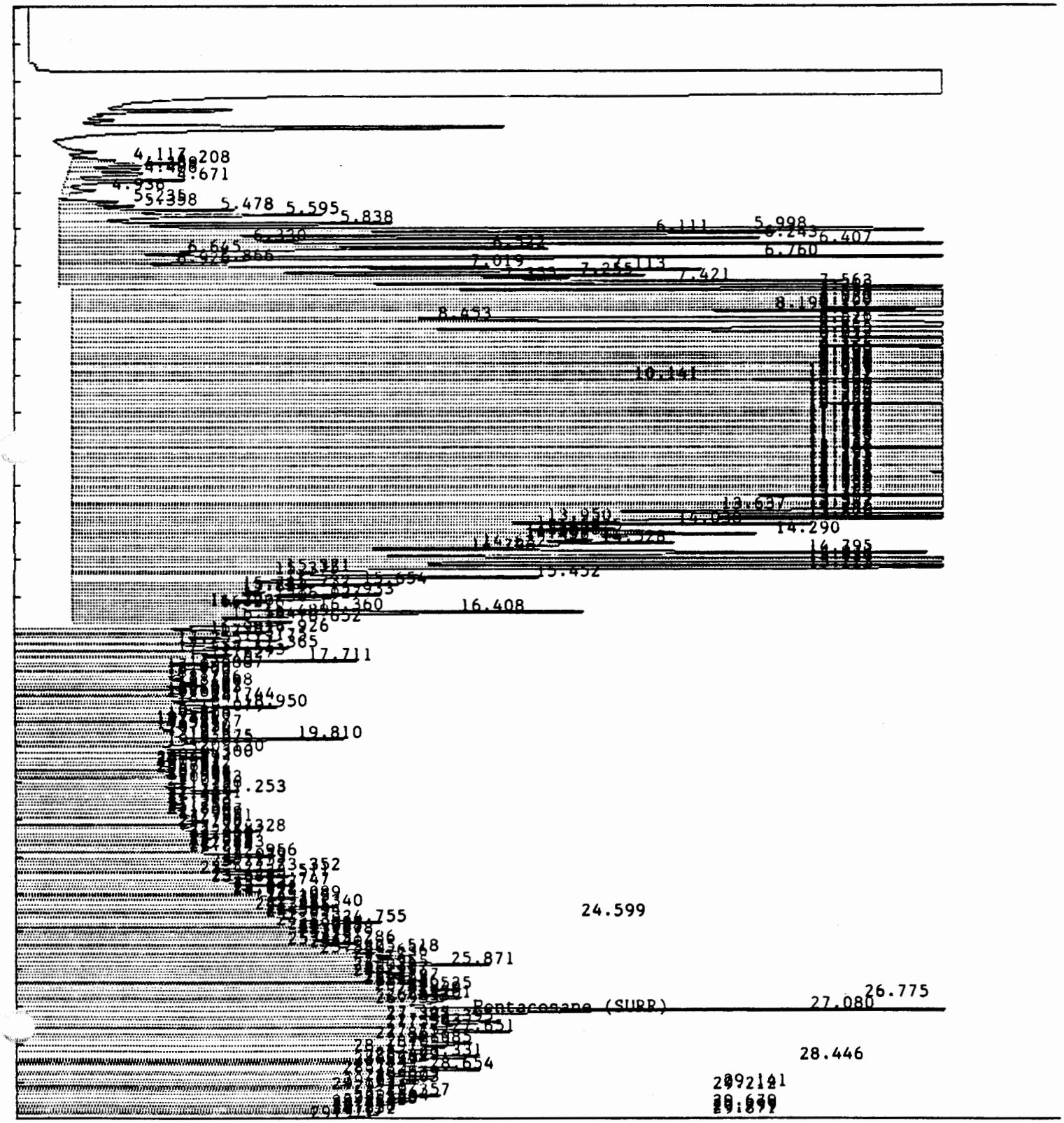
Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM03 B-2 4.5' - 6.5'

File ID: /DATA/LOOP/RESULT/D176A052.RES
Date Analyzed: 1624 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

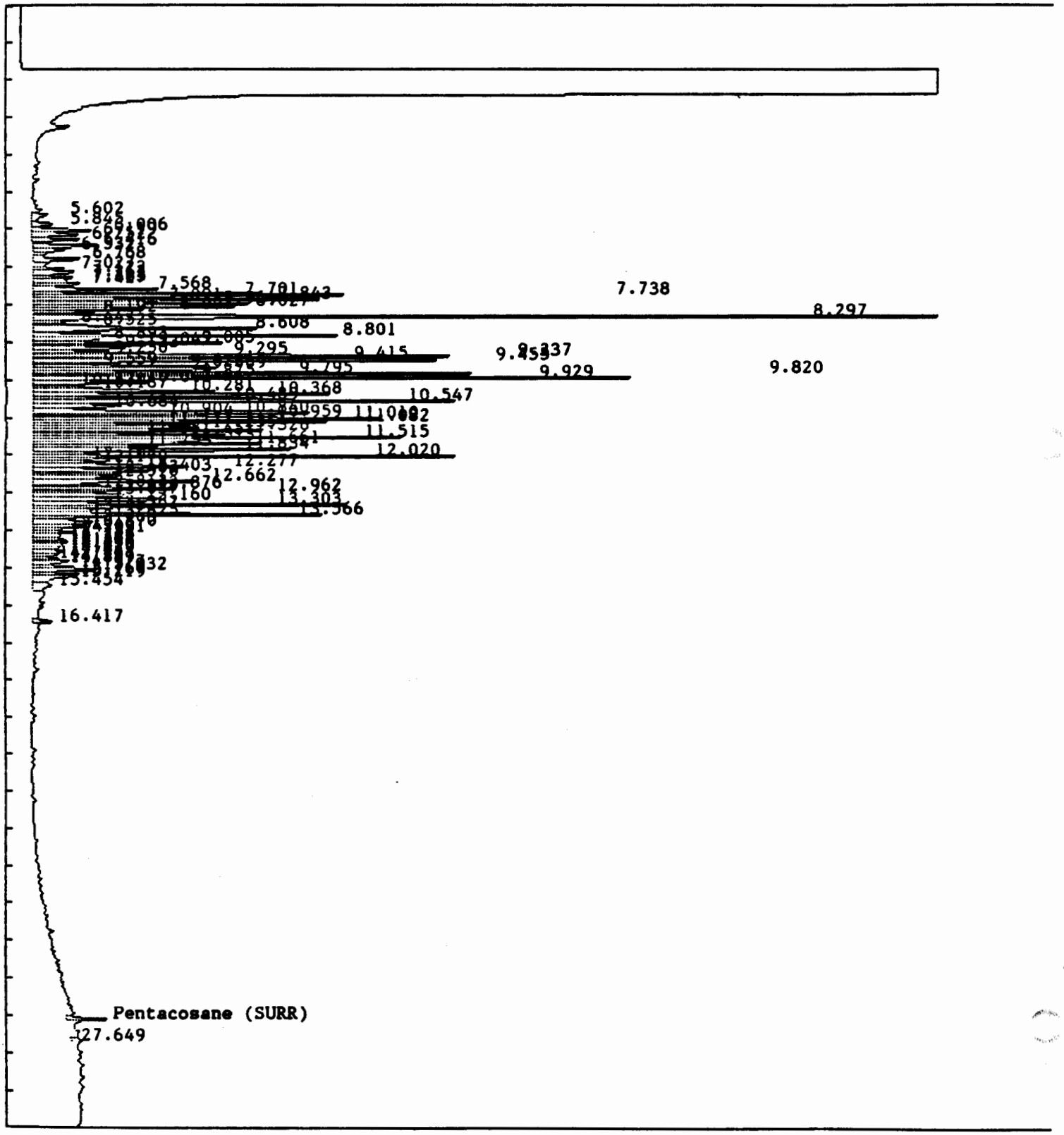
Dil. Factor: 1
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/ 8
Bottle : 52
Run Time: 30.00 min.



Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM03 B-2 4.5'-6.5' (1:20 Dilution)

File ID: /DATA/LOOP/RESULT/D176A072.RES
Date Analyzed: 1509 26Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: 20
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/28
Bottle : 72
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: B-2 6.5-8.5'

Lab ID: R106PM04
File ID: D176A073

Date Extracted: 06/20/91
Date Analyzed: 06/26/91
Time Analyzed: 15:46
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/kg)	POL (ug/kg)
TPH (as Diesel Oil)	8.30		1820000	17800

Surrogate Pentacosane (C-25) Recovery: 83%

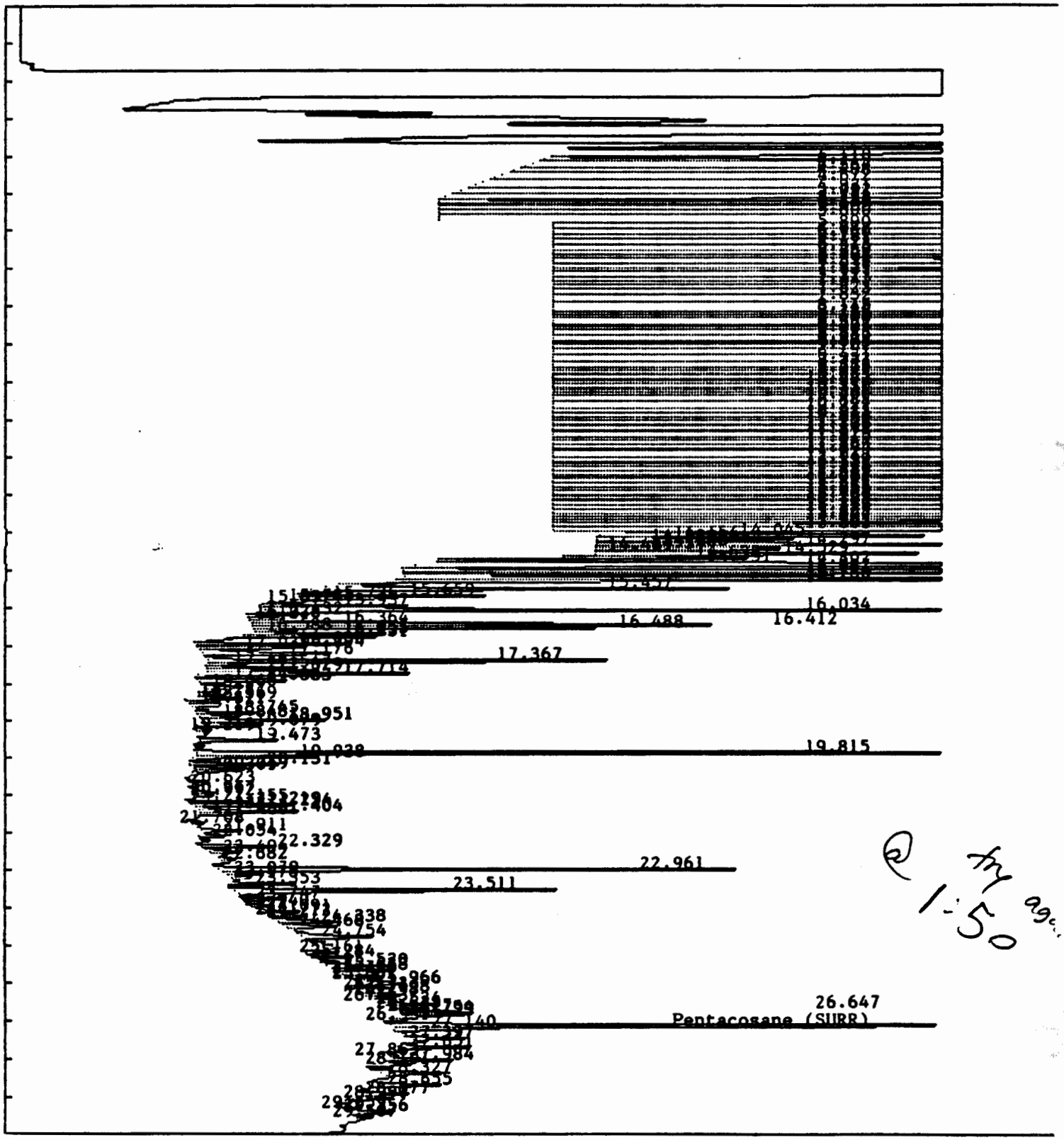
Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM04 B-2 6.5' - 8.5'

File ID: /DATA/LOOP/RESULT/D176A053.RES
Date Analyzed: 1702 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: 1
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/ 9
Bottle : 53
Run Time: 29.98 min.

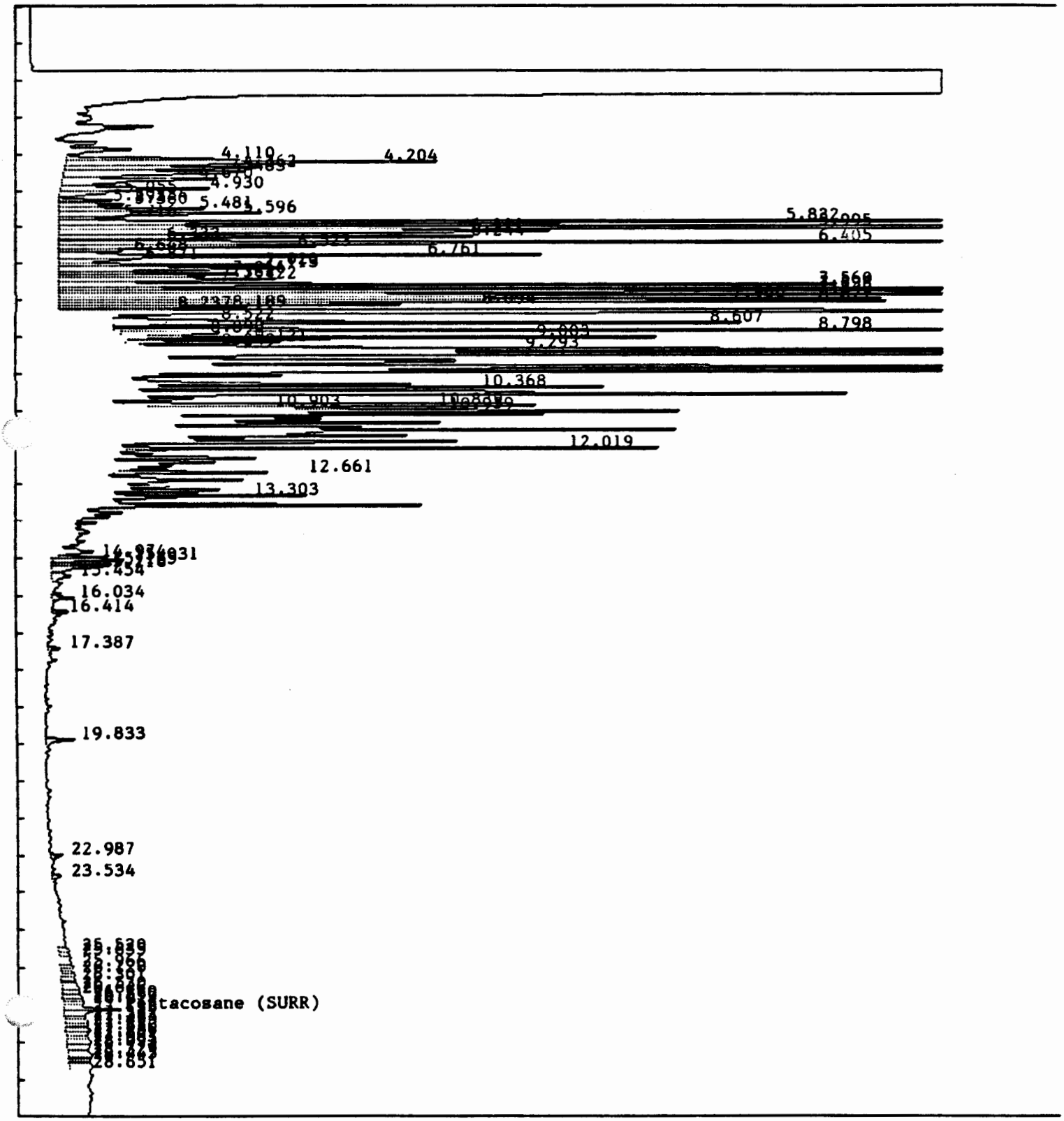


@ try again 1:50

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM04 B-2 6.5'-8.5' (1:20 Dilution)

File ID: /DATA/LOOP/RESULT/D176A073.RES
Date Analyzed: 1546 26Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: 20
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/29
Bottle : 73
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: B-3 0-2'

Lab ID: R106PM05
File ID: D176A054

Date Extracted: 06/20/91
Date Analyzed: 06/25/91
Time Analyzed: 17:39
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)	23.51		9410	733

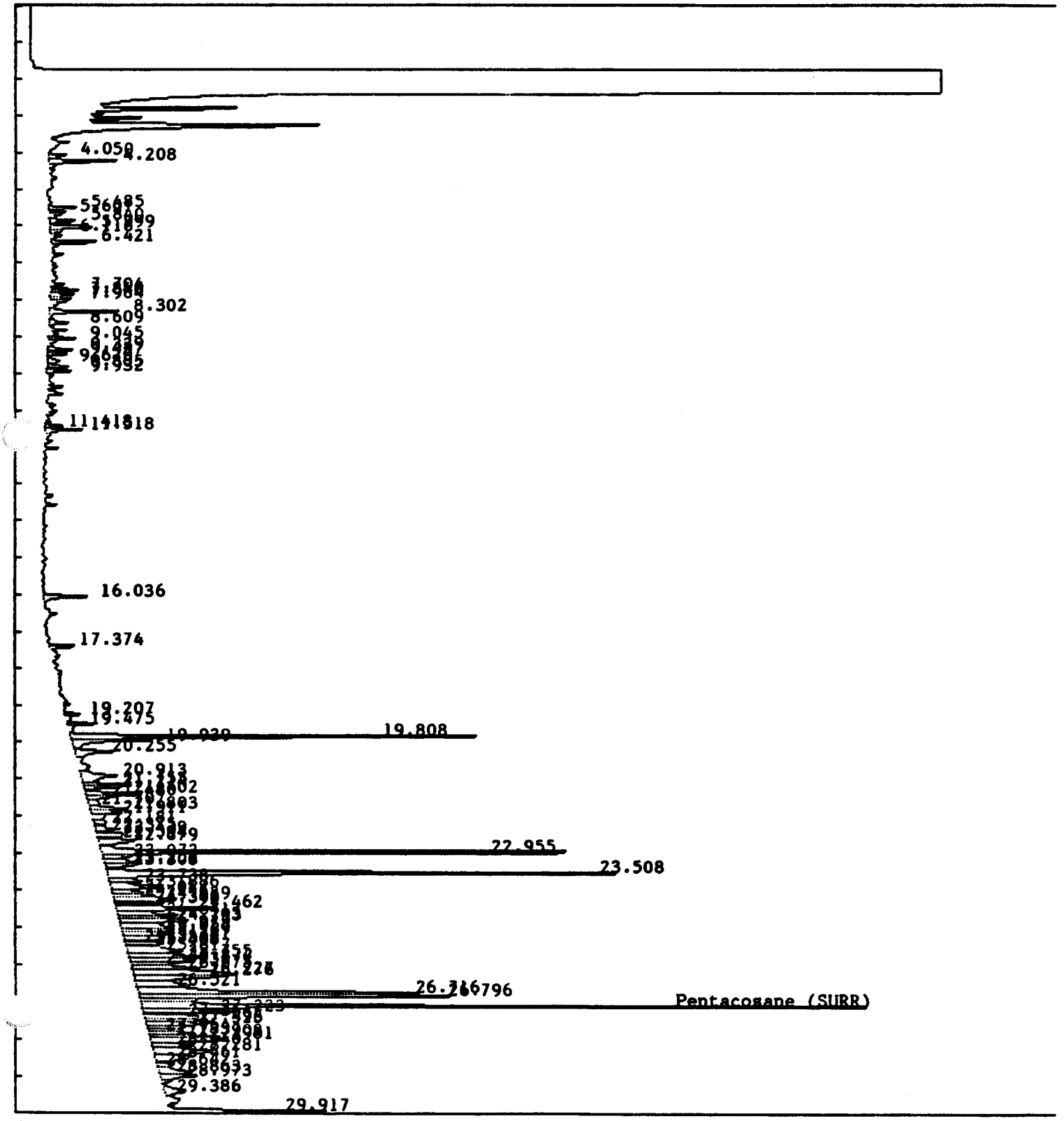
Surrogate Pentacosane (C-25) Recovery: 97%

Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM05 B-3 0' - 2'

File ID:	/DATA/LOOP/RESULT/D176A054.RES	Dil. Factor:	_____
Date Analyzed:	1739 25Jun1991	Instrument:	GC-D (HP 5890A)
Column:	30 M x 0.32 mm DB-1 (FSCC)	Seq/Smpl:	1/10
Detector:	Flame Ionization (FID)	Bottle :	54
Inj. Volume:	2.0 uL	Run Time:	30.00 min.



Client: Walk Haydel and Assoc.
Sample: B-3 2-4'

Lab ID: R106PM06
File ID: D176A055

Date Extracted: 06/20/91
Date Analyzed: 06/25/91
Time Analyzed: 18:16
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)		BQL	766

Surrogate Pentacosane (C-25) Recovery: 85%

Corresponding Blank: D176A049

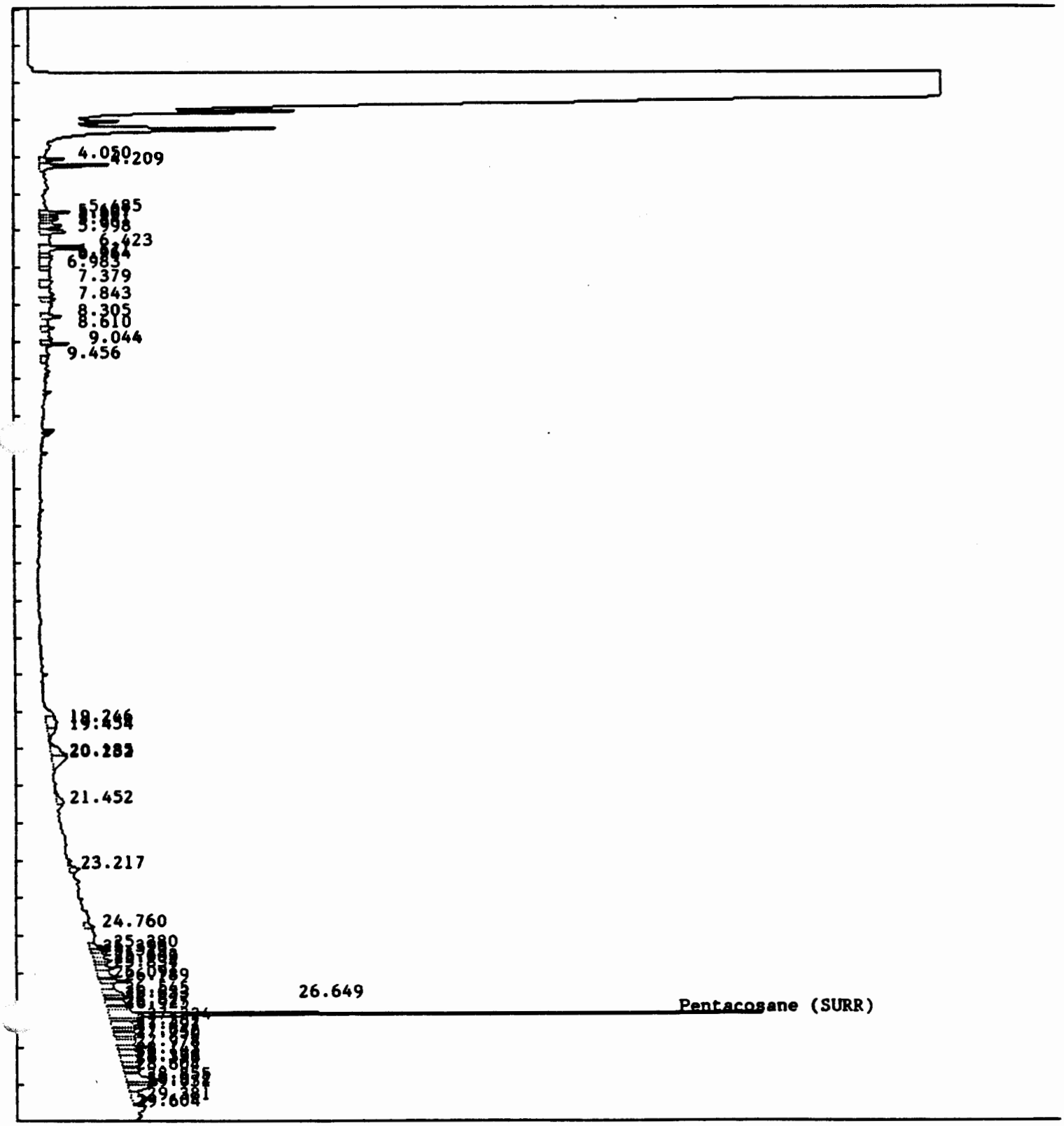
NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM06 B-3 2' - 4'

File ID: /DATA/LOOP/RESULT/D176A055.RES
Date Analyzed: 1816 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/11
Bottle : 55
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: B-3 4-6'

Lab ID: R106PM07
File ID: D176A056

Date Extracted: 06/20/91
Date Analyzed: 06/25/91
Time Analyzed: 18:53
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)		BQL	775

Surrogate Pentacosane (C-25) Recovery: 66%

Corresponding Blank: D176A049

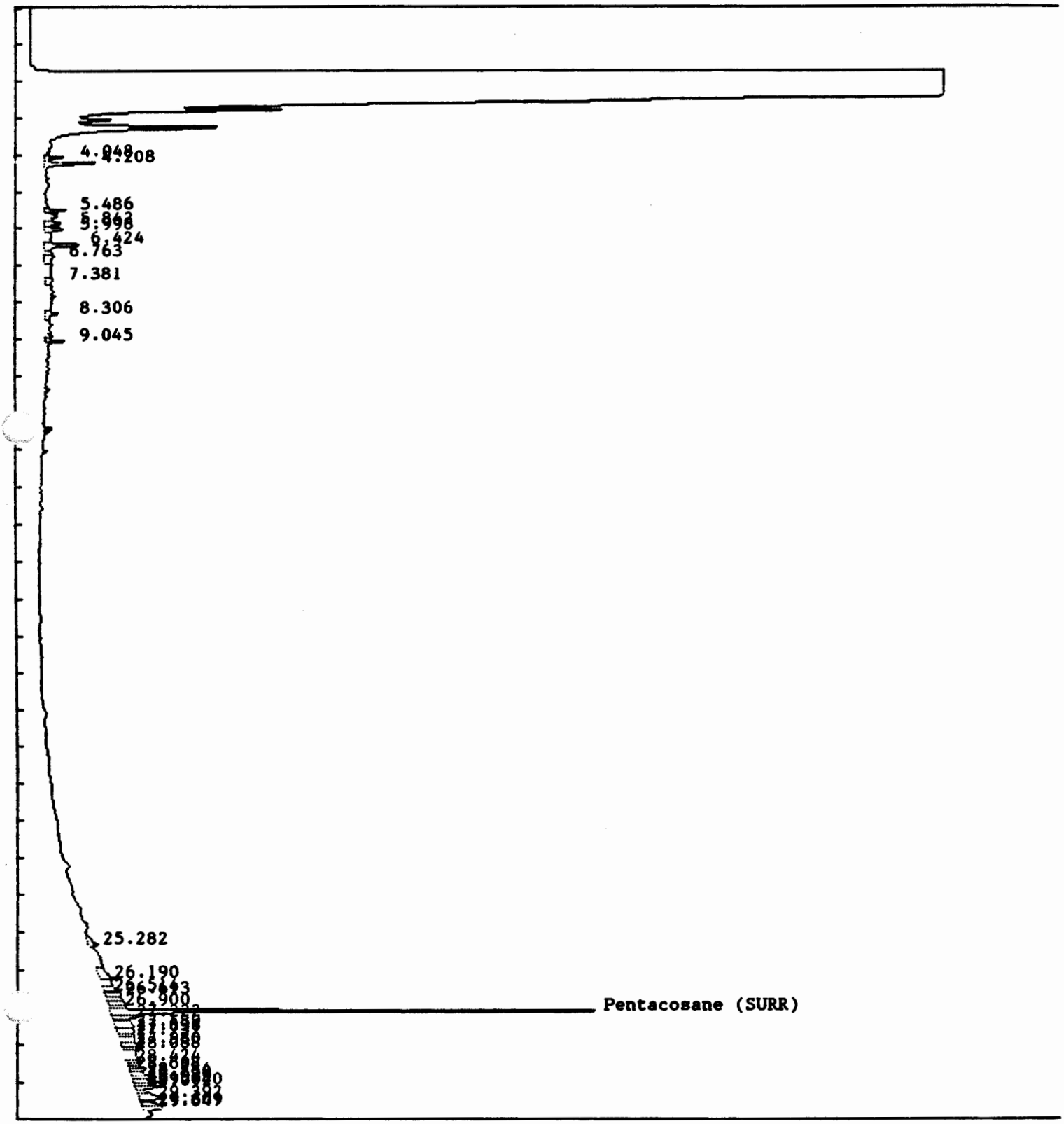
NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM07 B-3 4' - 6'

File ID: /DATA/LOOP/RESULT/D176A056.RES
Date Analyzed: 1853 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/12
Bottle : 56
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: B-3 6-8'

Lab ID: R106PM08
File ID: D176A057

Date Extracted: 06/20/91
Date Analyzed: 06/25/91
Time Analyzed: 19:30
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)		BQL	866

Surrogate Pentacosane (C-25) Recovery: 82%

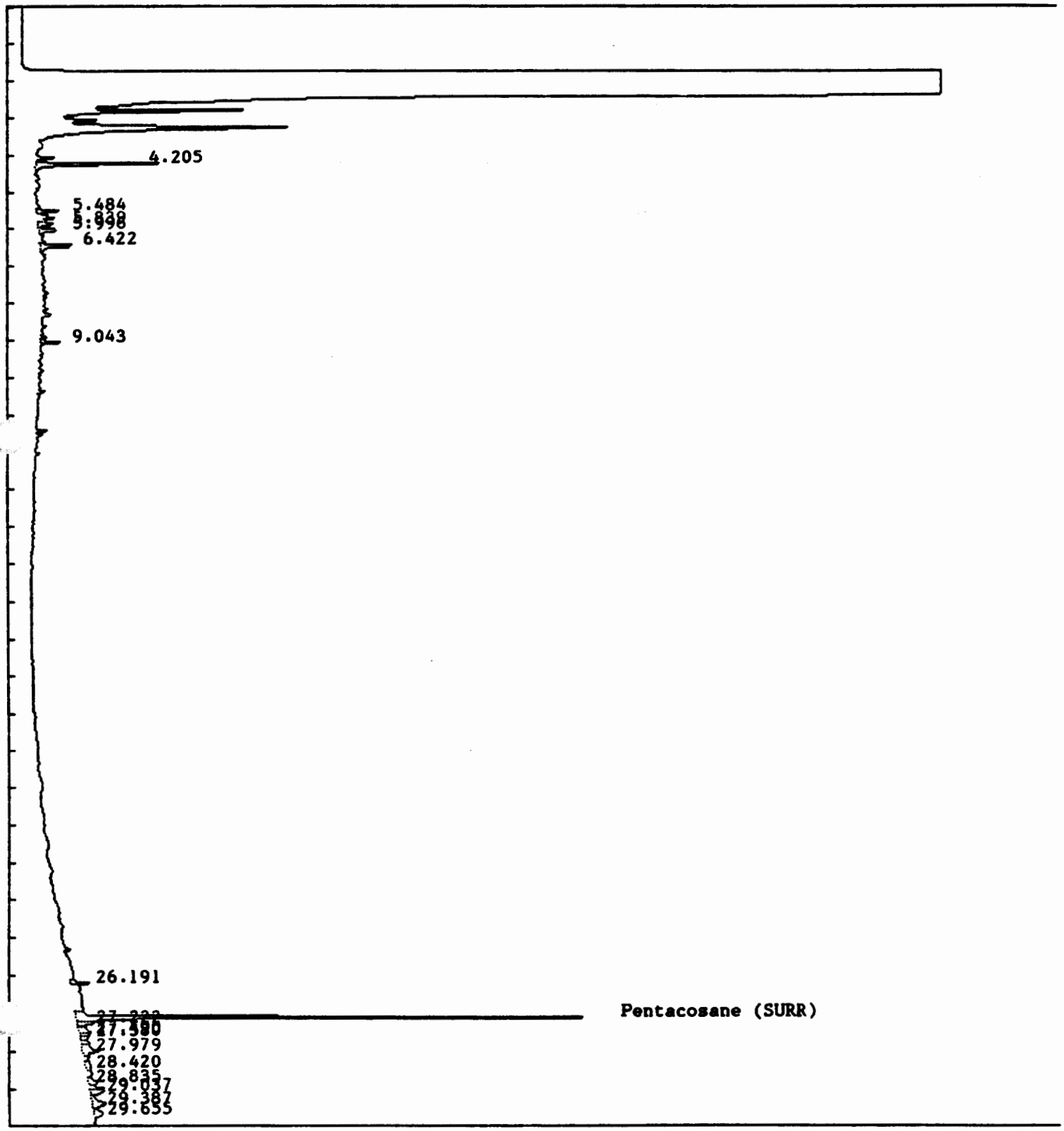
Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM08 B-3 6' - 8'

File ID: /DATA/LOOP/RESULT/D176A057.RES
Date Analyzed: 1930 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/13
Bottle : 57
Run Time: 30.00 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/20/91
Sample:	Extraction Blank	Date Analyzed:	06/25/91
	Blank Spike	Time Analyzed:	20:44
Lab ID:	R106PM09	Analyst:	LSK
File ID:	D176A059	GC Method:	CALIF. LUFT
		Date Sampled:	N/A

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)	MS 17.71		68% Recovery	667

Surrogate Pentacosane (C-25) Recovery: 87%

Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/kg):
Semivolatiles: 33400

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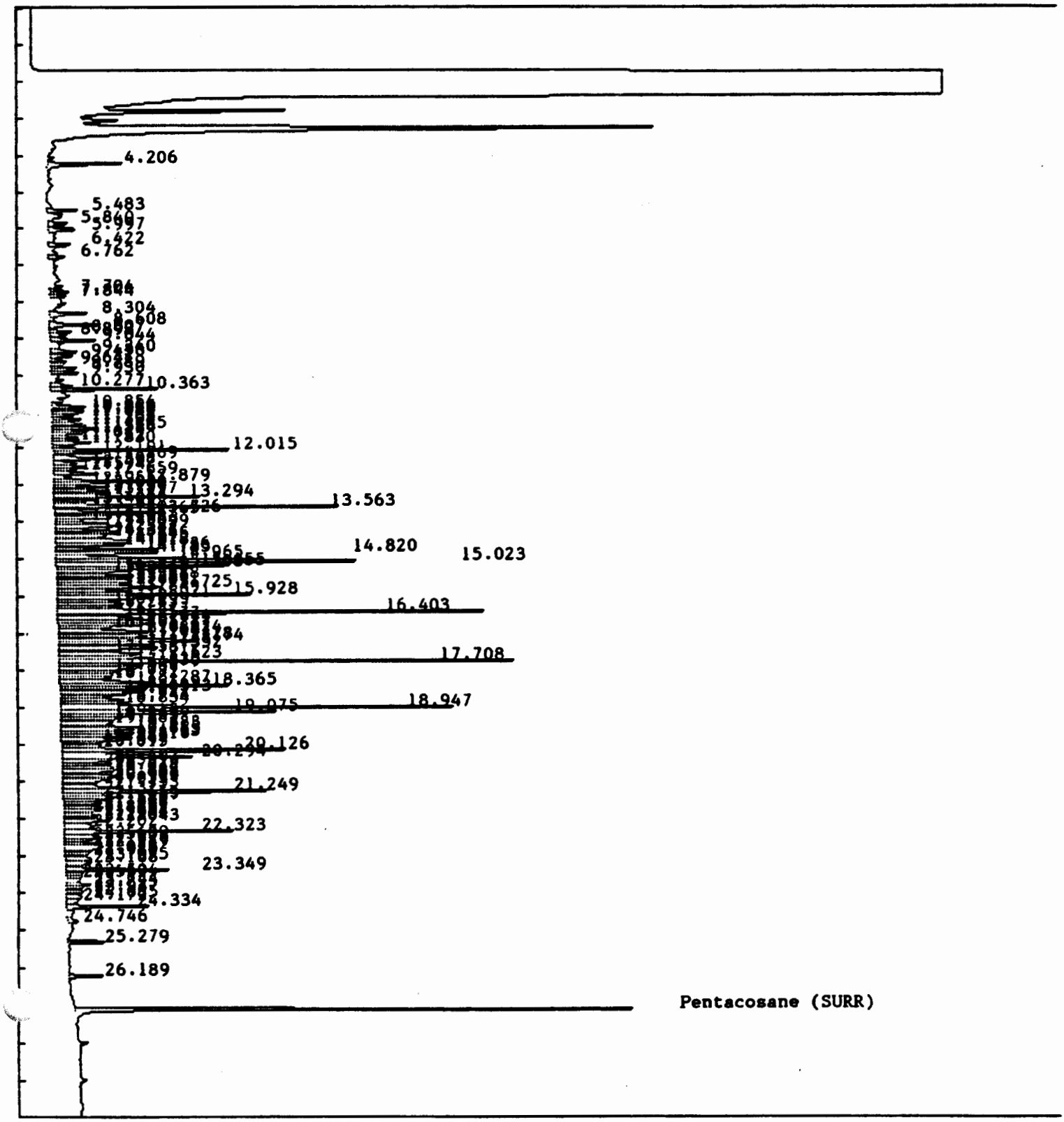
Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM09 Blank Spike

File ID: /DATA/LOOP/RESULT/D176A059.RES
Date Analyzed: 2044 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/15
Bottle : 59
Run Time: 30.00 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/20/91
Sample:	Extraction Blank	Date Analyzed:	06/25/91
	Blank Spike Duplicate	Time Analyzed:	21:21
Lab ID:	R106PM10	Analyst:	LSK
File ID:	D176A060	GC Method:	CALIF. LUFT
		Date Sampled:	N/A

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/kg)	POL (ug/kg)
TPH (as Diesel Oil)	MS 17.71		70% Recovery	667

Surrogate Pentacosane (C-25) Recovery: 89%

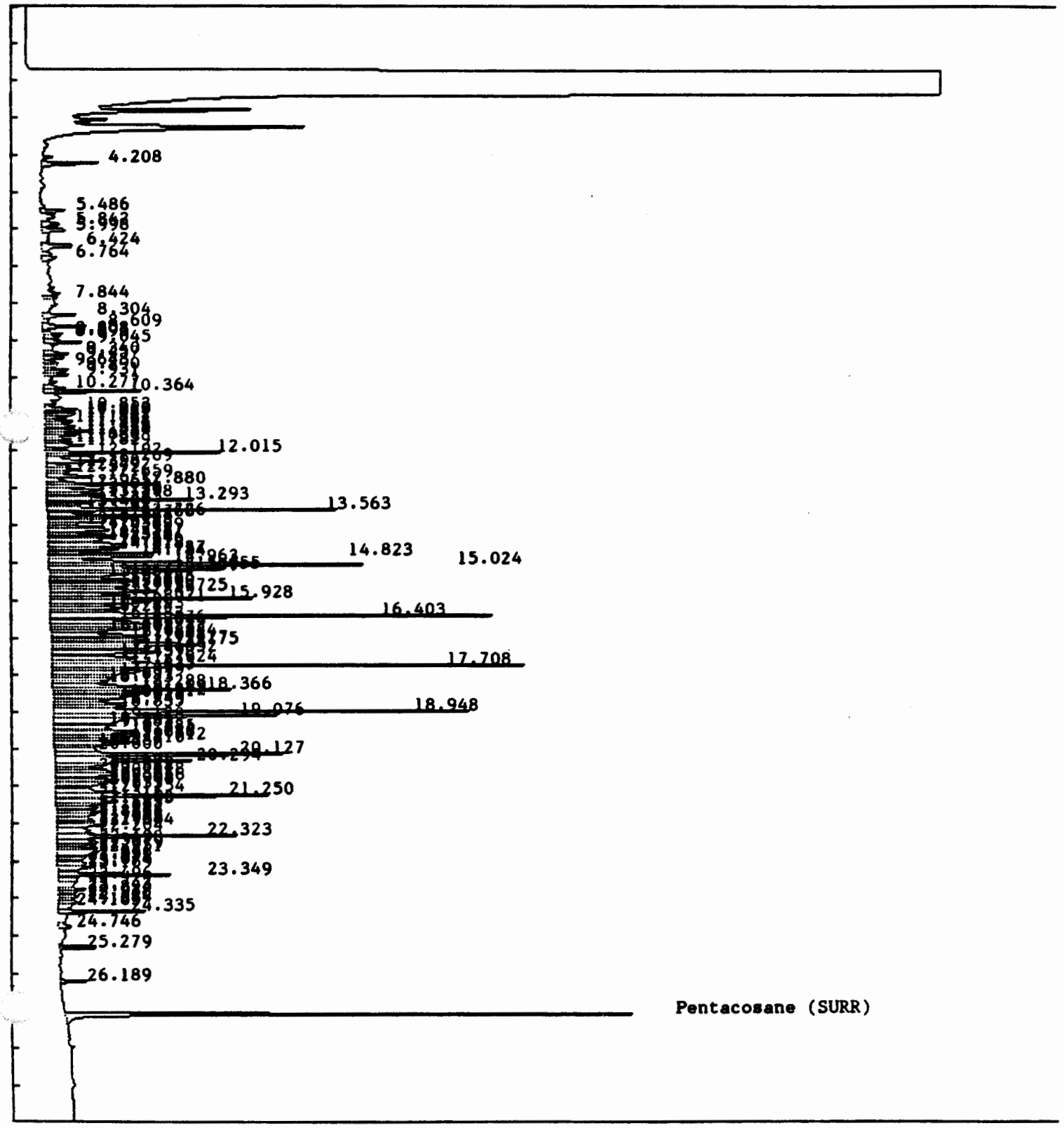
Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/kg):
Semivolatiles: 33400

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM10 Blank Spike Duplicate

File ID: /DATA/LOOP/RESULT/D176A060.RES
Date Analyzed: 2121 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/16
Bottle : 60
Run Time: 30.00 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/20/91
Sample:	B-3 6-8'	Date Analyzed:	06/25/91
	Matrix Spike	Time Analyzed:	21:58
Lab ID:	R106PM11	Analyst:	LSK
File ID:	D176A061	GC Method:	CALIF. LUFT
		Date Sampled:	06/13/91

Total Petroleum Hydrocarbons

Compound		Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)	MS	17.71	49% Recovery	667

Surrogate Pentacosane (C-25) Recovery: 84%

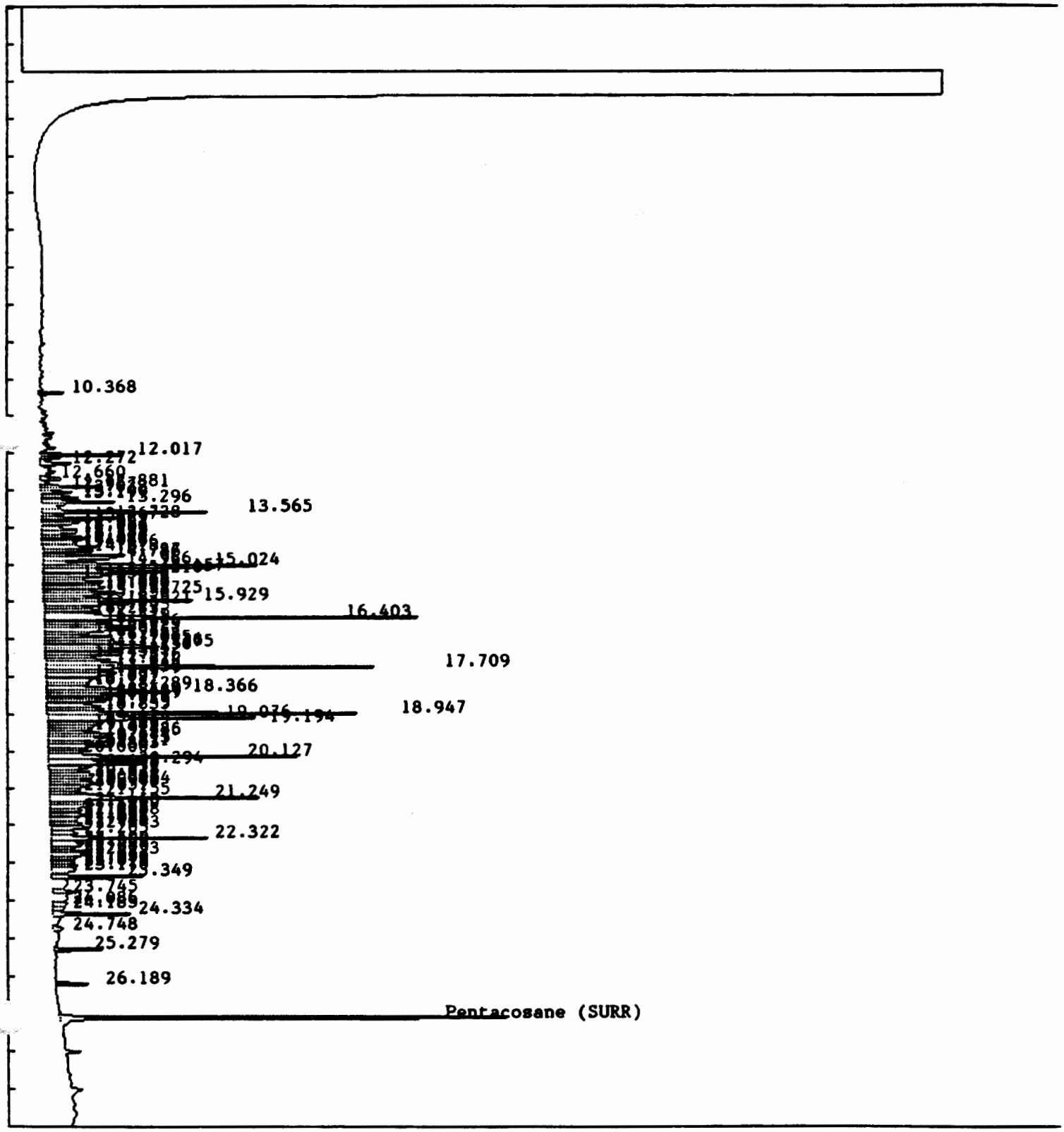
Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/kg):
Semivolatiles: 33400

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM11 B-3 6' - 8' Matrix Spike

File ID: /DATA/LOOP/RESULT/D176A061.RES
Date Analyzed: 2158 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/17
Bottle : 61
Run Time: 30.02 min.



Client: Walk Haydel and Assoc.
Sample: B-3 6-8'
Matrix Spike Duplicate
Lab ID: R106PM12
File ID: D176A062

Date Extracted: 06/20/91
Date Analyzed: 06/25/91
Time Analyzed: 22:35
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound		Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)	MS	17.71	53% Recovery	866

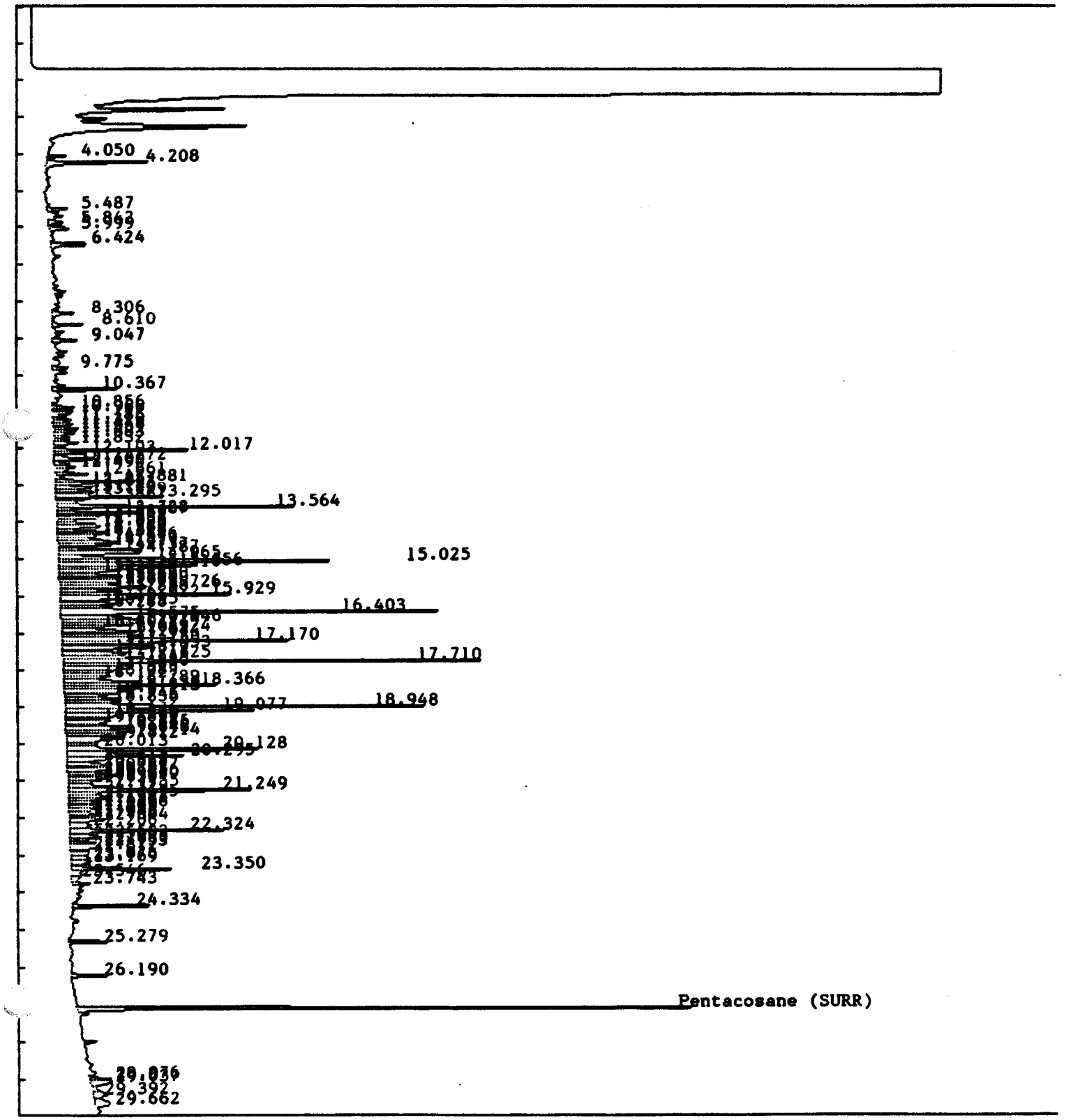
Surrogate Pentacosane (C-25) Recovery: 90%

Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/kg):
Semivolatiles: 43300

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM12 B-3 6' - 8' Matrix Spike Duplicate

File ID:	/DATA/LOOP/RESULT/D176A062.RES	Dil. Factor:	_____
Date Analyzed:	2235 25Jun1991	Instrument:	GC-D (HP 5890A)
Column:	30 M x 0.32 mm DB-1 (FSCC)	Seq/Smpl:	1/18
Detector:	Flame Ionization (FID)	Bottle :	62
Inj. Volume:	2.0 uL	Run Time:	30.00 min.



Client: Walk Haydel and Assoc.
Sample: B1A 0-2'

Lab ID: R106PM13
File ID: D176A063

Date Extracted: 06/20/91
Date Analyzed: 06/25/91
Time Analyzed: 23:12
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/kg)	POL (ug/kg)
TPH (as Diesel Oil)	9.28		31200	833

Surrogate Pentacosane (C-25) Recovery: 71%

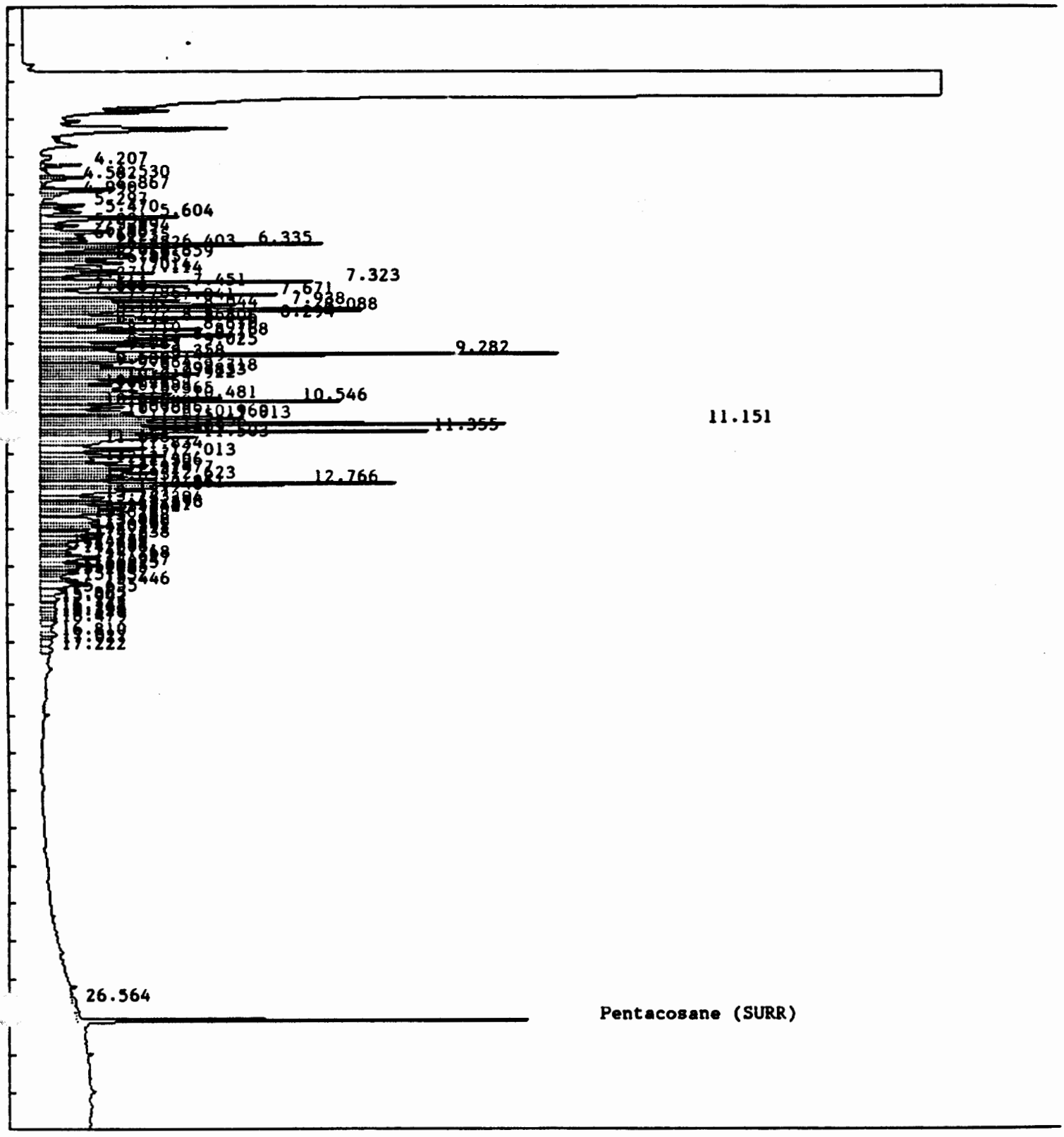
Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM13 B-1A 0' - 2'

File ID: /DATA/LOOP/RESULT/D176A063.RES
Date Analyzed: 2312 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/19
Bottle : 63
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: B-1A 2-4'

Lab ID: R106PM14
File ID: D176A074

Date Extracted: 06/20/91
Date Analyzed: 06/26/91
Time Analyzed: 16:23
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)	9.93		907000	15900

Surrogate Pentacosane (C-25) Recovery: 66%

Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

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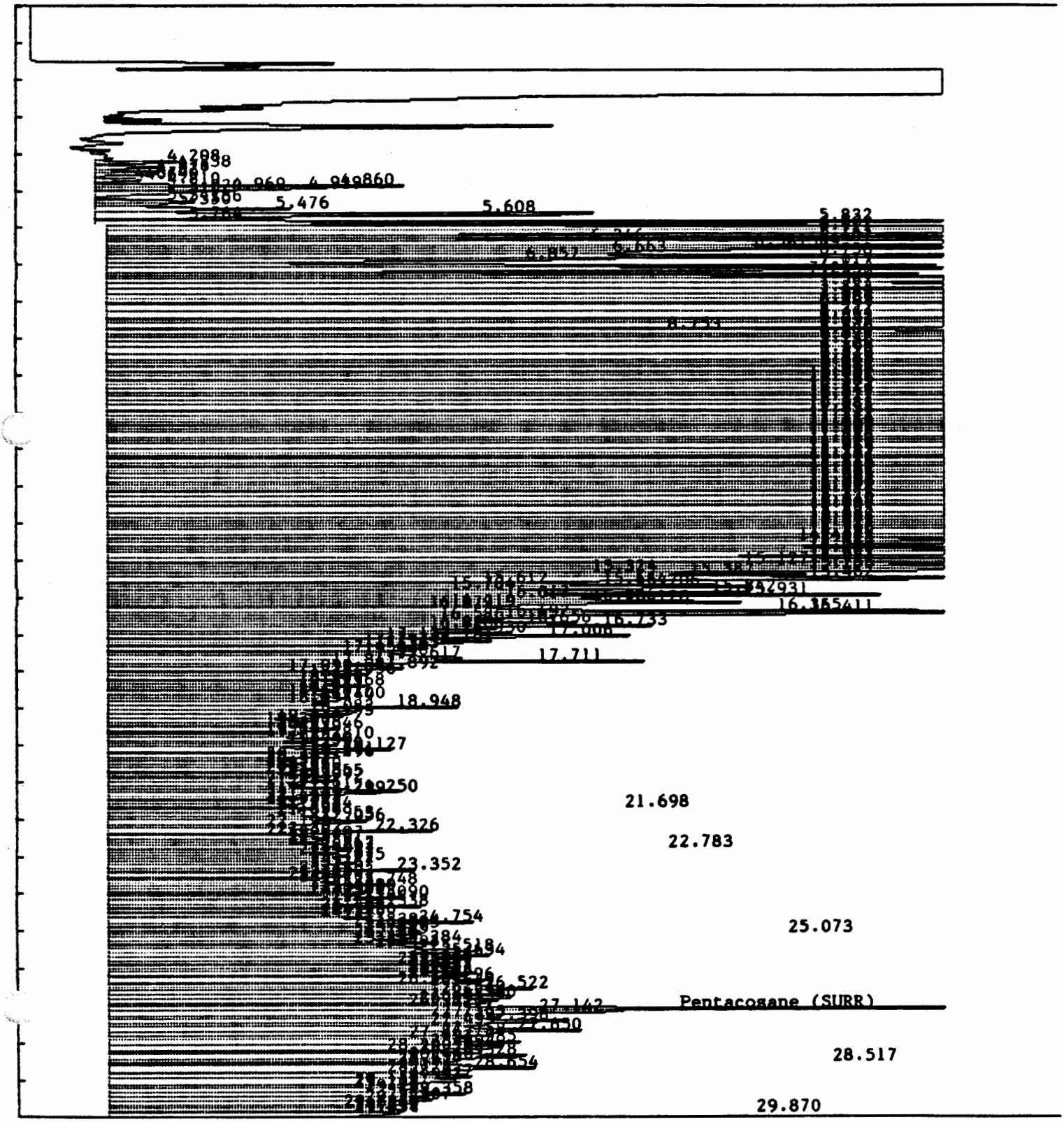
Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM14 B-1A 2' - 4'

File ID: /DATA/LOOP/RESULT/D176A064.RES
Date Analyzed: 2349 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

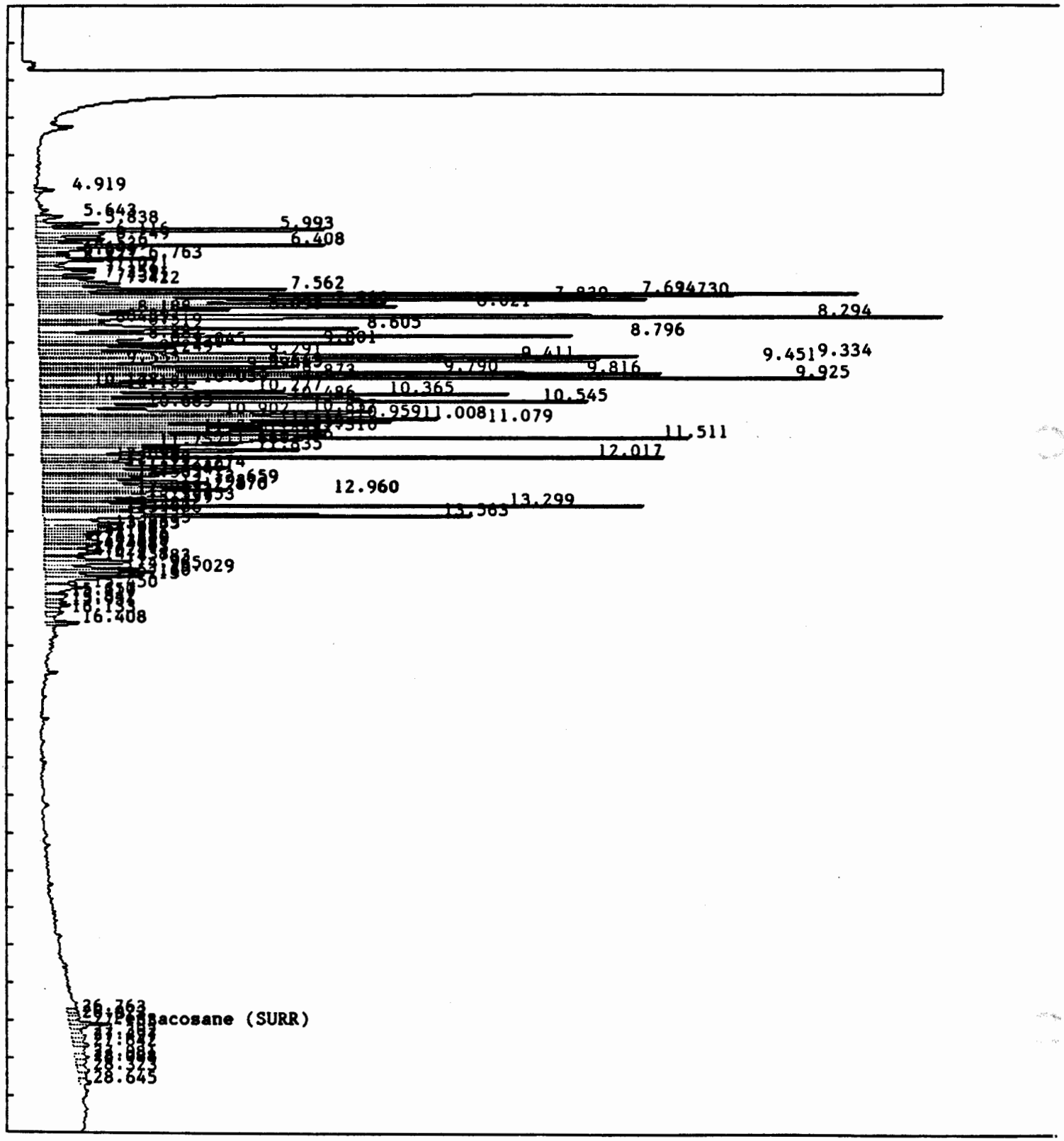
Dil. Factor: 1
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/20
Bottle : 64
Run Time: 30.00 min.



Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM14 B-1A 2'-4' (1:20 Dilution)

File ID: /DATA/LOOP/RESULT/D176A074.RES
Date Analyzed: 1623 26Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: 20
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/30
Bottle : 74
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: B1-A 4-6'

Lab ID: R106PM15
File ID: D176A075

Date Extracted: 06/20/91
Date Analyzed: 06/26/91
Time Analyzed: 17:00
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)	9.92	852000	15700

Surrogate Pentacosane (C-25) Recovery: 28%

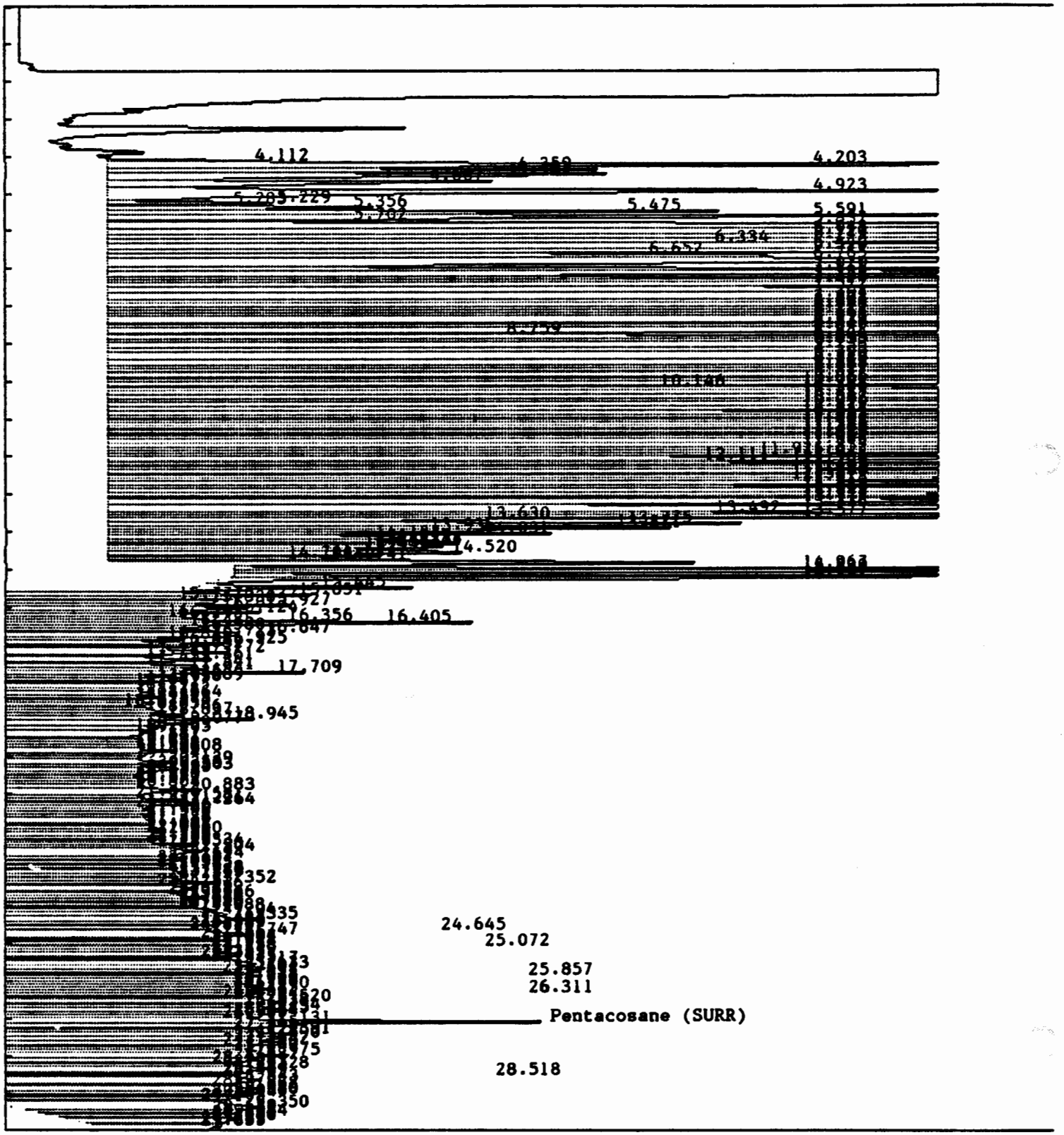
Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM15 B-1A 4' - 6'

File ID: /DATA/LOOP/RESULT/D176A065.RES
Date Analyzed: 0026 26Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

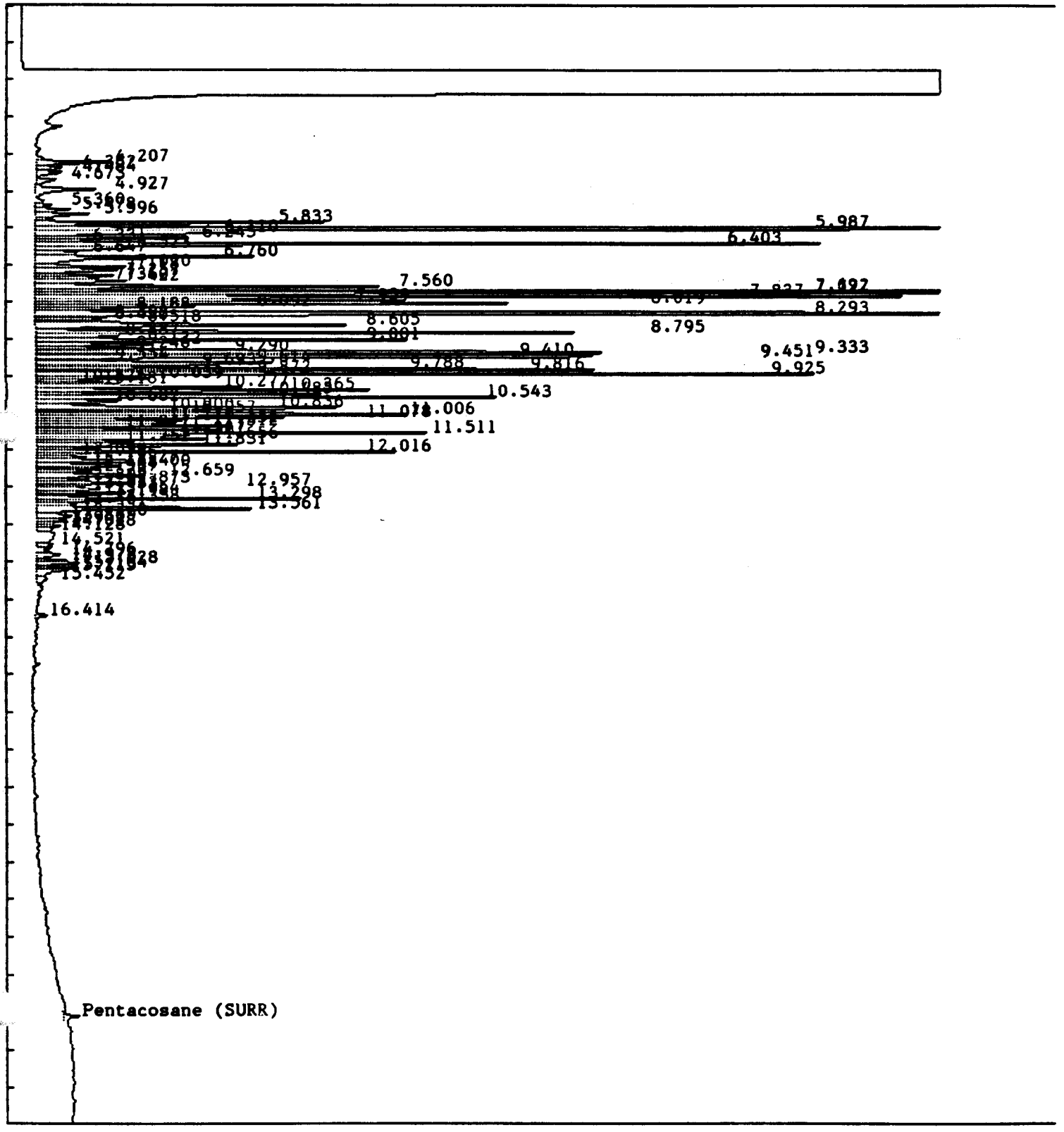
Dil. Factor: 1
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/21
Bottle : 65
Run Time: 30.00 min.



Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM15 B-1A 4'-6' (1:20 Dilution)

File ID: /DATA/LOOP/RESULT/D176A075.RES
Date Analyzed: 1700 26Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: 20
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/31
Bottle : 75
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: B-1A 6-8'

Lab ID: R106PM20
File ID: D176A076

Date Extracted: 06/20/91
Date Analyzed: 06/26/91
Time Analyzed: 17:38
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/13/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)	5.99		1440000	17100

Surrogate Pentacosane (C-25) Recovery: 49%

Corresponding Blank: D176A049

NOTES: Sample Results Based on Dry Weight
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

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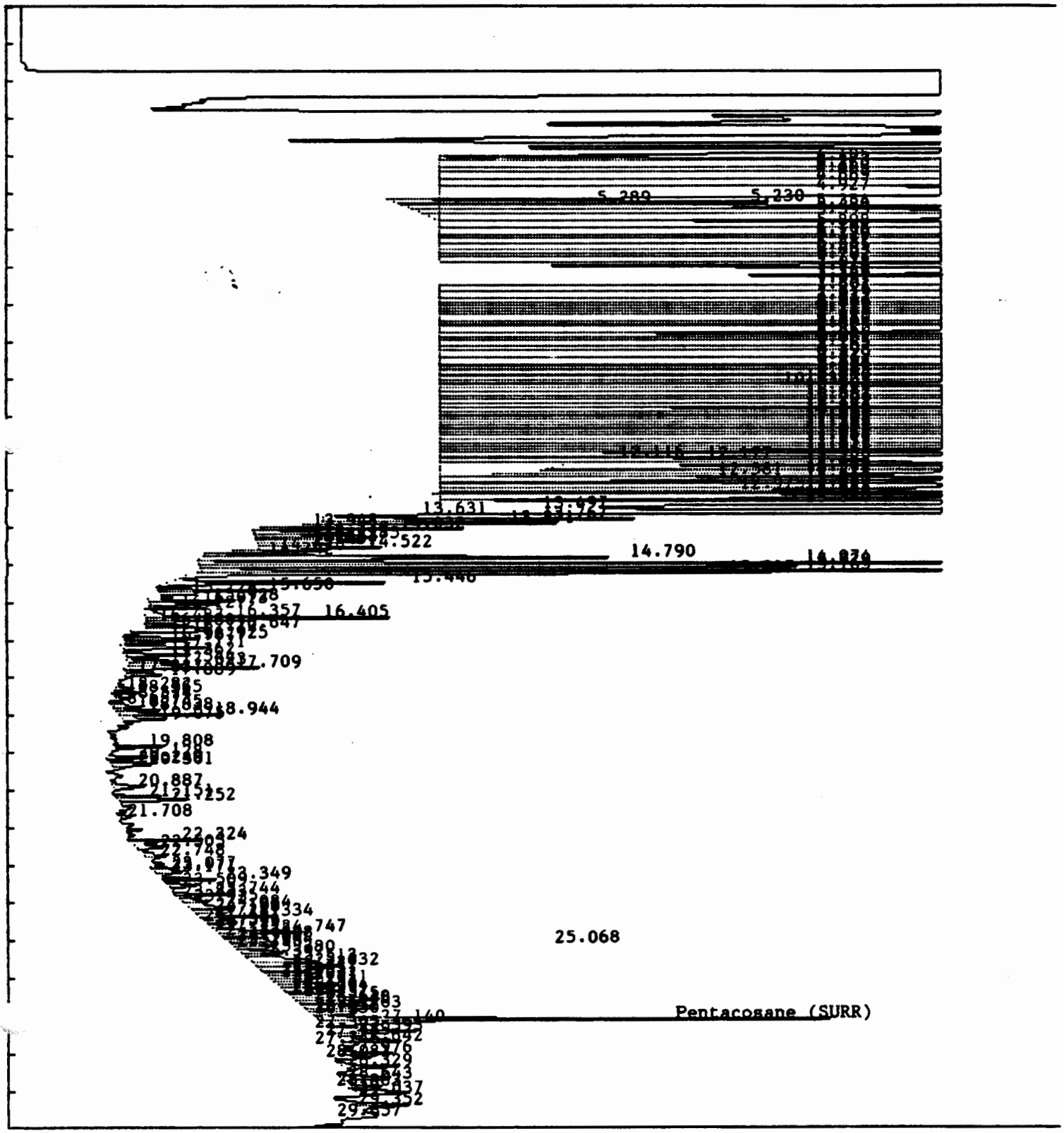
Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM20 B-1A 6' - 8'

File ID: /DATA/LOOP/RESULT/D176A066.RES
Date Analyzed: 0103 26Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

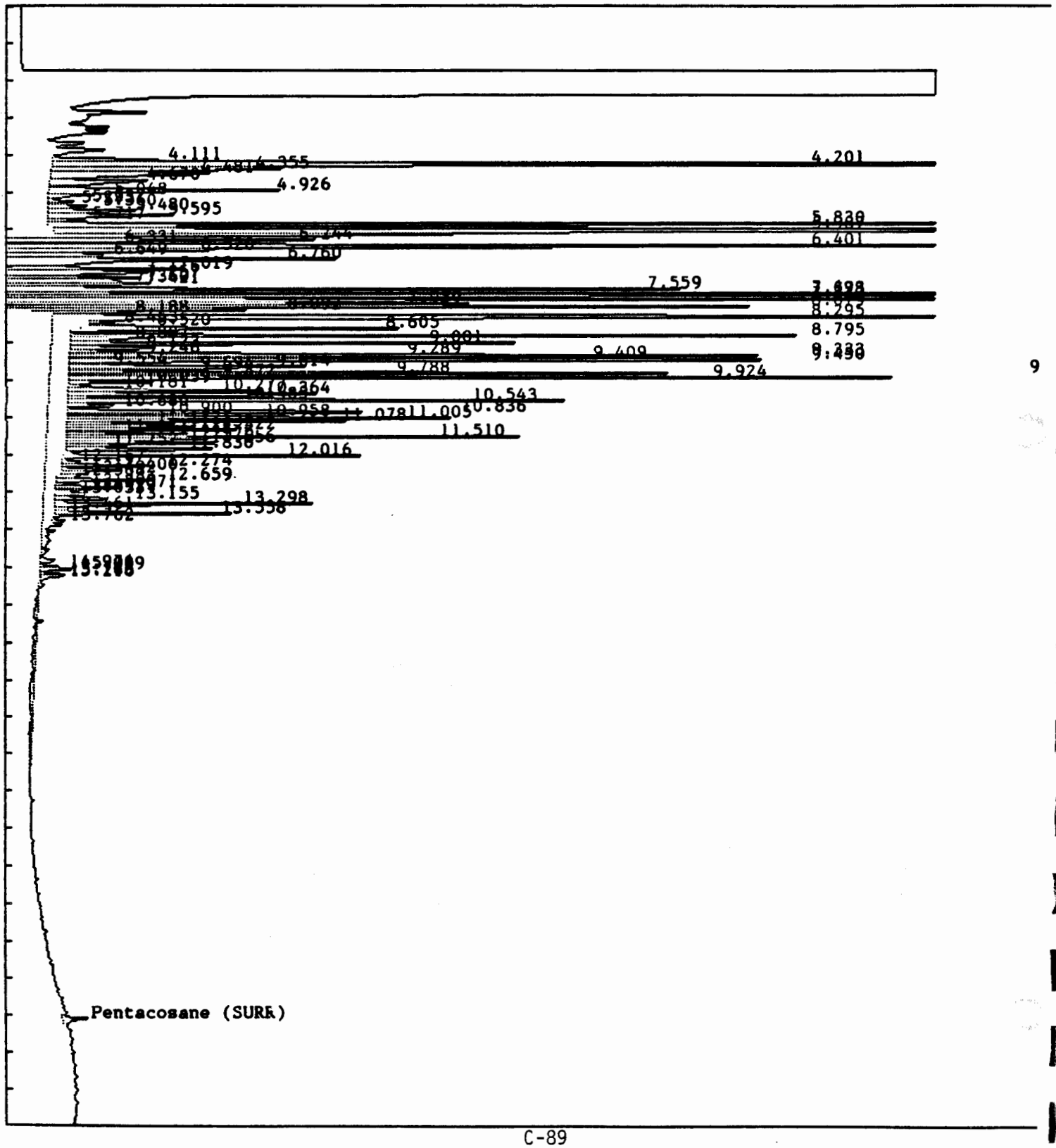
Dil. Factor: 1
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/22
Bottle : 66
Run Time: 30.00 min.



Total Petroleum Hydrocarbons Analysis
Sample Name: R106PM20 B-1A 6'-8' (1:20 Dilution)

File ID: /DATA/LOOP/RESULT/D176A076.RES
Date Analyzed: 1738 26Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: 20
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/32
Bottle : 76
Run Time: 29.98 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/20/91
Sample:	Extraction Blank	Date Analyzed:	06/25/91
		Time Analyzed:	14:27
Lab ID:	SBLK01	Analyst:	LSK
File ID:	D176A049	GC Method:	CALIF. LUFT

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/kg)	PQL (ug/kg)
TPH (as Diesel Oil)			BQL	667

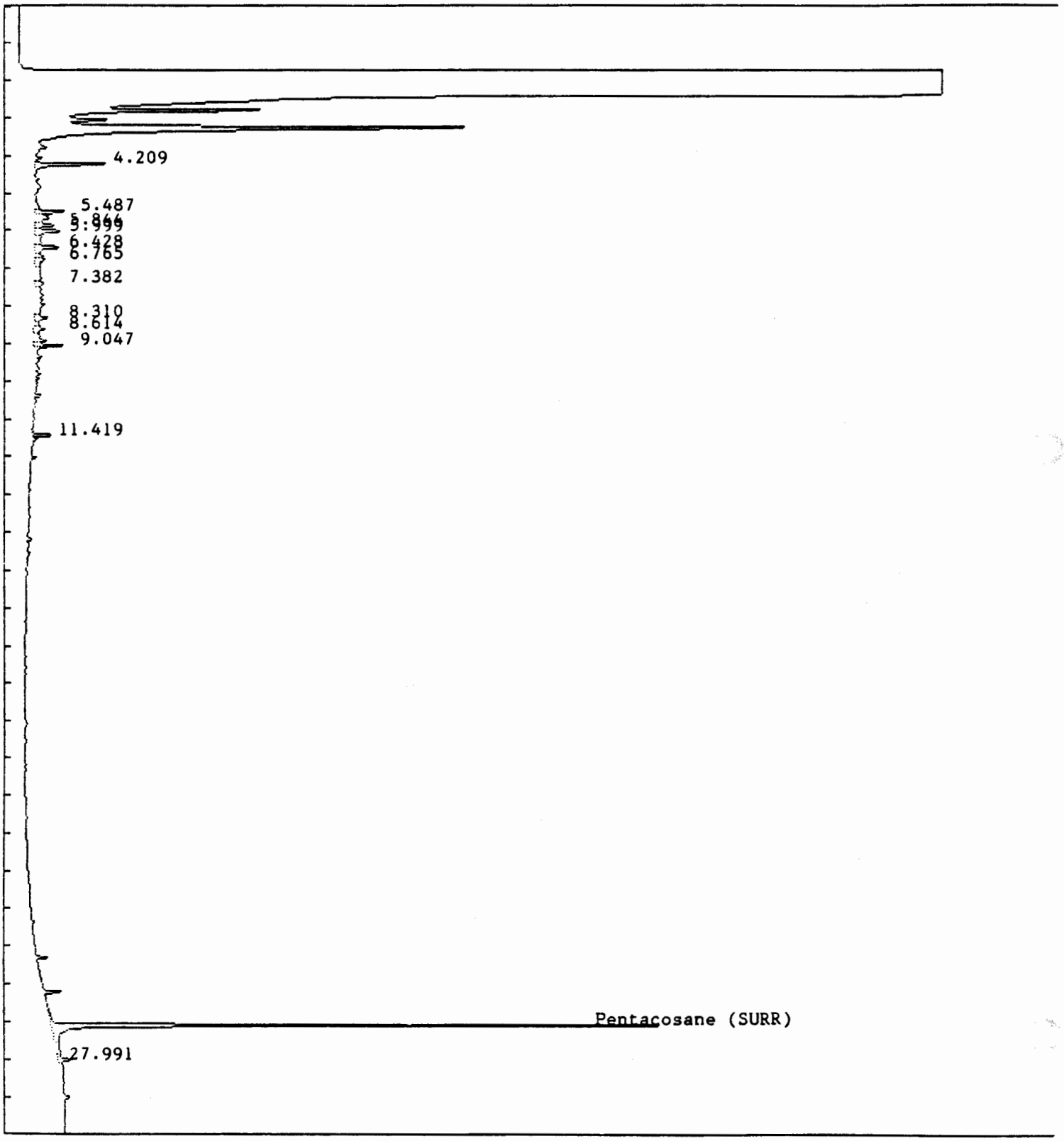
Surrogate Pentacosane (C-25) Recovery: 98%

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: **SBLK01** **Extraction Blank**

File ID: /DATA/LOOP/RESULT/D176A049.RES
Date Analyzed: 1427 25Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/ 5
Bottle : 49
Run Time: 30.00 min.



ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 James Drive West, Suite 100
St. Rose, Louisiana 70087
(504) 469-0333

GAS CHROMATOGRAPHY BLANK SPIKE QC RESULTS SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL (ug/kg)	BS % RECOVERY	BSD % RECOVERY	QC RANGE	RPD	RPD LIMIT
TPH (as Diesel Oil)	R106PM	43300	68%	70%	50-150	2	25

GAS CHROMATOGRAPHY MATRIX SPIKE QC RESULTS SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL (ug/kg)	MS % RECOVERY	MSD % RECOVERY	QC RANGE	RPD	RPD LIMIT
TPH (as Diesel Oil)	R106PM	43300	49% *	53%	50-150	7	25

NOTES:

* Value Exceeds QC Criteria

Lab Number: R106PM

PROCEDURE RECORDS

Test Methods for Evaluating Solid Waste,
Physical/Chemical Methods, SW-846, USEPA 3rd Edition, Revised November, 1986

Test	Method	Analyst	Date/Time Analyzed
Lead (graphite furnace)	3050/7421	LH	06/26/91 14:25
GC/MS Volatile Organics	8240	AS	SEE COMP. LIST

Leaking Underground Fuel Tank Field Manual:
Guidelines For Site Assessment, Cleanup, and Underground Storage Tank Closure, December 1987, State of California

Test	Method	Analyst	Date/Time Analyzed
Total Petroleum Hydrocarbons	Modified 8015	RM	SEE COMP. LIST

USEPA Methods for Chemical Analysis of Water and Wastes,
EPA-600/4-79-020, Revised March 1979.

Test	Method	Analyst	Date/Time Analyzed
Total Solids	160.3	DW	06/20/91 14:00

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 JAMES DRIVE WEST • SUITE 100
ST. ROSE, LA. 70087

COOLER RECEIPT FORM

MRD Cooler # _____

PROJECT: WALK HAYDEL + ASSOC. HAFB SITE SS-17 Date received: 6-14-91

USE OTHER SIDE OF THIS FORM TO NOTE DETAILS CONCERNING CHECK-IN PROBLEMS.

A. PRELIMINARY EXAMINATION PHASE: Date cooler was opened: 6-14-91

by (print) JACK CORTEZ (sign) [signature]

1. Did cooler come with a shipping slip (air bill, etc.)? ..... (YES) NO

   If YES, enter carrier name & air bill number here: FED EX # 6764998107

2. Were custody seals on outside of cooler? ..... (YES) NO

   If YES, how many & where: ONE ON FRONT RIGHT & ONE ON BACK LEFT

   If YES, enter the following: seal date: 6-13-91, seal name: GH

3. Were custody seals unbroken and intact at the date and time of arrival? ..... (YES) NO
4. Were custody papers sealed in a plastic bag & taped inside to the lid? ..... (YES) NO
5. Were custody papers filled out properly (ink, signed, etc.)? ..... (YES) NO
6. Did you sign custody papers in the appropriate place? ..... (YES) NO
7. Was project identifiable from custody papers? If YES, enter project name at the top of this form. (YES) NO
8. If required, was enough ice used? ..... (YES) NO
9. Have designated person initial here to acknowledge receipt of cooler: JC (date) 6-14-91

B. LOG-IN PHASE: Date samples were logged-in: 6-17-91

by (print) JACK CORTEZ (sign) [signature]

10. Describe type of packing in cooler: WOOD SHAVING
11. Were all bottles sealed in separate plastic bags? ..... (YES) NO
12. Did all bottles arrive unbroken & were labels in good condition? ..... (YES) NO
13. Were all bottle labels complete (ID, date, time, signature, preservative, etc.)? ..... (YES) NO
14. Did all bottle labels agree with custody papers? ..... (YES) NO
15. Were correct containers used for the tests indicated? ..... (YES) NO
16. Were correct preservatives added to samples? ..... (YES) NO
17. Was a sufficient amount of sample sent for tests indicated? ..... (YES) NO
18. Were bubbles absent in VOA samples? If NO, list by GAN: _____ (YES) NO
19. Was the shipment accepted? ..... (YES) NO
20. Was the project manager called and status discussed? If YES, give details on the back of this form. YES (NO)

21. Who was called ? By whom ? (date)

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

161 James Drive West
St. Rose, LA 70087
(504) 469-0333

CHAIN OF CUSTODY RECORD

PROJ. NO.: 5362.51

CLIENT: WHA WAFB Site SS-17

SAMPLES: (Signature and Initials)

SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	COMP	GRAB	SAMPLE I.D.	NO. OF CONTAINERS	SAMPLES PRESERVED (Y/N)	ANALYSIS REQUESTED: TPH-L	VOA	Tox/Pb			REMARKS	FOR LAB USE ONLY: LAB I.D. #
	6/13/91	1141		/	B-2 0.5-2.5'	4	Y	/	/					01
	6/13/91	1141	/		B-2 0.5-2.5'	1				/				01
	6/13/91	1147		/	B-2 2.5-4.5'	4		/	/					02
	6/13/91	1147	/		B-2 2.5-4.5'	1				/				02
	6/13/91	1152		/	B-2 4.5-6.5'	4		/	/					03
	6/13/91	1152	/		B-2 4.5-6.5'	1				/				03
	6/13/91	1204		/	B-2 6.5-8.5'	4		/	/					04
	6/13/91	1204			B-2 6.5-8.5'	1				/				04
	6/13/91	1247		/	B-3 0-2'	4		/	/					05
	6/13/91	1247	/		B-3 0-2'	1				/				05
	6/13/91	1251		/	B-3 2'-4'	4		/	/					06
	6/13/91	1251	/		B-3 2'-4'	1				/				06
	6/13/91	1258		/	B-3 4-6'	3		/	/					07
	6/13/91	1258	/		B-3 4-6'	1				/				07
	6/13/91	1305		/	B-3 6-8'	4		/	/					08

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)

Date/Time: 6-14 1000

Requested Turnaround: ____24 - 48 hours; ____Less than 5 days; ____Less than standard; ____Standard

Regulatory Concerns: ____RCRA; ____NPDES; ____Drinking Water; ____CLP; ____None; ____Other____

EPISODE ID: CA R106 Pn

LABORTARY APPROVAL REQUIRED PRIOR TO SAMPLE SUBMISSION

CONTACT NAME AND PHONE NUMBER

White Copy____ Canary Copy____ Pink Copy____

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

CHAIN OF CUSTODY RECORD

161 James Drive West
St. Rose, LA 70087
(504) 469-0333

PROJ. NO. 5362.51

CLIENT WHZA HAFB site SS-17

SAMPLES: (Signature and Initials)

SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	COMP	GRAB	SAMPLE I.D.	NO. OF CONTAINERS	SAMPLES PRESERVED (Y/N)	ANALYSIS REQUESTED: TPH-1	VOA	Total Pb				REMARKS	FOR LAB USE ONLY: LAB I.D. #
	6/13/91	1305	✓		B-3 6-8	1	Y			✓					08
	6/13/91	1305		✓	B-3 6-8 QC	4		✓	✓						08
	6/13/91	1402		✓	B1A 0-2'	4		✓	✓						09
	6/13/91	1402	✓		B1A 0-2'	1				✓					09
	6/13/91	1407		✓	B1A 2-4'	4		✓	✓						10
	6/13/91	1407			B1A 2-4'	1				✓					10
	6/13/91	1416		✓	B1A 4-6'	4		✓	✓						11
	6/13/91	1416	✓		B1A 4-6'	1				✓					11
	6/13/91	1420	✓		B1A QC-46'	1				✓					11
	6/13/91	1423		✓	B1A 6-8'	4		✓	✓						12
	6/13/91	1423	✓		B1A 6-8'	1	✓			✓					12

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
		6-14 1000

Requested Turnaround
_____24 - 48 hours
_____Less than 5 days
_____Less than standard
_____Standard

Regulatory Concerns
_____RCRA
_____NPDES
_____Drinking Water
_____CLP
_____None
_____Other_____

EPISODE ID R106 Pm

LABORTARY APPROVAL REQUIRED PRIOR TO SAMPLE SUBMISSION

CONTACT NAME AND PHONE NUMBER

White Copy_____ Canary Copy_____ Pink Copy_____

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 James Drive West, Suite 100
St. Rose, Louisiana 70087
(504) 469-0333

LABORATORY REPORT

Prepared for: WALK HAYDEL & ASSOC.
Attention: MR. RAY VACHON
600 CARONDELET ST.
NEW ORLEANS, LA 70130

Lab Episode Number: R106NP
Work Order Number: 5380
Date Received: 06/12/91

Task Order Number: 063
Job Number: 5362.51
Subcontract Number: 8889-001

NARRATIVE

SAMPLE ID	LAB ID	MATRIX
TH-20	R106NP01	WATER
MW-1	R106NP02	WATER
BS-BLANK SPIKE	R106NP03	WATER
BD-BLANK SPIKE DUPLICATE	R106NP04	WATER
MS-MW-1	R106NP05	WATER
MD-MW-1	R106NP06	WATER
MW-2	R106NP07	WATER
MW-5	R106NP08	WATER
TRIP BLANK #4	R106NP09	WATER
TRIP BLANK #3	R106NP10	WATER
UST NO. 2	R106NP11	LIQUID
BS-BLANK SPIKE	R106NP12	LIQUID
BD-BLANK SPIKE DUPLICATE	R106NP13	LIQUID
MS-UST NO. 2	R106NP14	LIQUID
MD-UST NO.2	R106NP15	LIQUID
BU-UST NO. 2	R106NP16	LIQUID
EFFLUENT	R106NP17	WATER
BS-BLANK SPIKE	R106NP18	WATER
BD-BLANK SPIKE DUPLICATE	R106NP19	WATER
MS-EFFLUENT	R106NP20	WATER
MD-EFFLUENT	R106NP21	WATER
EFFLUENT	R106NP22	WATER
BS-BLANK SPIKE	R106NP23	WATER
BD-BLANK SPIKE DUPLICATE	R106NP24	WATER
MS-EFFLUENT	R106NP25	WATER
MD-EFFLUENT	R106NP26	WATER
TRIP BLANK #2	R106NP27	WATER
TRIP BLANK #1	R106NP28	WATER

The above samples were received for the Holloman AFB Site SS-17 Project, and the samples were assigned the lab identification numbers as indicated. This Lab Episode is one of three belonging to this project: R106NP received 06/12/91, R106NS received 06/13/91 and R106PM received 06/14/91.

Tests for Volatile Organics (VOAs) by Method 8240, Total Petroleum Hydrocarbons (TPH) by Modified Method 8015, Total Lead by Method 3020/7421 and one Flash Point by Method 1010 were performed on the samples in accordance with the

Lab Number: R106NP
Page Number: 2

Narrative Continued -

assignments on the attached chain of custody record.

Samples listed on the chain of custody record with a "QC" designation were treated as requiring Blank Spike, Blank Spike Duplicate, Matrix Spike and Matrix Spike Duplicate determinations, and the samples prepared for this purpose are indicated by the prefixes "BS", "BD", "MS", and "MD" respectively in the Sample ID's given above. One exception is BU-UST NO. 2 where "BU" indicates a duplicate determination of flash point on sample UST NO. 2.

In the Quality Control VOA Matrix Spike Results Summary of Batch QC Sample 06NP26, a percent recovery for Benzene is above the QC Range and the Relative Percent Difference (RPD) is greater than the RPD Limit. This was due to interference from the high level of Benzene (17,000 ppb) in the EFFLUENT sample from which the Matrix Spikes were prepared.

In the Gas Chromatography QC Results Summary (for TPH) several parameters are outside of the QC Ranges or above the RPD Limits. A reextraction of the entire batch was scheduled but no sample remained. One extract, the matrix spike of "MW-1" was reinjected to confirm the findings. Although the blank spike and matrix spike duplicate results are erratic and below acceptable criteria, good correlation between the matrix spike (diesel oil) and the surrogate (pentacosane) is demonstrated. It appears that only a few extractions exhibited poor recovery. The sample surrogate recoveries ranged from 59 to 106%.

The chain of custody record is included with this report.

If you have any questions regarding this analysis, please contact the Project Coordinator.

Technical Review/Clerical Accuracy/Report Completeness Certified By:

Richard C. Koch, PhD
Project Coordinator

Date 7-1-91

Method Compliance Certified/Data Released By:

John R. Troost
V.P./Operations General Manager

Date 7/1/91

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Lab Number: R106NP
Page Number: 3

GENERAL CHEMISTRY RESULTS

TH-20
DATE/TIME SAMPLED: 06/11/91 09:25:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	0.028	mg/l (ppm)	0.005	-

MW-1
DATE/TIME SAMPLED: 06/11/91 10:32:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	0.008	mg/l (ppm)	0.005	-

BLANK SPIKE

Test	% Recovery	SL	Units
Lead (graphite furnace)	97	0.04	mg/l (ppm)

BLANK SPIKE DUPLICATE

Test	% Recovery	SL	Units
Lead (graphite furnace)	96	0.04	mg/l (ppm)

MATRIX SPIKE MW-1

Test	% Recovery	SL	Units
Lead (graphite furnace)	99	0.04	mg/l (ppm)

MATRIX SPIKE DUPLICATE MW-1

Test	% Recovery	SL	Units
Lead (graphite furnace)	100	0.04	mg/l (ppm)

MW-2
DATE/TIME SAMPLED: 06/11/91 11:30:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	0.005	mg/l (ppm)	0.005	-

Lab Number: R106NP
Page Number: 4

MW-5
DATE/TIME SAMPLED: 06/11/91 12:45:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	0.015	mg/l (ppm)	0.005	-

UST NO. 2
DATE/TIME SAMPLED: 06/10/91 19:18:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	3.2	mg/l (ppm)	0.25	50
Flash Point	≤25	deg.C	-	-

BLANK SPIKE

Test	% Recovery	SL	Units
Lead (graphite furnace)	111	0.04	mg/l (ppm)

BLANK SPIKE DUPLICATE

Test	% Recovery	SL	Units
Lead (graphite furnace)	98	0.04	mg/l (ppm)

MATRIX SPIKE UST NO. 2

Test	% Recovery	SL	Units
Lead (graphite furnace)	DO	0.04	mg/l (ppm)

MATRIX SPIKE DUPLICATE UST NO.2

Test	% Recovery	SL	Units
Lead (graphite furnace)	DO	0.04	mg/l (ppm)

DUPLICATE UST NO. 2

Test	Concentration	Units	PQL	DF
Flash Point	≤25	deg.C	-	-

Lab Number: R106NP
Page Number: 5

EFFLUENT
DATE/TIME SAMPLED: 06/10/91 16:49:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	BQL	mg/l (ppm)	0.005	-

BLANK SPIKE

Test	% Recovery	SL	Units
Lead (graphite furnace)	96	0.04	mg/l (ppm)

BLANK SPIKE DUPLICATE

Test	% Recovery	SL	Units
Lead (graphite furnace)	96	0.04	mg/l (ppm)

MATRIX SPIKE EFFLUENT

Test	% Recovery	SL	Units
Lead (graphite furnace)	95	0.04	mg/l (ppm)

MATRIX SPIKE DUPLICATE EFFLUENT

Test	% Recovery	SL	Units
Lead (graphite furnace)	96	0.04	mg/l (ppm)

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	PQL
Lead (graphite furnace)	BQL	mg/l (ppm)	0.005

BQL: Below Quantitation Limit
DF: Dilution Factor
PQL: Practical Quantitation Limit
SL: Spike Level

Lab Number: R106NP
Page Number: 6

QC REPORT

BLANK SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% Recovery	Dup. % Recovery	QC Range	RPD	RPD Limit
Lead (graphite furnace)	06NP02	0.04 mg/l	97	96	80-120	1	20
Lead (graphite furnace)	06NP11	0.04 mg/l	111	98	80-120	12	20
Lead (graphite furnace)	06NP22	0.04 mg/l	96	96	80-120	0	20

MATRIX SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% Recovery	Dup. % Recovery	ADVSY Range	RPD	RPD Limit
Lead (graphite furnace)	06NP02	0.04 mg/l	99	100	80-120	1	20
Lead (graphite furnace)	06NP11	0.04 mg/l	DO	DO	80-120	-	20
Lead (graphite furnace)	06NP22	0.04 mg/l	95	96	80-120	1	20

DO: Diluted Out
RPD: Relative Percent Difference
NOTE: A set of blank spikes is analyzed after every twentieth sample. Blank spike recoveries exceeding an established "QC Range" or "RPD Limit" trigger reanalysis of all samples in the batch. Results of matrix spikes, performed in duplicate on the twentieth field sample in a batch, exceeding "ADVSY Range" or "ADVSY RPD", are generally reported without remediation. Established ranges and limits are actual registers of the precision and accuracy capabilities of the methods on clean matrices and genuine field samples.

Client: WALK-HAYDEL & ASSOC.
Sample: TH-20
Lab ID: R106NP01
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/19/91
Date Sampled: 06/11/91
Data File ID: RE170P

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane	11.39	440. D	25.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene	11.35	16.	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	104	76-114
Toluene-d8	98	88-110
4-Bromofluorobenzene	96	86-115

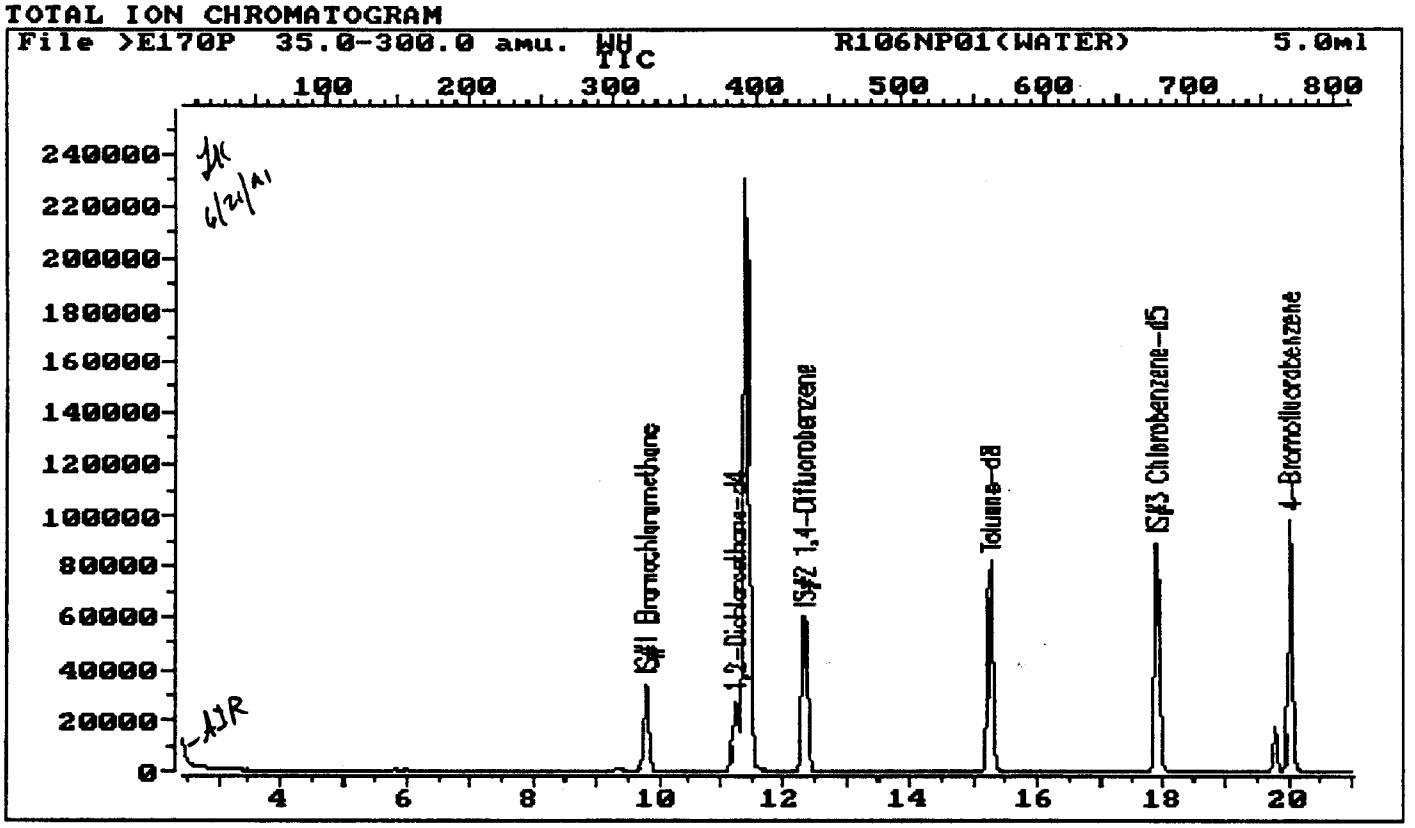
pH 2

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RE170J

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM

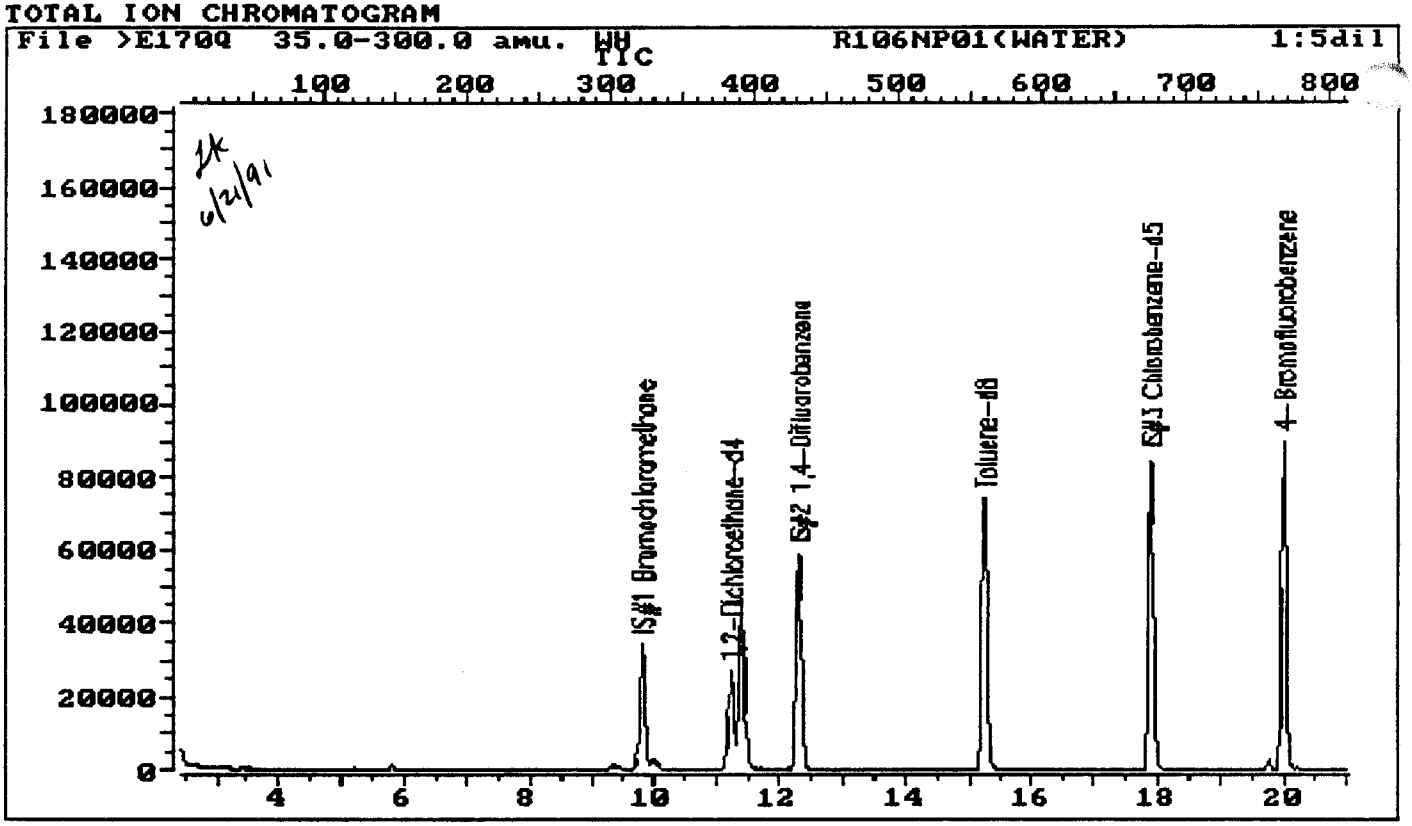


Data File: >E170P::D3 Quant Output File: ^E170P::QT
Name: WH R106NP01
Misc: (WATER) 5.0ml TH-20 INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910619 15:17

Operator ID: JOHN
Quant Time: 910619 20:09
Injected at: 910619 19:41

TOTAL ION CHROMATOGRAM



Data File: >E170Q::D3 Quant Output File: ^E170Q::QT
Name: WH R106NP01
Misc: (WATER) 1:5dil TH-20 INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910619 15:17

Operator ID: JOHN
Quant Time: 910619 20:52
Injected at: 910619 20:30

Client: WALK-HAYDEL & ASSOC.
Sample: MW-1
Lab ID: R106NP02
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/19/91
Date Sampled: 06/11/91
Data File ID: RE170M

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	500.
Acrylonitrile		BQL	500.
Chloromethane		BQL	100.
Bromomethane		BQL	100.
Vinyl Chloride		BQL	100.
Chloroethane		BQL	100.
Methylene Chloride		BQL	50.
1,1-Dichloroethene		BQL	50.
1,1-Dichloroethane		BQL	50.
1,2-Dichloroethene (total)		BQL	50.
Trichlorofluoromethane		BQL	50.
Chloroform		BQL	50.
1,2-Dichloroethane	11.44	870.	50.
1,1,1-Trichloroethane		BQL	50.
Carbon Tetrachloride		BQL	50.
Bromodichloromethane		BQL	50.
1,2-Dichloropropane		BQL	50.
trans-1,3-Dichloropropene		BQL	50.
Trichloroethene		BQL	50.
Dibromochloromethane		BQL	50.
1,1,2-Trichloroethane		BQL	50.
Benzene		BQL	50.
cis-1,3-Dichloropropene		BQL	50.
Bromoform		BQL	50.
Tetrachloroethene		BQL	50.
1,1,2,2-Tetrachloroethane		BQL	50.
Toluene		BQL	50.
Chlorobenzene		BQL	50.
Ethylbenzene		BQL	50.
2-Chloroethylvinyl ether (1)		BQL	100.
Acetone		BQL	100.
Carbon Disulfide		BQL	50.
2-Butanone		BQL	100.
Vinyl Acetate		BQL	100.
2-Hexanone		BQL	100.
4-Methyl-2-Pentanone		BQL	100.
Styrene		BQL	50.
Xylene (total)		BQL	50.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	102	76-114
Toluene-d8	96	88-110
4-Bromofluorobenzene	92	86-115

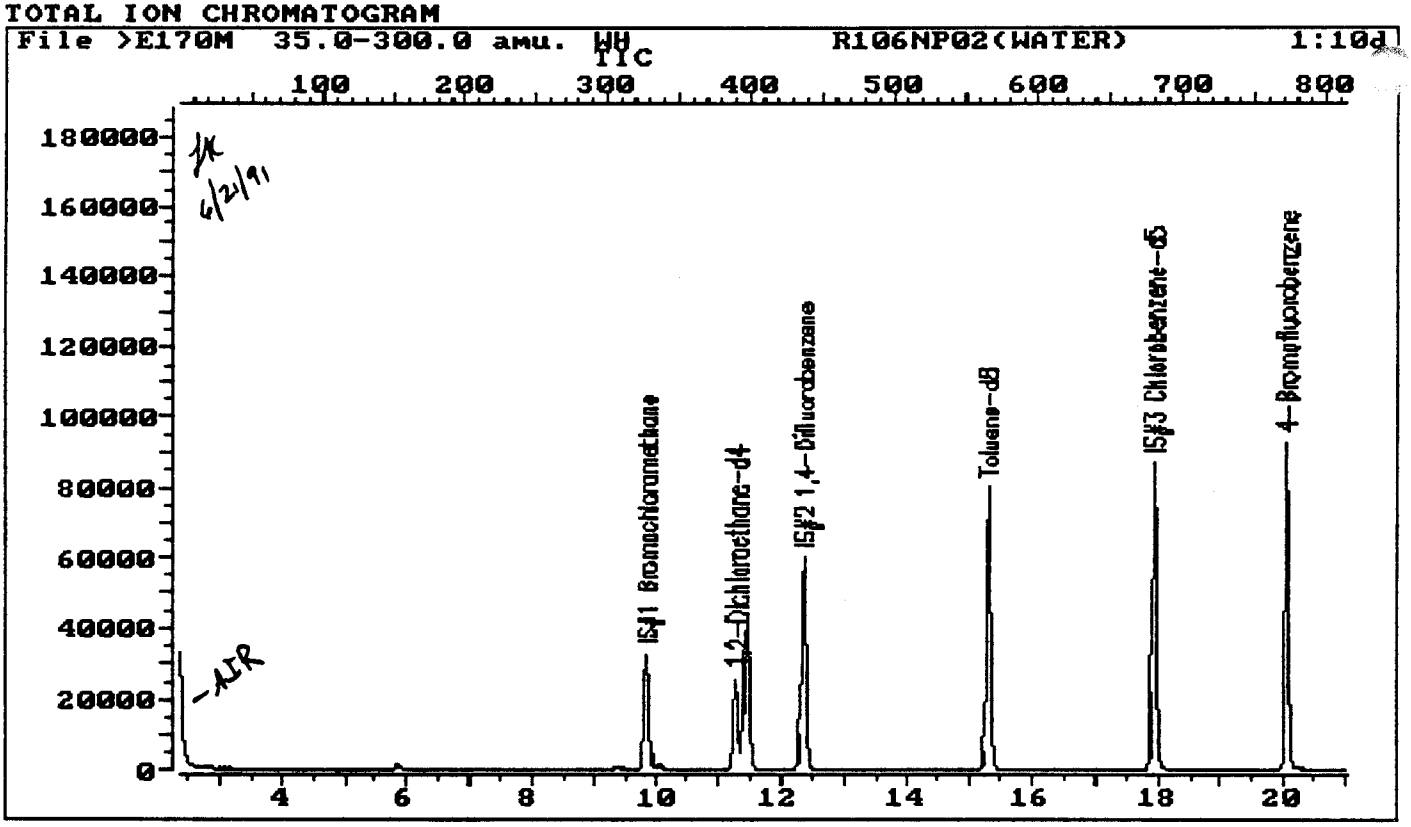
pH 2

Surrogate Spike Level: 500 ug/l
Associated Blank: VOA RE170J

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E170M::D3 Quant Output File: ^E170M::QT
Name: WH R106NP02
Misc: (WATER) 1:10dil MW-1 INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910619 15:17

Operator ID: JOHN
Quant Time: 910619 18:01
Injected at: 910619 17:33

Client: WALK-HAYDEL & ASSOC.
Sample: VOA BLANK SPIKE E170K
Lab ID: BS06NP03
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/19/91
Date Sampled: NA
Data File ID: RE170K

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	POL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene	4.91	96% MS Recovery	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene	12.84	97% MS Recovery	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene	11.37	102% MS Recovery	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene	15.40	94% MS Recovery	5.
Chlorobenzene	18.00	95% MS Recovery	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	98	76-114
Toluene-d8	95	88-110
4-Bromofluorobenzene	94	86-115

pH NA

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RE170J

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 50 ug/l

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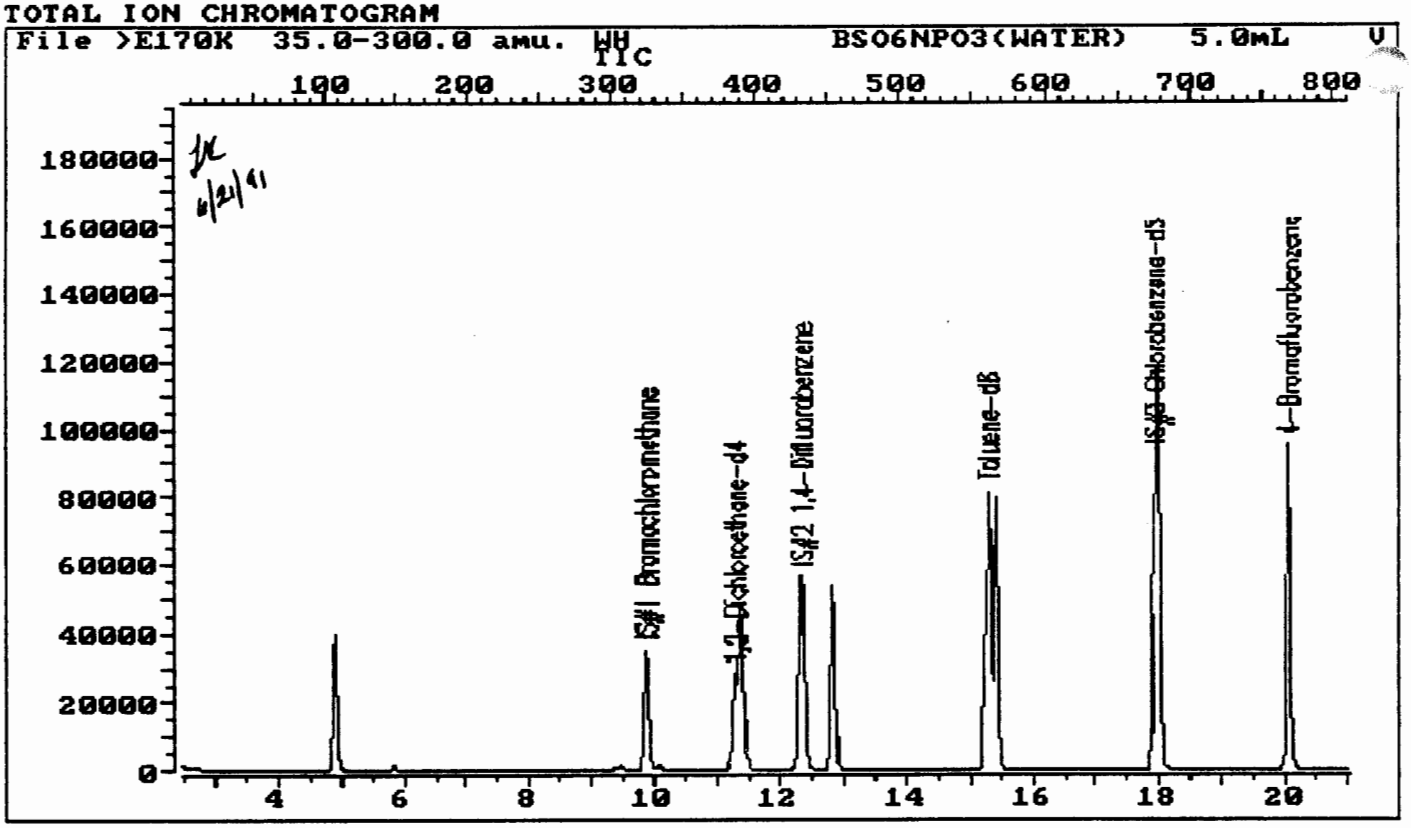
TOTAL ION CHROMATOGRAM



Data File: >E170K::D3 Quant Output File: ^E170K::QT
Name: WH BSO6NPO3
Misc: (WATER) 5.0mL VOA BLANK SPIKE E170K INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910619 15:17

Operator ID: BRUCE
Quant Time: 910619 16:44
Injected at: 910619 16:13

Client: WALK-HAYDEL & ASSOC.
Sample: VOA BLANK SPIKE DUP. E170L
Lab ID: BD06NP04
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/19/91
Date Sampled: NA
Data File ID: RE170L

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene	4.93	101% MS Recovery	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene	12.88	91% MS Recovery	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene	11.41	105% MS Recovery	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene	15.43	94% MS Recovery	5.
Chlorobenzene	17.99	95% MS Recovery	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	106	76-114
Toluene-d8	94	88-110
4-Bromofluorobenzene	91	86-115

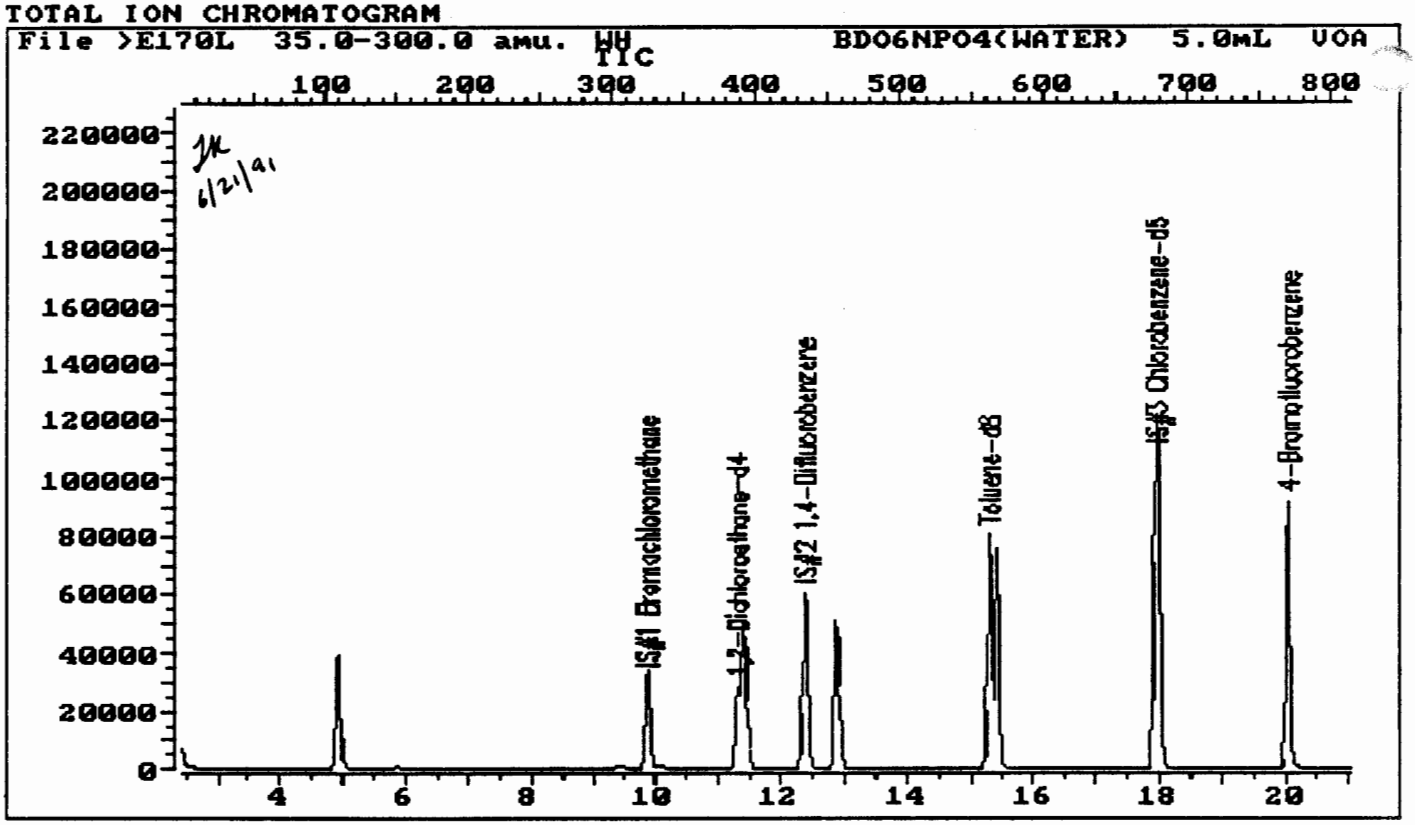
pH NA

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RE170J

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 50 ug/l

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E170L::D3 Quant Output File: ^E170L::QT
Name: WH BDO6NPO4
Misc: (WATER) 5.0mL VOA BLANK SPIKE DUP. E170L INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910619 15:17

Operator ID: BRUCE
Quant Time: 910619 17:22
Injected at: 910619 16:52

Client: WALK-HAYDEL & ASSOC.
Sample: MW-1 MATRIX SPIKE
Lab ID: MS06NP05
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/19/91
Date Sampled: 06/11/91
Data File ID: RE170N

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	500.
Acrylonitrile		BQL	500.
Chloromethane		BQL	100.
Bromomethane		BQL	100.
Vinyl Chloride		BQL	100.
Chloroethane		BQL	100.
Methylene Chloride		BQL	50.
1,1-Dichloroethene	4.86	96% MS Recovery	50.
1,1-Dichloroethane		BQL	50.
1,2-Dichloroethene (total)		BQL	50.
Trichlorofluoromethane		BQL	50.
Chloroform		BQL	50.
1,2-Dichloroethane	11.42	830.	50.
1,1,1-Trichloroethane		BQL	50.
Carbon Tetrachloride		BQL	50.
Bromodichloromethane		BQL	50.
1,2-Dichloropropane		BQL	50.
trans-1,3-Dichloropropene		BQL	50.
Trichloroethene	12.77	92% MS Recovery	50.
Dibromochloromethane		BQL	50.
1,1,2-Trichloroethane		BQL	50.
Benzene	11.35	101% MS Recovery	50.
cis-1,3-Dichloropropene		BQL	50.
Bromoform		BQL	50.
Tetrachloroethene		BQL	50.
1,1,2,2-Tetrachloroethane		BQL	50.
Toluene	15.31	93% MS Recovery	50.
Chlorobenzene	17.93	95% MS Recovery	50.
Ethylbenzene		BQL	50.
2-Chloroethylvinyl ether (1)		BQL	100.
Acetone		BQL	100.
Carbon Disulfide		BQL	50.
2-Butanone		BQL	100.
Vinyl Acetate		BQL	100.
2-Hexanone		BQL	100.
4-Methyl-2-Pentanone		BQL	100.
Styrene		BQL	50.
Xylene (total)		BQL	50.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	99	76-114
Toluene-d8	95	88-110
4-Bromofluorobenzene	94	86-115

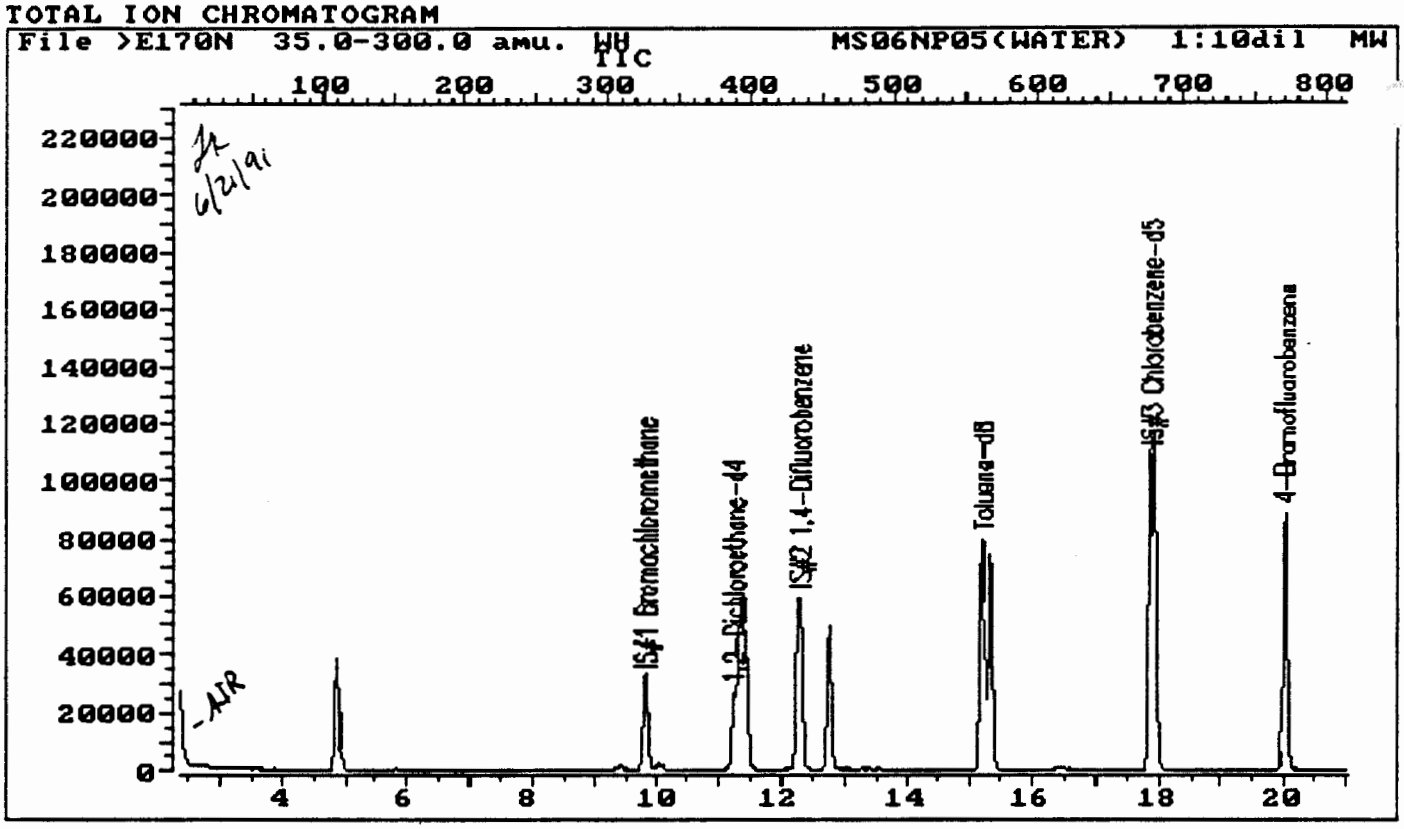
pH 2

Surrogate Spike Level: 500 ug/l
Associated Blank: VOA RE170J

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 500 ug/l

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E170N::D3 Quant Output File: ^E170N::QT
Name: WH MS06NP05
Misc: (WATER) 1:10dil MW-1 MATRIX SPIKE INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910619 15:17

Operator ID: JOHN
Quant Time: 910619 18:44
Injected at: 910619 18:20

Client: WALK-HAYDEL & ASSOC.
Sample: MW-1 MATRIX SPIKE DUP.
Lab ID: MD06NP06
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/19/91
Date Sampled: 06/11/91
Data File ID: RE1700

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	500.
Acrylonitrile		BQL	500.
Chloromethane		BQL	100.
Bromomethane		BQL	100.
Vinyl Chloride		BQL	100.
Chloroethane		BQL	100.
Methylene Chloride		BQL	50.
1.1-Dichloroethene	4.88	95% MS Recovery	50.
1.1-Dichloroethane		BQL	50.
1.2-Dichloroethene (total)		BQL	50.
Trichlorofluoromethane		BQL	50.
Chloroform		BQL	50.
1.2-Dichloroethane	11.44	860.	50.
1.1.1-Trichloroethane		BQL	50.
Carbon Tetrachloride		BQL	50.
Bromodichloromethane		BQL	50.
1.2-Dichloropropane		BQL	50.
trans-1.3-Dichloropropene		BQL	50.
Trichloroethene	12.84	93% MS Recovery	50.
Dibromochloromethane		BQL	50.
1.1.2-Trichloroethane		BQL	50.
Benzene	11.37	104% MS Recovery	50.
cis-1.3-Dichloropropene		BQL	50.
Bromoform		BQL	50.
Tetrachloroethene		BQL	50.
1.1.2.2-Tetrachloroethane		BQL	50.
Toluene	15.40	97% MS Recovery	50.
Chlorobenzene	17.97	97% MS Recovery	50.
Ethylbenzene		BQL	50.
2-Chloroethylvinyl ether (1)		BQL	100.
Acetone		BQL	100.
Carbon Disulfide		BQL	50.
2-Butanone		BQL	100.
Vinyl Acetate		BQL	100.
2-Hexanone		BQL	100.
4-Methyl-2-Pentanone		BQL	100.
Styrene		BQL	50.
Xylene (total)		BQL	50.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	101	76-114
Toluene-d8	95	88-110
4-Bromofluorobenzene	95	86-115

pH 2

Surrogate Spike Level: 500 ug/l
Associated Blank: VOA RE170J

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 500 ug/l

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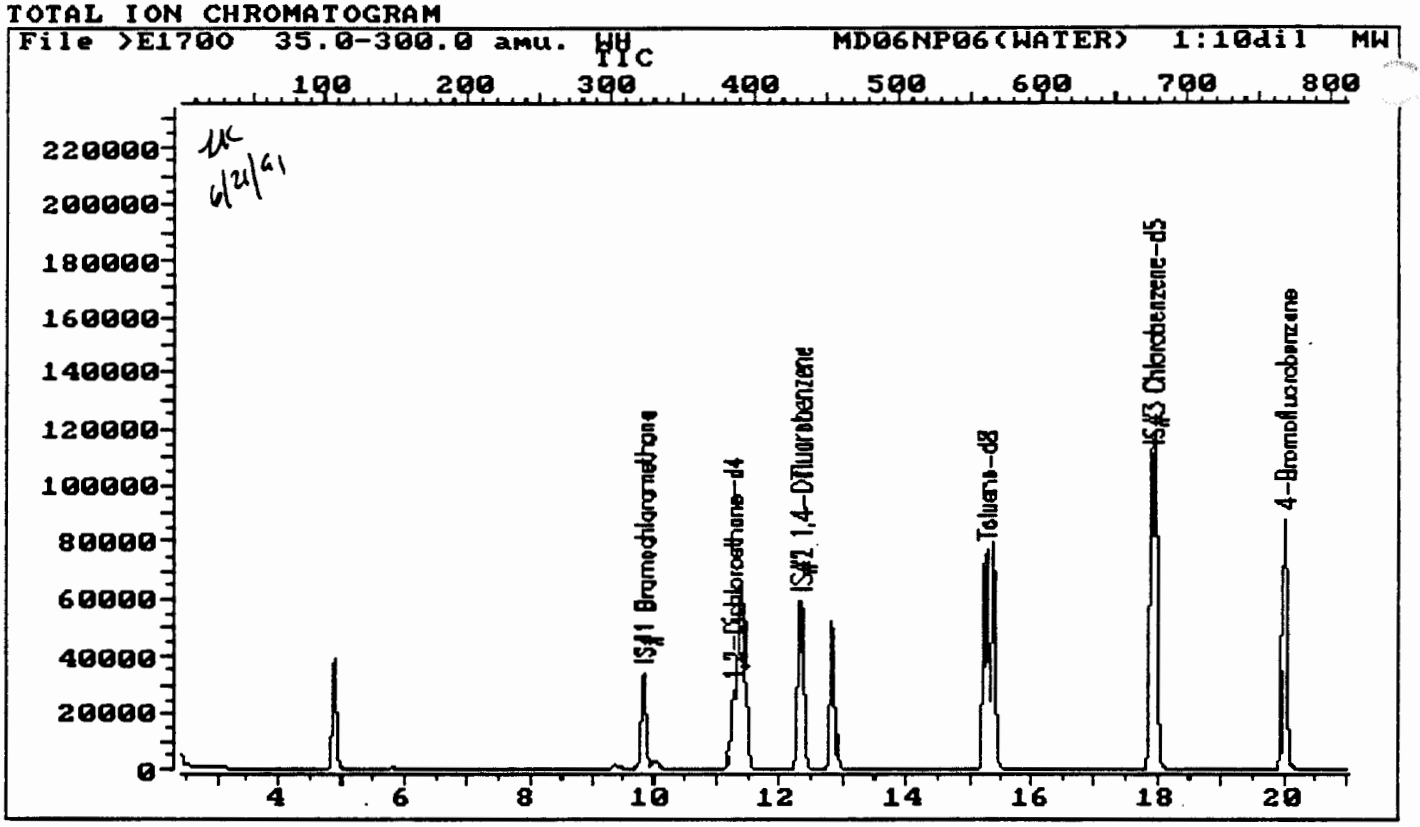
TOTAL ION CHROMATOGRAM



Data File: >E1700::D3 Quant Output File: ^E1700::QT
Name: WH MD06NP06
Misc: (WATER) 1:10dil MW-1 MATRIX SPIKE DUP. INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910619 15:17

Operator ID: JOHN
Quant Time: 910619 19:30
Injected at: 910619 18:59

Client: WALK-HAYDEL & ASSOC.
Sample: MW-2
Lab ID: R106NP07
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/19/91
Date Sampled: 06/11/91
Data File ID: RE170S

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane	11.41	260.	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	99	76-114
Toluene-d8	94	88-110
4-Bromofluorobenzene	96	86-115

pH 2

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RE170J

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

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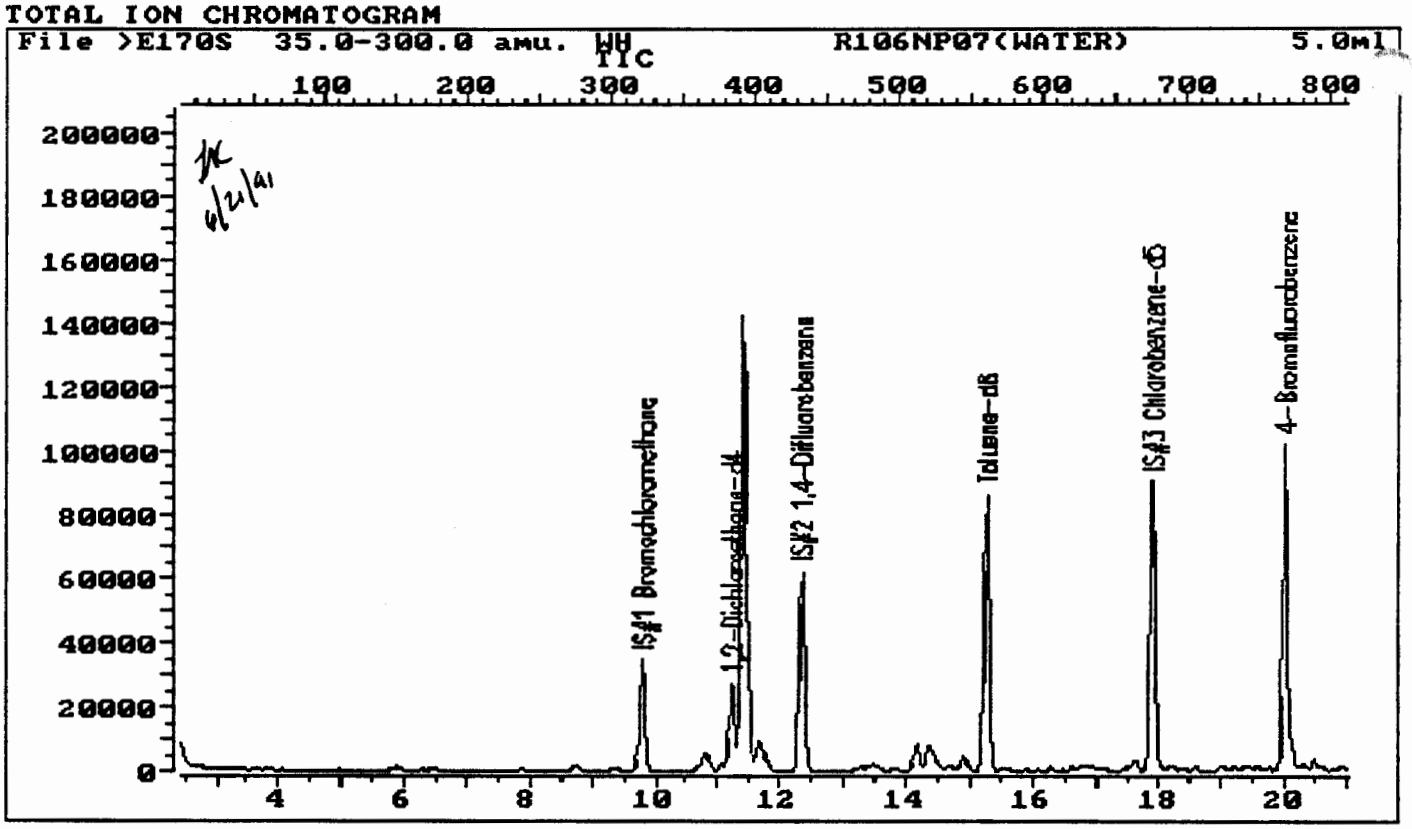
TOTAL ION CHROMATOGRAM



Data File: >E170S::D3 Quant Output File: ^E170S::QT
Name: WH R106NP07
Misc: (WATER) 5.0ml MW-2 INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910619 15:17

Operator ID: JOHN
Quant Time: 910619 21:37
Injected at: 910619 21:05

Client: WALK-HAYDEL & ASSOC.
Sample: MW-5
Lab ID: R106NP08
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/21/91
Date Sampled: 06/11/91
Data File ID: RE172D

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	250.
Acrylonitrile		BQL	250.
Chloromethane		BQL	50.
Bromomethane		BQL	50.
Vinyl Chloride		BQL	50.
Chloroethane		BQL	50.
Methylene Chloride		BQL	25.
1,1-Dichloroethene		BQL	25.
1,1-Dichloroethane		BQL	25.
1,2-Dichloroethene (total)		BQL	25.
Trichlorofluoromethane		BQL	25.
Chloroform		BQL	25.
1,2-Dichloroethane	11.43	120.	25.
1,1,1-Trichloroethane		BQL	25.
Carbon Tetrachloride		BQL	25.
Bromodichloromethane		BQL	25.
1,2-Dichloropropane		BQL	25.
trans-1,3-Dichloropropene		BQL	25.
Trichloroethene		BQL	25.
Dibromochloromethane		BQL	25.
1,1,2-Trichloroethane		BQL	25.
Benzene	11.36	1400.	25.
cis-1,3-Dichloropropene		BQL	25.
Bromoform		BQL	25.
Tetrachloroethene		BQL	25.
1,1,2,2-Tetrachloroethane		BQL	25.
Toluene	15.40	42.	25.
Chlorobenzene		BQL	25.
Ethylbenzene	18.19	980.	25.
2-Chloroethylvinyl ether (1)		BQL	50.
Acetone		BQL	50.
Carbon Disulfide		BQL	25.
2-Butanone		BQL	50.
Vinyl Acetate		BQL	50.
2-Hexanone		BQL	50.
4-Methyl-2-Pentanone		BQL	50.
Styrene		BQL	25.
Xylene (total)	18.42-19.11	210.	25.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	106	76-114
Toluene-d8	107	88-110
4-Bromofluorobenzene	109	86-115

pH 2

Surrogate Spike Level: 250 ug/l
Associated Blank: VOA RE172C

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

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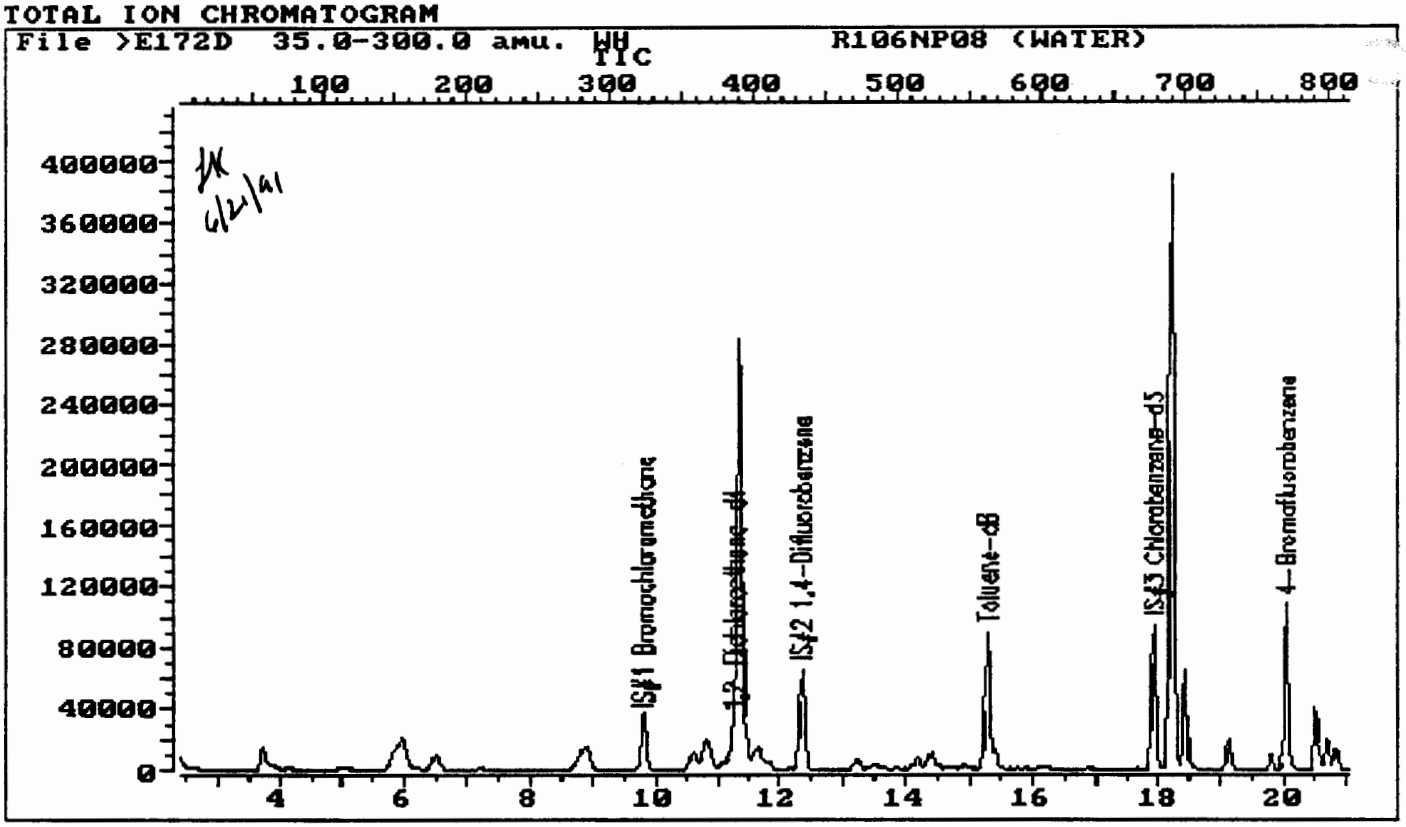
TOTAL ION CHROMATOGRAM



Data File: >E172D::D3 Quant Output File: ^E172D::QT
Name: WH R106NP08
Misc: (WATER) 1:5 DI MW-5 INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910621 07:49

Operator ID: BRUCE
Quant Time: 910621 09:17
Injected at: 910621 08:51

Client: WALK-HAYDEL & ASSOC.
Sample: TRIP BLANK #3
Lab ID: R106NP10
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/20/91
Date Sampled: 05/21/91
Data File ID: RE171F

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	112	76-114
Toluene-d8	105	88-110
4-Bromofluorobenzene	108	86-115

pH 2

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RE171C

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

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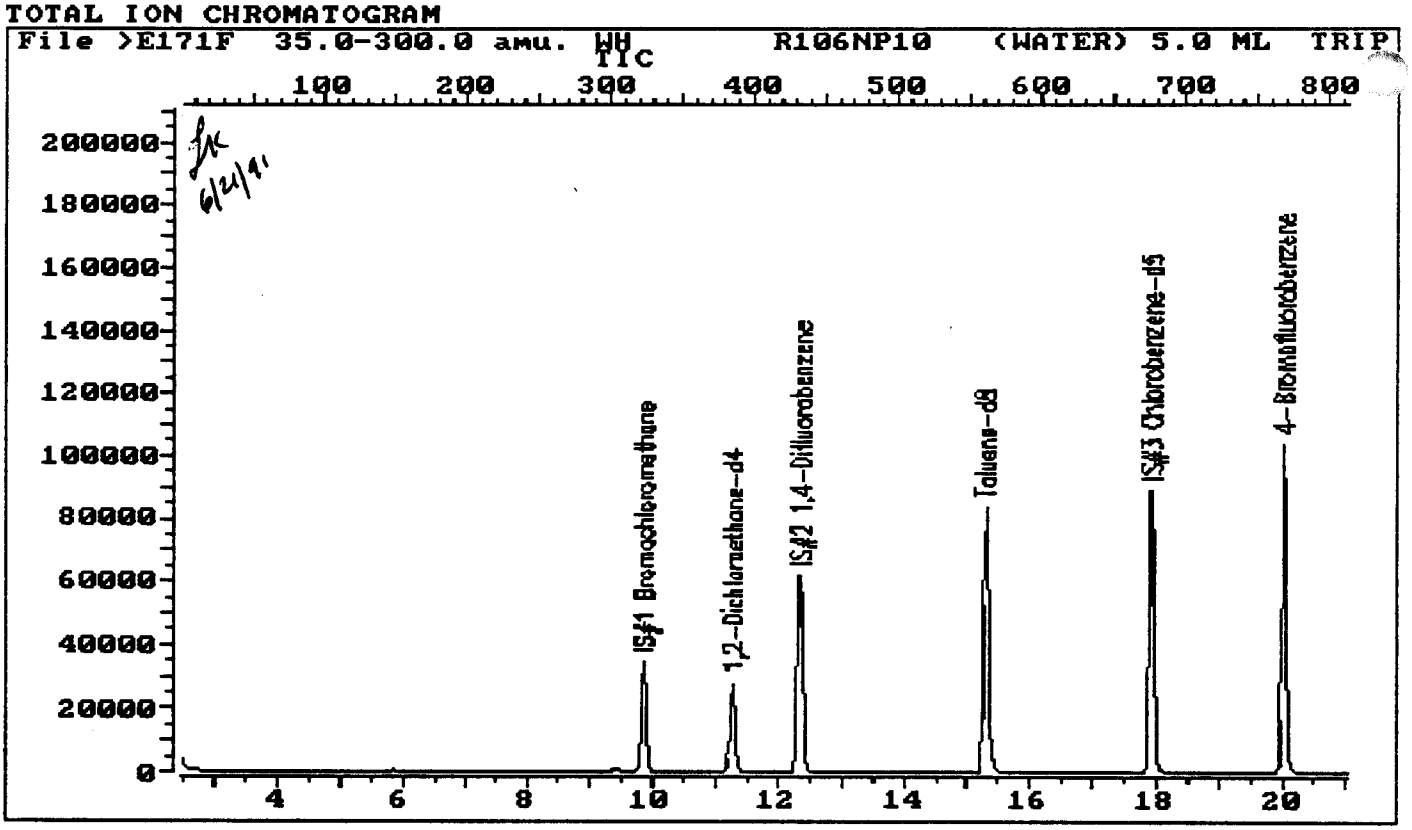
TOTAL ION CHROMATOGRAM



Data File: >E171F::D3 Quant Output File: ^E171F::QT
Name: WH R106NP10
Misc: (WATER) 5.0 ML TRIP BLANK #3 INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910620 08:43

Operator ID: JOE
Quant Time: 910620 12:10
Injected at: 910620 11:41

Client:	WALK-HAYDEL & ASSOC.	Date Extracted:	NA
Sample:	EFFLUENT	Date Analyzed:	06/20/91
Lab ID:	R106NP22	Date Sampled:	06/10/91
Method:	SW 846-8240	Data File ID:	RE171I

GC/MS

VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	5000.
Acrylonitrile		BQL	5000.
Chloromethane		BQL	1000.
Bromomethane		BQL	1000.
Vinyl Chloride		BQL	1000.
Chloroethane		BQL	1000.
Methylene Chloride		BQL	500.
1,1-Dichloroethene		BQL	500.
1,1-Dichloroethane		BQL	500.
1,2-Dichloroethene (total)		BQL	500.
Trichlorofluoromethane		BQL	500.
Chloroform		BQL	500.
1,2-Dichloroethane		BQL	500.
1,1,1-Trichloroethane		BQL	500.
Carbon Tetrachloride		BQL	500.
Bromodichloromethane		BQL	500.
1,2-Dichloropropane		BQL	500.
trans-1,3-Dichloropropene		BQL	500.
Trichloroethene		BQL	500.
Dibromochloromethane		BQL	500.
1,1,2-Trichloroethane		BQL	500.
Benzene	11.40	17000.	500.
cis-1,3-Dichloropropene		BQL	500.
Bromoform		BQL	500.
Tetrachloroethene		BQL	500.
1,1,2,2-Tetrachloroethane		BQL	500.
Toluene	15.43	18000.	500.
Chlorobenzene		BQL	500.
Ethylbenzene	18.23	2600.	500.
2-Chloroethylvinyl ether (1)		BQL	1000.
Acetone		BQL	1000.
Carbon Disulfide		BQL	500.
2-Butanone		BQL	1000.
Vinyl Acetate		BQL	1000.
2-Hexanone		BQL	1000.
4-Methyl-2-Pentanone		BQL	1000.
Styrene		BQL	500.
Xylene (total)	18.43-19.12	8500.	500.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	101	76-114
Toluene-d8	100	88-110
4-Bromofluorobenzene	98	86-115

pH 2

Surrogate Spike Level: 5000 ug/l

Associated Blank: VOA RE171C

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

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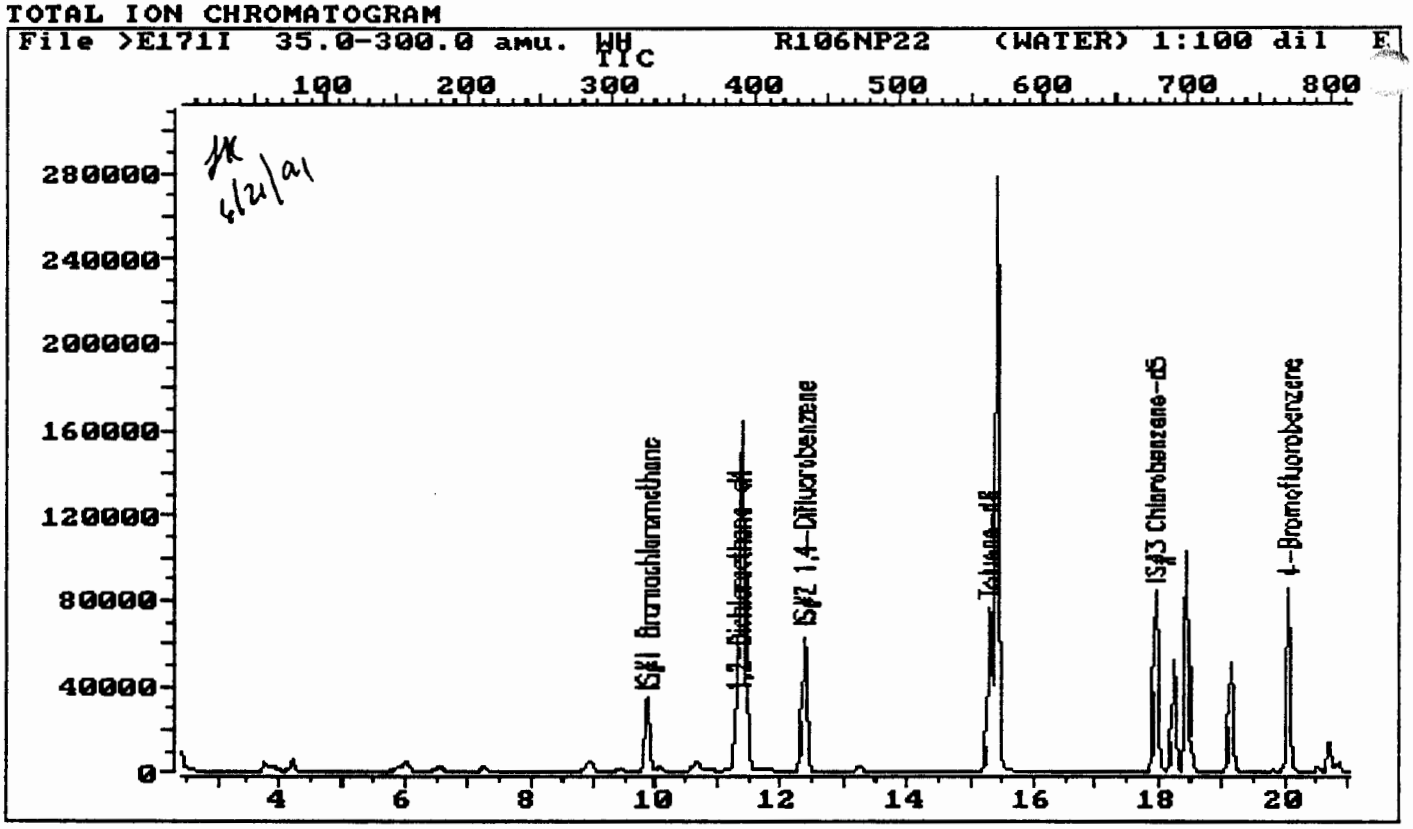
TOTAL ION CHROMATOGRAM



Data File: >E171I::D3 Quant Output File: ^E171I::QT
Name: WH R106NP22
Misc: (WATER) 1:100 dil EFFLUENT INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910620 08:43

Operator ID: JOE
Quant Time: 910620 16:21
Injected at: 910620 15:55

Client: WALK-HAYDEL & ASSOC.
Sample: VOA BLANK SPIKE E171D
Lab ID: BS06NP23
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/20/91
Date Sampled: NA
Data File ID: RE171D

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene	4.88	97% MS Recovery	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene	12.81	97% MS Recovery	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene	11.35	92% MS Recovery	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene	15.36	101% MS Recovery	5.
Chlorobenzene	17.93	100% MS Recovery	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	100	76-114
Toluene-d8	102	88-110
4-Bromofluorobenzene	103	86-115

pH NA

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RE171C

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 50 ug/l

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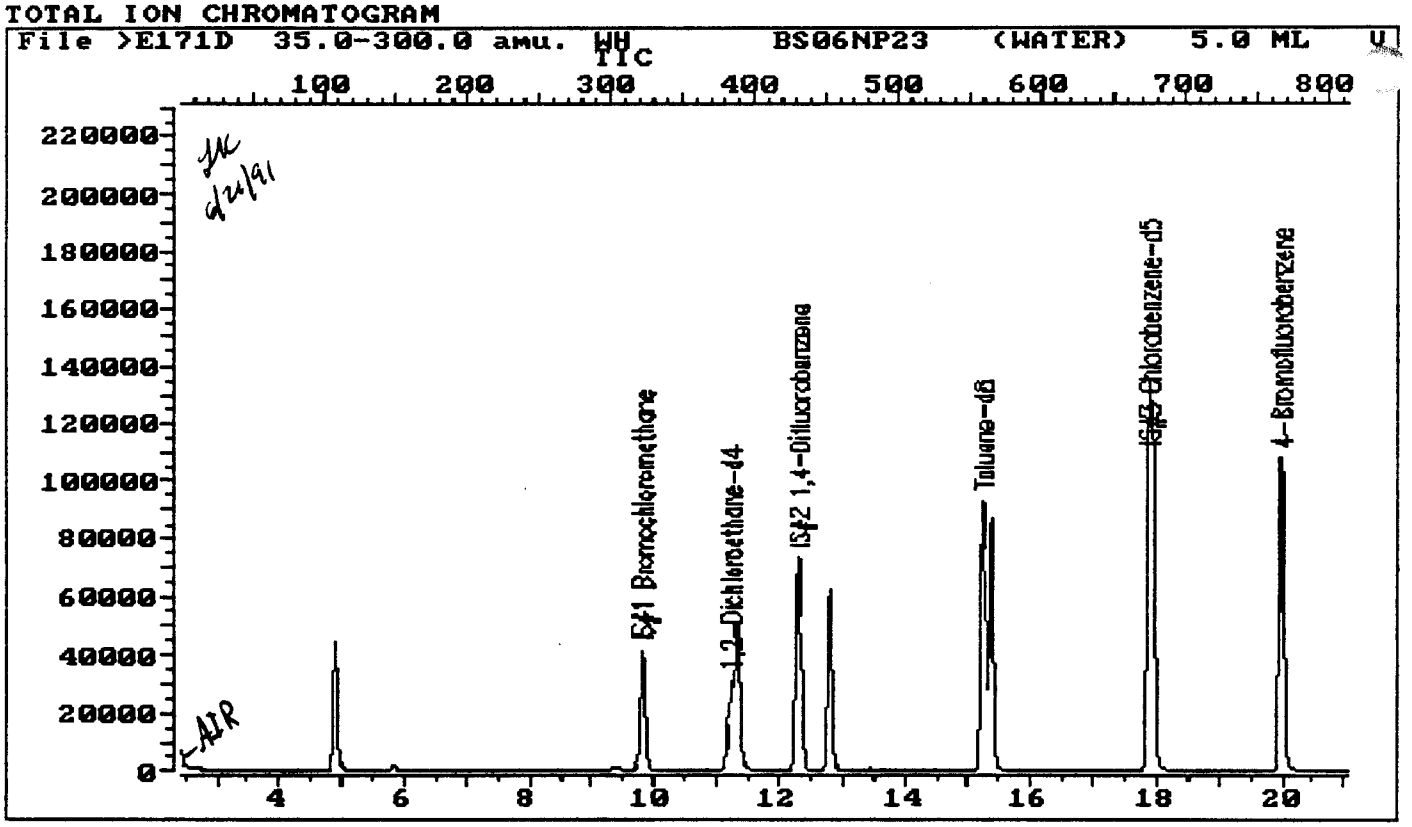
TOTAL ION CHROMATOGRAM



Data File: >E171D::D3 Quant Output File: ^E171D::QT
Name: WH BS06NP23
Misc: (WATER) 5.0 ML VOA BLANK SPIKE E171D INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910620 08:43

Operator ID: JOE
Quant Time: 910620 10:26
Injected at: 910620 09:57

Client: WALK-HAYDEL & ASSOC.
Sample: VOA BLANK SPIKE DUP. E171E
Lab ID: BD06NP24
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/20/91
Date Sampled: NA
Data File ID: RE171E

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene	4.92	99% MS Recovery	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene	12.83	96% MS Recovery	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene	11.36	96% MS Recovery	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene	15.39	105% MS Recovery	5.
Chlorobenzene	17.96	104% MS Recovery	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	103	76-114
Toluene-d8	106	88-110
4-Bromofluorobenzene	109	86-115

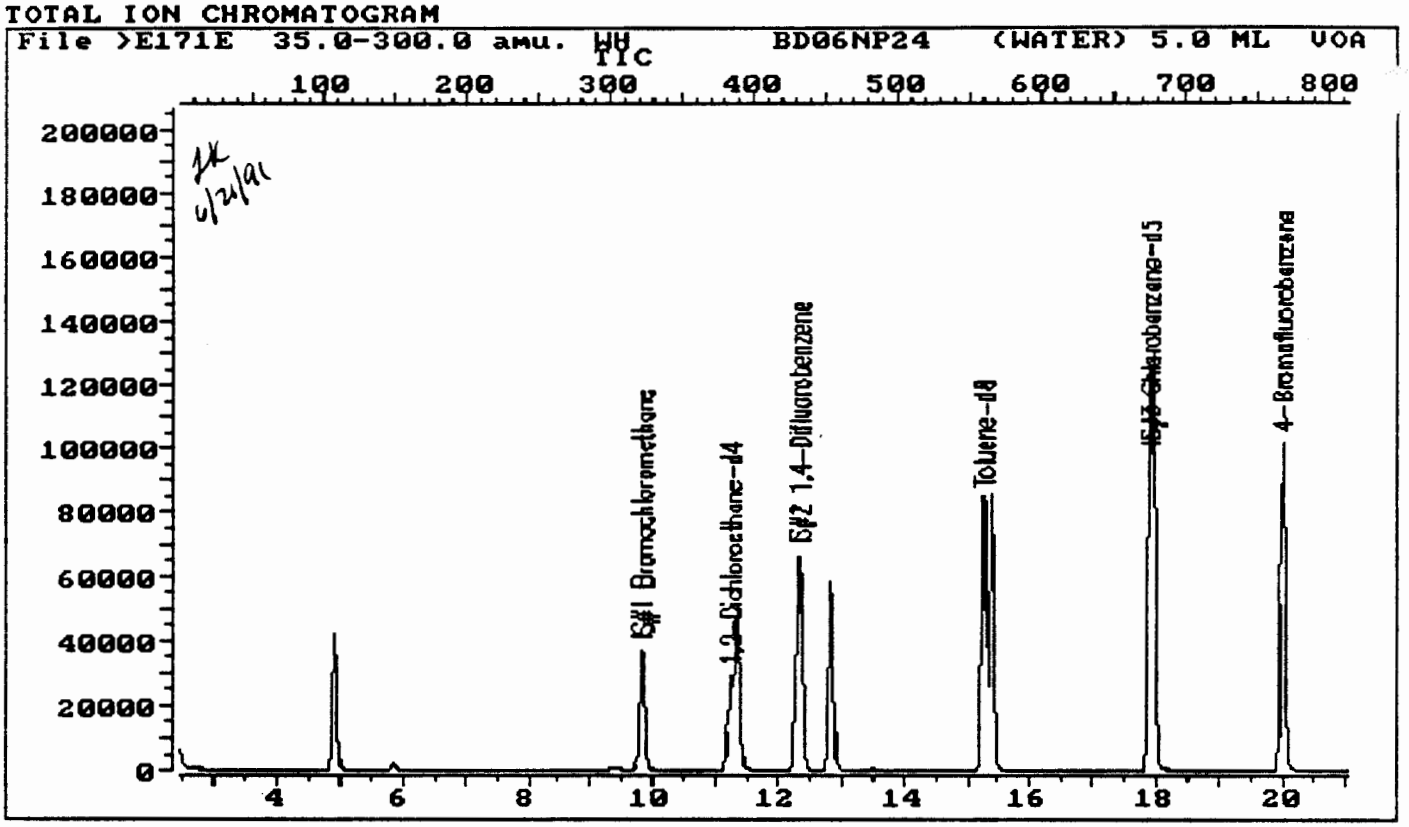
pH NA

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RE171C

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 50 ug/l

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E171E::D3 Quant Output File: ^E171E::QT
Name: WH BD06NP24
Misc: (WATER) 5.0 ML VOA BLANK SPIKE DUPL. E171E INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910620 08:43

Operator ID: JOE
Quant Time: 910620 11:15
Injected at: 910620 10:49

Client: WALK-HAYDEL & ASSOC.
Sample: EFFLUENT MATRIX SPIKE
Lab ID: MS06NP25
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/20/91
Date Sampled: 06/10/91
Data File ID: RE171J

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	5000.
Acrylonitrile		BQL	5000.
Chloromethane		BQL	1000.
Bromomethane		BQL	1000.
Vinyl Chloride		BQL	1000.
Chloroethane		BQL	1000.
Methylene Chloride		BQL	500.
1,1-Dichloroethene	4.84	104% MS Recovery	500.
1,1-Dichloroethane		BQL	500.
1,2-Dichloroethene (total)		BQL	500.
Trichlorofluoromethane		BQL	500.
Chloroform		BQL	500.
1,2-Dichloroethane		BQL	500.
1,1,1-Trichloroethane		BQL	500.
Carbon Tetrachloride		BQL	500.
Bromodichloromethane		BQL	500.
1,2-Dichloropropane		BQL	500.
trans-1,3-Dichloropropene		BQL	500.
Trichloroethene	12.81	89% MS Recovery	500.
Dibromochloromethane		BQL	500.
1,1,2-Trichloroethane		BQL	500.
Benzene	11.35	93% MS Recovery	500.
cis-1,3-Dichloropropene		BQL	500.
Bromoform		BQL	500.
Tetrachloroethene		BQL	500.
1,1,2,2-Tetrachloroethane		BQL	500.
Toluene	15.38	80% MS Recovery	500.
Chlorobenzene	17.95	98% MS Recovery	500.
Ethylbenzene	18.20	2500.	500.
2-Chloroethylvinyl ether (1)		BQL	1000.
Acetone		BQL	1000.
Carbon Disulfide		BQL	500.
2-Butanone		BQL	1000.
Vinyl Acetate		BQL	1000.
2-Hexanone		BQL	1000.
4-Methyl-2-Pentanone		BQL	1000.
Styrene		BQL	500.
Xylene (total)	18.41-19.12	8300.	500.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	109	76-114
Toluene-d8	102	88-110
4-Bromofluorobenzene	101	86-115

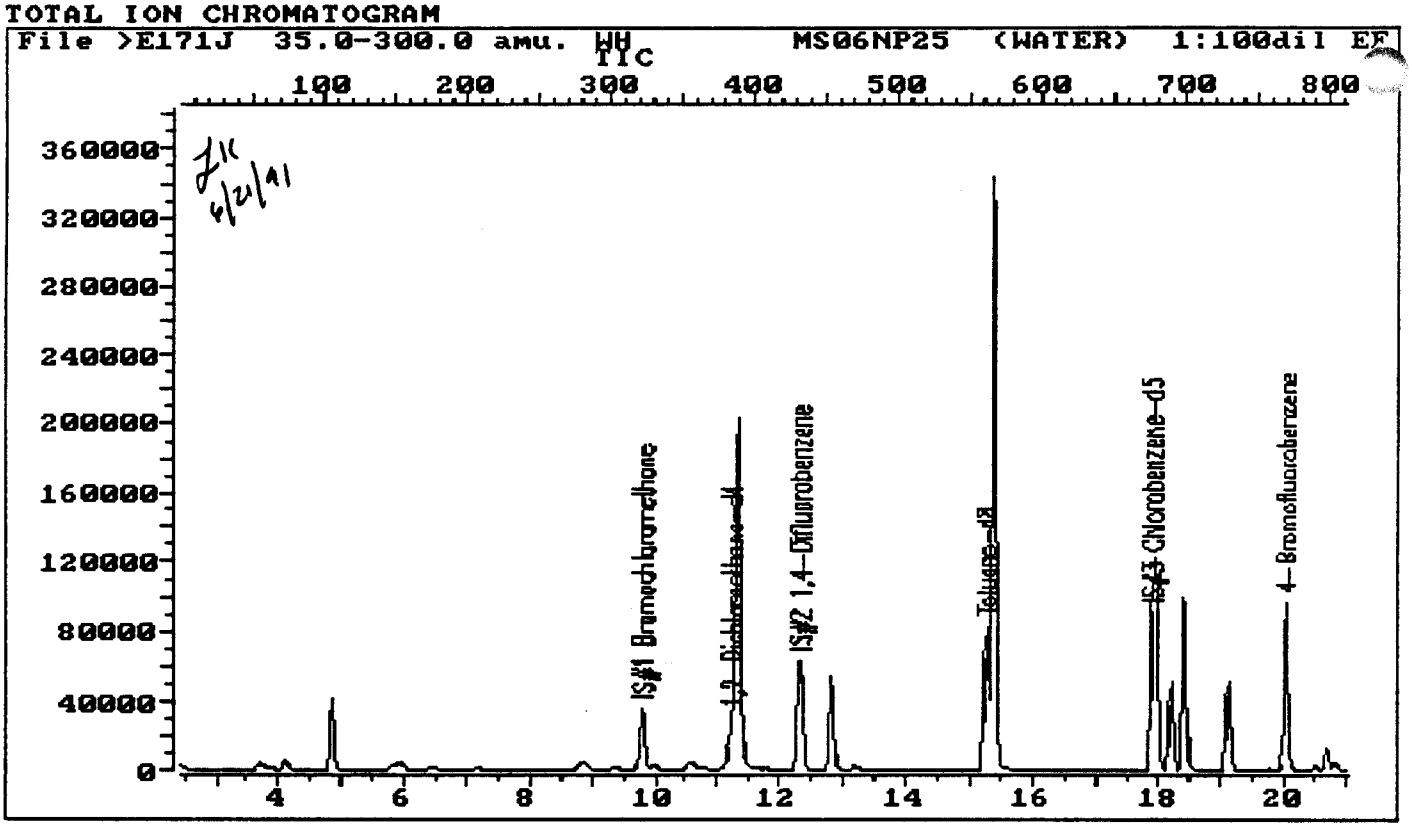
pH 2

Surrogate Spike Level: 5000 ug/l
Associated Blank: VOA RE171C

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 5000 ug/l

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E171J::D3 Quant Output File: ^E171J::QT
Name: WH MS06NP25
Misc: (WATER) 1:100dil EFFLUENT MATRIX SPIKE E171J INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910620 08:43

Operator ID: JOHN
Quant Time: 910620 17:20
Injected at: 910620 16:48

Client: WALK-HAYDEL & ASSOC.
Sample: EFFLUENT MATRIX SPIKE DUP.
Lab ID: MD06NP26
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/20/91
Date Sampled: 06/10/91
Data File ID: RE171K

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	5000.
Acrylonitrile		BQL	5000.
Chloromethane		BQL	1000.
Bromomethane		BQL	1000.
Vinyl Chloride		BQL	1000.
Chloroethane		BQL	1000.
Methylene Chloride		BQL	500.
1,1-Dichloroethene	4.81	97% MS Recovery	500.
1,1-Dichloroethane		BQL	500.
1,2-Dichloroethene (total)		BQL	500.
Trichlorofluoromethane		BQL	500.
Chloroform		BQL	500.
1,2-Dichloroethane		BQL	500.
1,1,1-Trichloroethane		BQL	500.
Carbon Tetrachloride		BQL	500.
Bromodichloromethane		BQL	500.
1,2-Dichloropropane		BQL	500.
trans-1,3-Dichloropropene		BQL	500.
Trichloroethene	12.77	92% MS Recovery	500.
Dibromochloromethane		BQL	500.
1,1,2-Trichloroethane		BQL	500.
Benzene	11.32	137% MS Recovery	500.
cis-1,3-Dichloropropene		BQL	500.
Bromoform		BQL	500.
Tetrachloroethene		BQL	500.
1,1,2,2-Tetrachloroethane		BQL	500.
Toluene	15.36	85% MS Recovery	500.
Chlorobenzene	17.95	96% MS Recovery	500.
Ethylbenzene	18.18	2500.	500.
2-Chloroethylvinyl ether (1)		BQL	1000.
Acetone		BQL	1000.
Carbon Disulfide		BQL	500.
2-Butanone		BQL	1000.
Vinyl Acetate		BQL	1000.
2-Hexanone		BQL	1000.
4-Methyl-2-Pentanone		BQL	1000.
Styrene		BQL	500.
Xylene (total)	18.41-19.09	8200.	500.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	107	76-114
Toluene-d8	101	88-110
4-Bromofluorobenzene	103	86-115

pH 2

Surrogate Spike Level: 5000 ug/l
Associated Blank: VOA RE171C

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: 5000 ug/l

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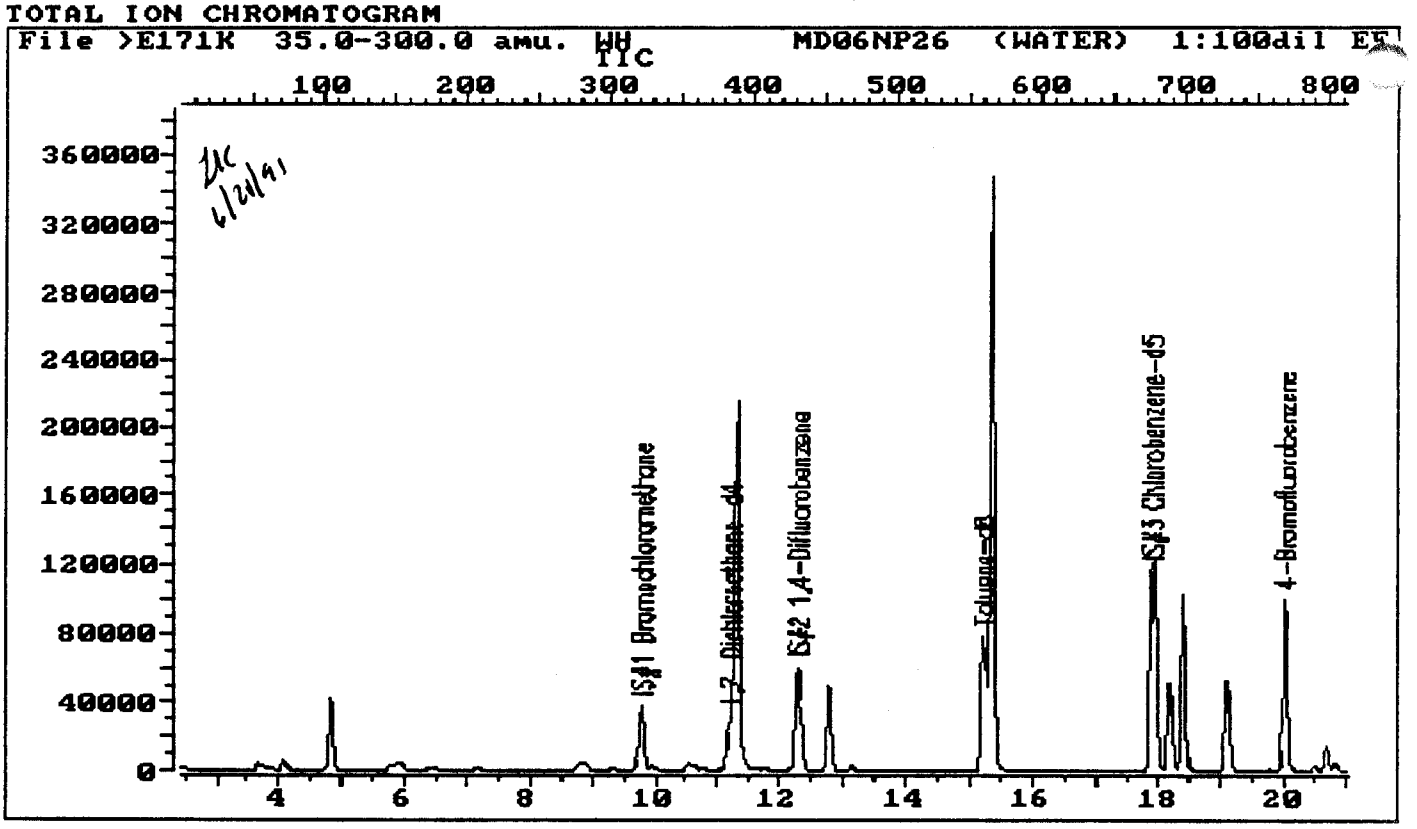
TOTAL ION CHROMATOGRAM



Data File: >E171K::D3 Quant Output File: ^E171K::QT
Name: WH MD06NP26
Misc: (WATER) 1:100dil EFFLUENT MAT. SPK. DUP. E171J INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910620 08:43

Operator ID: JOHN
Quant Time: 910620 18:20
Injected at: 910620 17:53

Client: WALK-HAYDEL & ASSOC.
Sample: TRIP BLANK #1
Lab ID: R106NP28
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/20/91
Date Sampled: 05/22/91
Data File ID: RE171G

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	110	76-114
Toluene-d8	109	88-110
4-Bromofluorobenzene	111	86-115

pH 2

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RE171C

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

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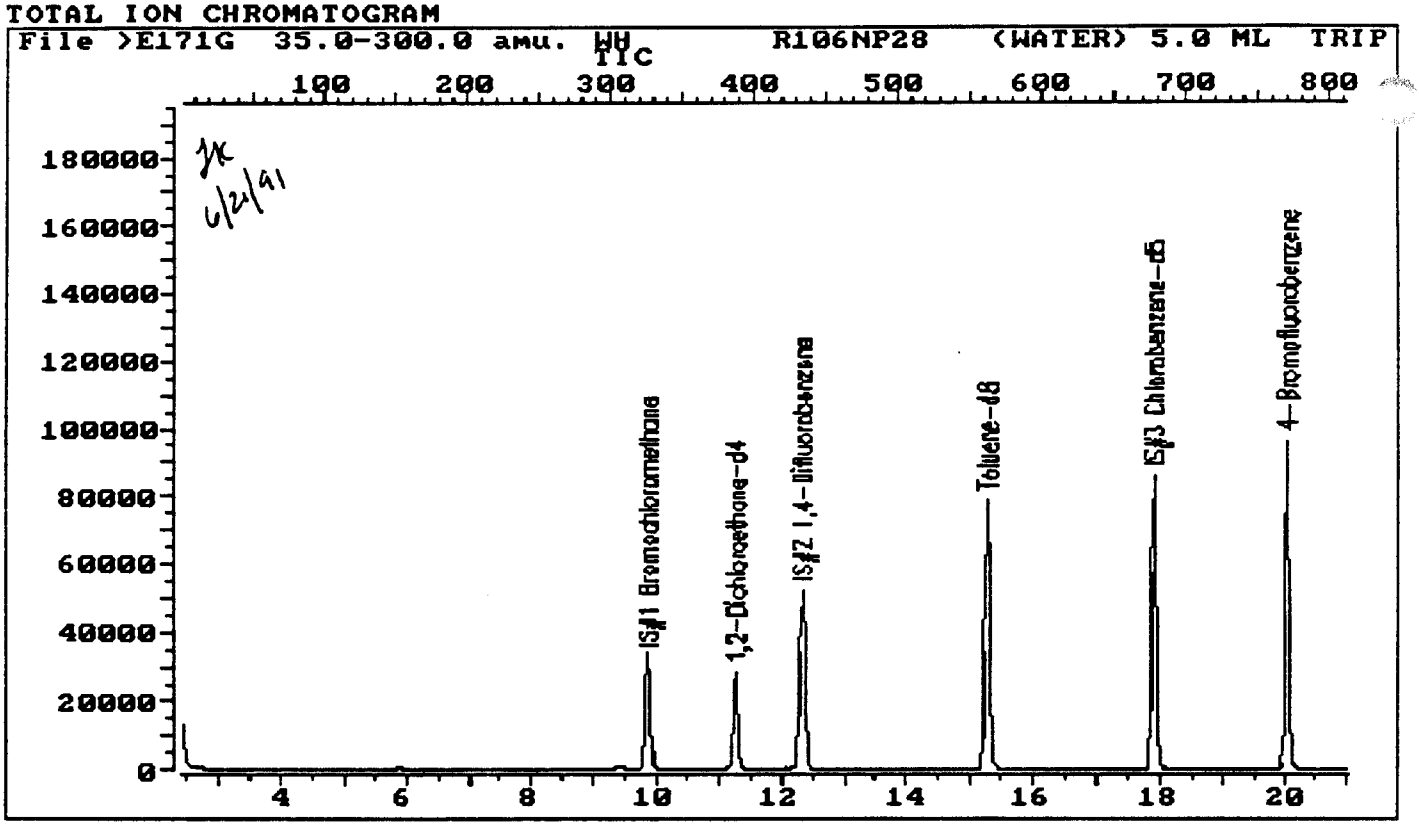
TOTAL ION CHROMATOGRAM



Data File: >E171G::D3 Quant Output File: ^E171G::QT
Name: WH R106NP28
Misc: (WATER) 5.0 ML TRIP BLANK # 1 INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910620 08:43

Operator ID: JOE
Quant Time: 910620 12:57
Injected at: 910620 12:33

Client: WALK-HAYDEL & ASSOC.
Sample: VOA LAB BLANK RE170J
Lab ID: R106NP
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/19/91
Date Sampled: NA
Data File ID: RE170J

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	99	76-114
Toluene-d8	97	88-110
4-Bromofluorobenzene	96	86-115

pH NA

Surrogate Spike Level: 50 ug/l
Associated Blank: NA

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

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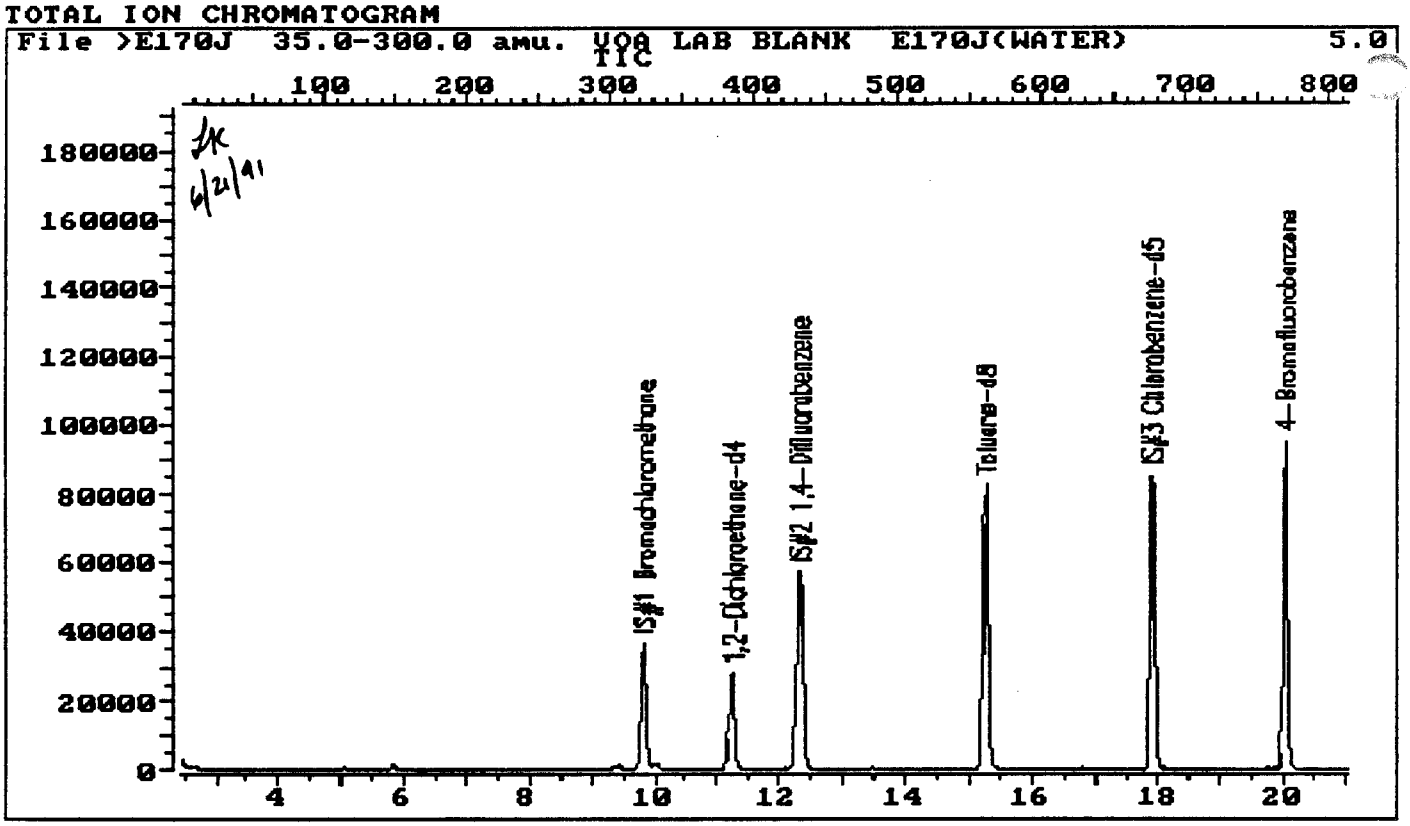
TOTAL ION CHROMATOGRAM



Data File: >E170J::D3 Quant Output File: ^E170J::QT
Name: VOA LAB BLANK E170J
Misc: (WATER) 5.0mL INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910619 15:17

Operator ID: BRUCE
Quant Time: 910619 16:01
Injected at: 910619 15:36

Client: WALK-HAYDEL & ASSOC.
Sample: VOA LAB BLANK RE171C
Lab ID: R106NP
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/20/91
Date Sampled: NA
Data File ID: RE171C

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	96	76-114
Toluene-d8	102	88-110
4-Bromofluorobenzene	101	86-115

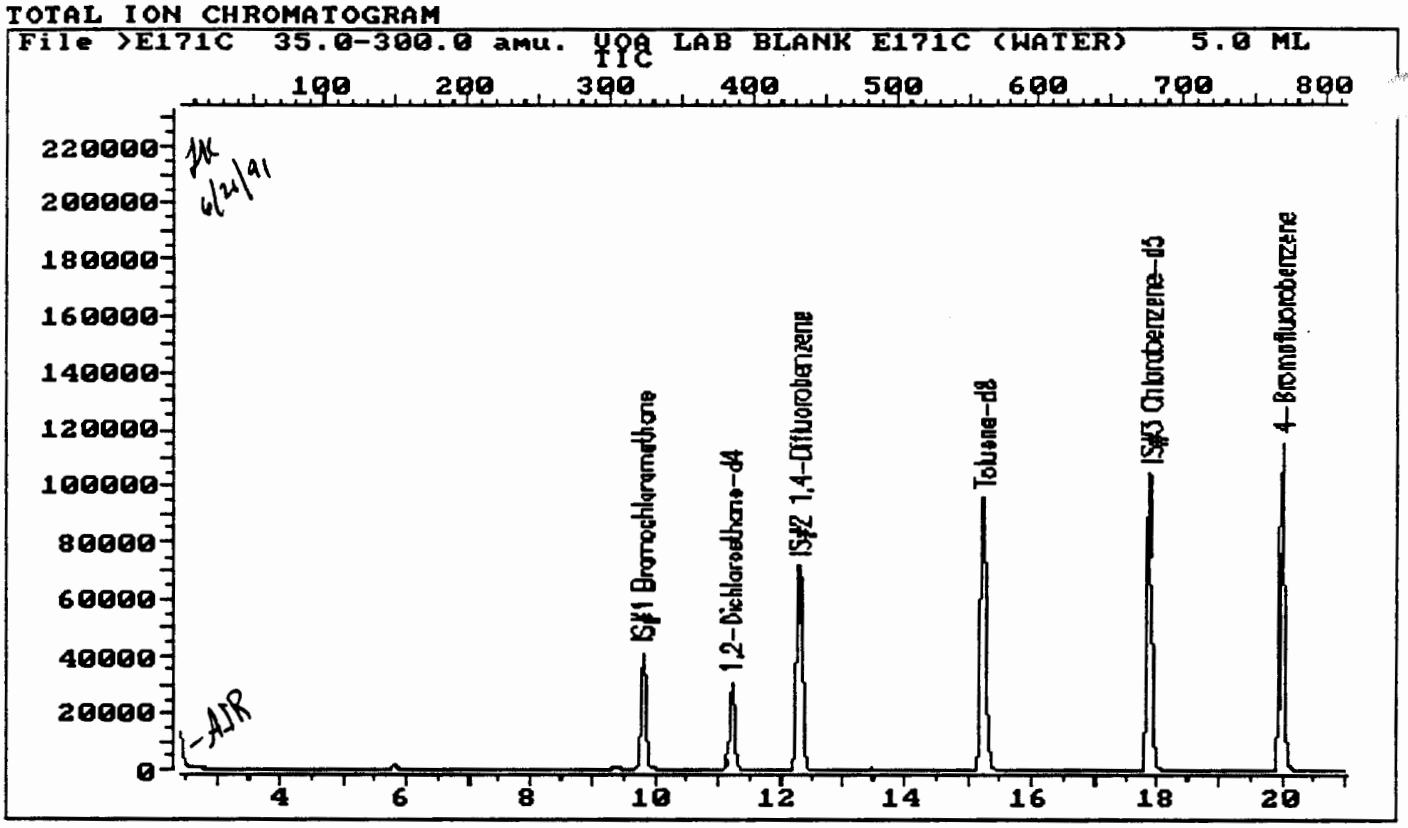
pH NA

Surrogate Spike Level: 50 ug/l
Associated Blank: NA

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E171C::D3 Quant Output File: ^E171C::QT
Name: VOA LAB BLANK E171C
Misc: (WATER) 5.0 ML INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910620 08:43

Operator ID: JOE
Quant Time: 910620 09:38
Injected at: 910620 09:04

Client: WALK-HAYDEL & ASSOC.
Sample: VOA LAB BLANK RE172C
Lab ID: R106NP
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/21/91
Date Sampled: NA
Data File ID: RE172C

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	98	76-114
Toluene-d8	102	88-110
4-Bromofluorobenzene	106	86-115

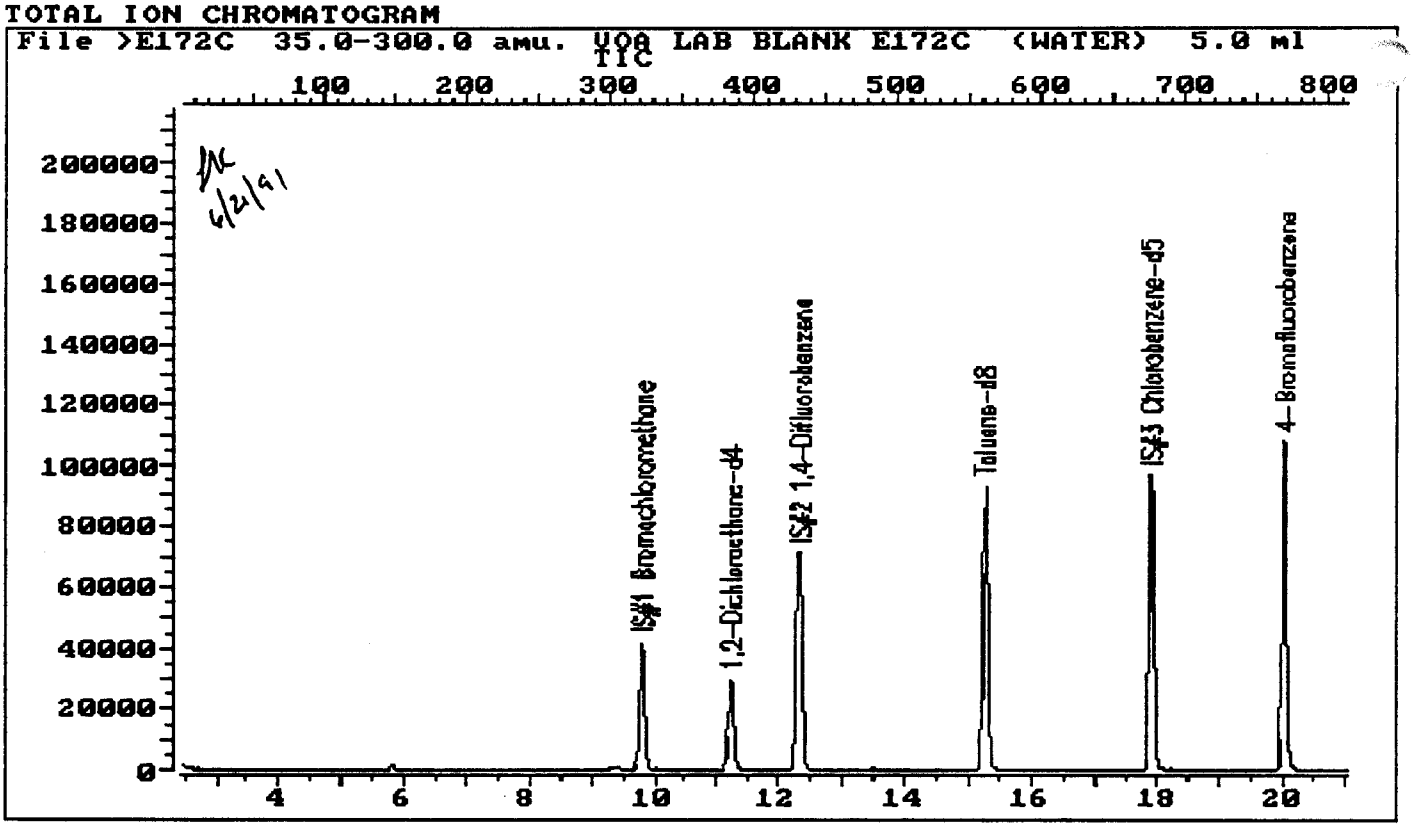
pH NA

Surrogate Spike Level: 50 ug/l
Associated Blank: NA

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >E172C::D3 Quant Output File: ^E172C::QT
Name: VOA LAB BLANK E172C
Misc: (WATER) 5.0 ml INST 7002E

Id File: ID_V2::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) FEB89
Last Calibration: 910621 07:49

Operator ID: BRUCE
Quant Time: 910621 08:32
Injected at: 910621 08:08

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 James Drive West, Suite 100
St Rose, Louisiana 70087
(504) 469-0333

QC REPORT

VOA BLANK SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% RECOVERY	DUP. % RECOVERY	QC RANGE	RPD	RPD LIMIT
1,1 Dichloroethene	06NP04	50 ug/l	96%	101%	61-145	5	14
Trichloroethene	06NP04	50 ug/l	97%	91%	71-120	6	14
Benzene	06NP04	50 ug/l	102%	105%	76-127	3	11
Toluene	06NP04	50 ug/l	94%	94%	76-125	0	13
Chlorobenzene	06NP04	50 ug/l	95%	95%	75-130	1	13

VOA MATRIX SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% RECOVERY	DUP. % RECOVERY	QC RANGE	RPD	RPD LIMIT
1,1 Dichloroethene	06NP06	50 ug/l	96%	95%	61-145	1	14
Trichloroethene	06NP06	50 ug/l	92%	93%	71-120	2	14
Benzene	06NP06	50 ug/l	101%	104%	76-127	3	11
Toluene	06NP06	50 ug/l	93%	97%	76-125	4	13
Chlorobenzene	06NP06	50 ug/l	95%	97%	75-130	2	13

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QC REPORT

VOA BLANK SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% RECOVERY	DUP. % RECOVERY	QC RANGE	RPD	RPD LIMIT
1,1 Dichloroethene	06NP24	50 ug/l	97%	99%	61-145	2	14
Trichloroethene	06NP24	50 ug/l	97%	96%	71-120	0	14
Benzene	06NP24	50 ug/l	92%	96%	76-127	4	11
Toluene	06NP24	50 ug/l	101%	105%	76-125	4	13
Chlorobenzene	06NP24	50 ug/l	100%	104%	75-130	4	13

VOA MATRIX SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% RECOVERY	DUP. % RECOVERY	QC RANGE	RPD	RPD LIMIT
1,1 Dichloroethene	06NP26	50 ug/l	104%	97%	61-145	8	14
Trichloroethene	06NP26	50 ug/l	89%	92%	71-120	3	14
Benzene	06NP26	50 ug/l	93%	137%	76-127	39	11
Toluene	06NP26	50 ug/l	80%	85%	76-125	7	13
Chlorobenzene	06NP26	50 ug/l	98%	96%	75-130	2	13

Client: Walk Haydel and Assoc.
Sample: TH-20

Lab ID: R106NP01
File ID: D171A020

Date Extracted: 06/16/91
Date Analyzed: 06/21/91
Time Analyzed: 17:05
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/11/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)			BQL	164

Surrogate Pentacosane (C-25) Recovery: 83%

Corresponding Blank: D171A019

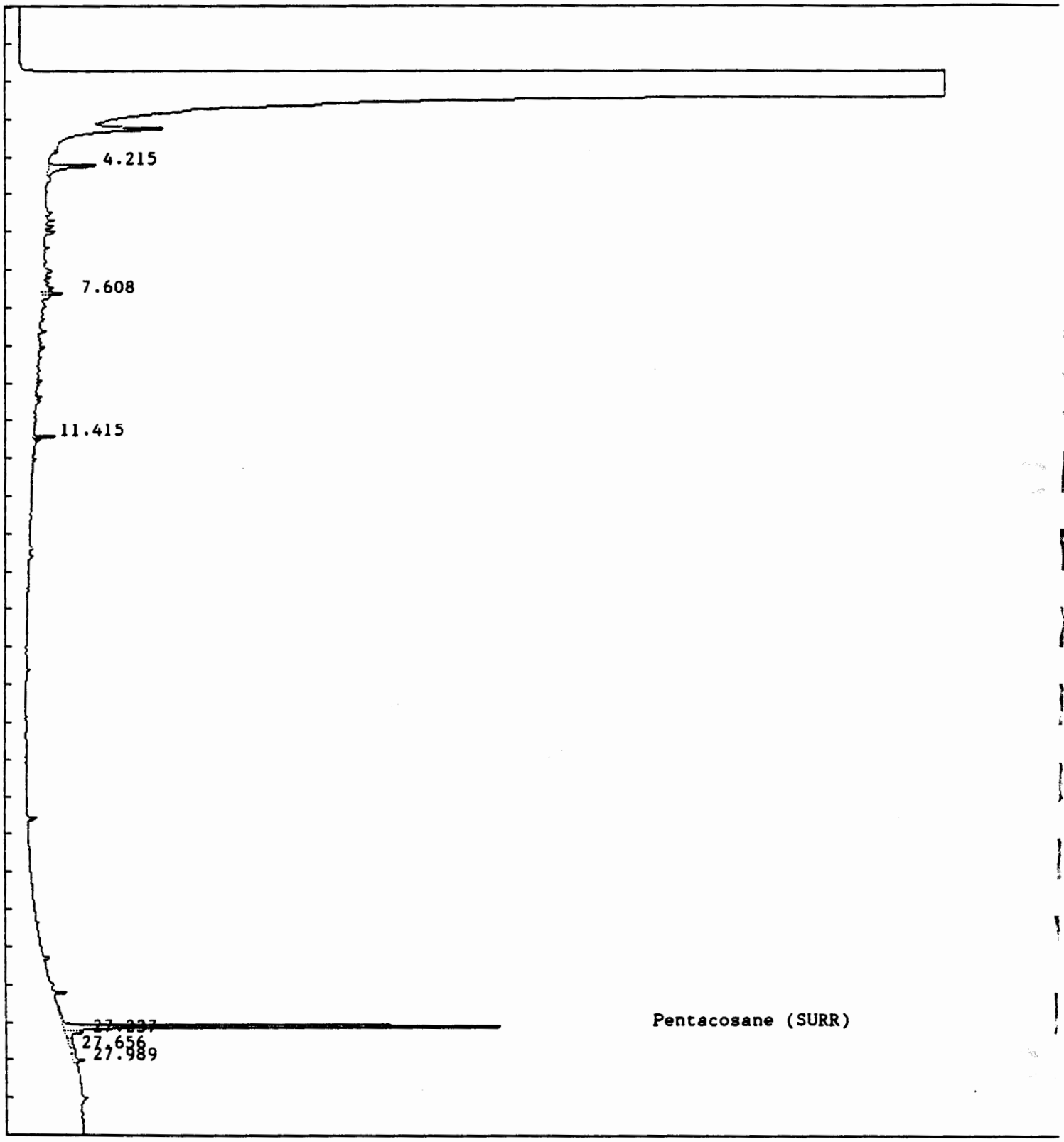
NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106MP01** **TH-20**

File ID: /DATA/LOOP/RESULT/D171A020.RES
Date Analyzed: 1705 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890
Seq/Smpl: 2/10
Bottle : 20
Run Time: 30.02 min.



Client: Walk Haydel and Assoc.
Sample: MW-1

Lab ID: R106NP02
File ID: D171A021

Date Extracted: 06/16/91
Date Analyzed: 06/21/91
Time Analyzed: 17:42
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/11/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)			BQL	235

Surrogate Pentacosane (C-25) Recovery: 84%

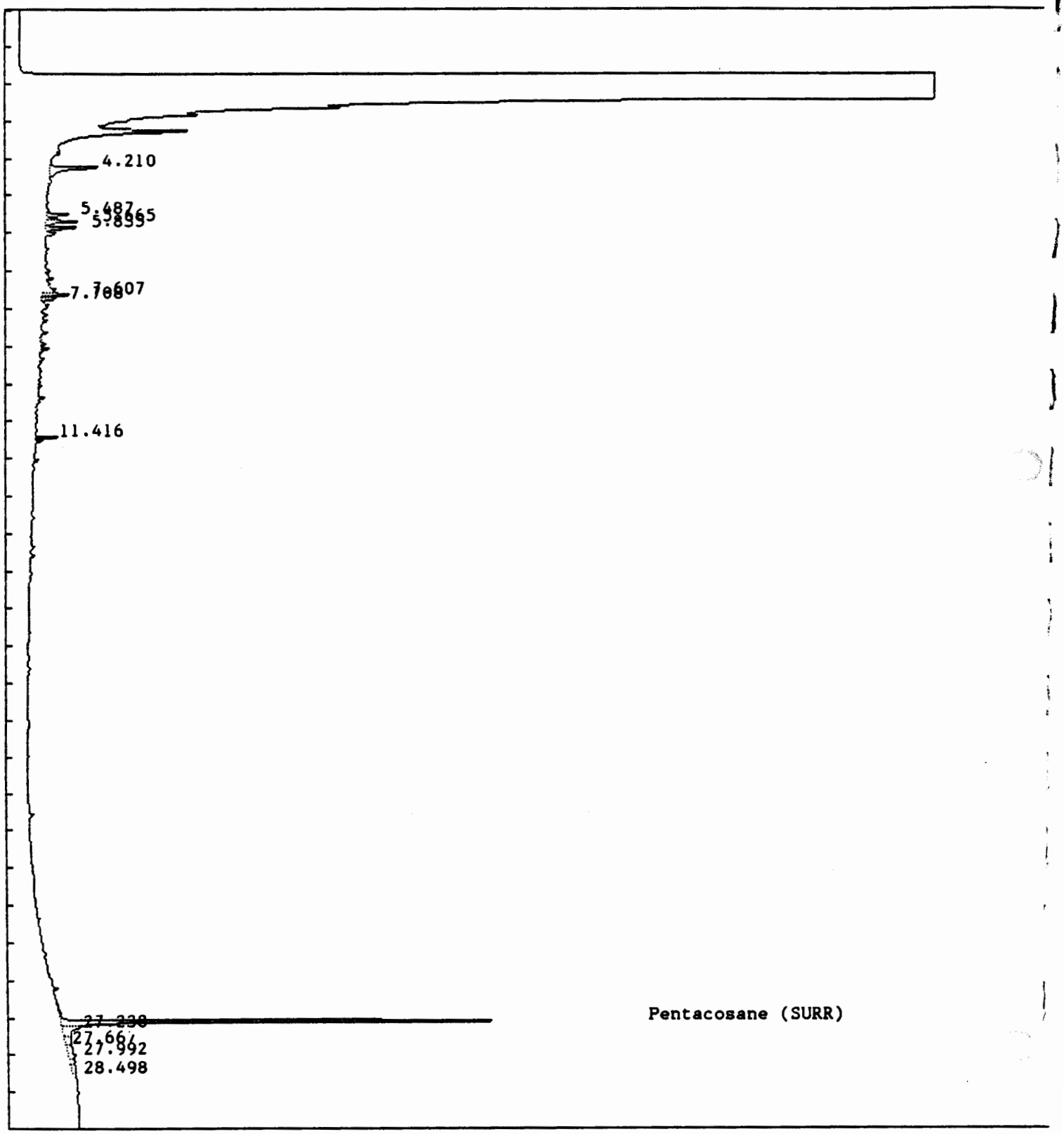
Corresponding Blank: D171A019

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NP02** **MW-1**

File ID: /DATA/LOOP/RESULT/D171A021.RES
Date Analyzed: 1742 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/11
Bottle : 21
Run Time: 30.02 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/16/91
Sample:	Extraction Blank	Date Analyzed:	06/21/91
	Blank Spike	Time Analyzed:	18:19
Lab ID:	R106NP03	Analyst:	LSK
File ID:	D171A022	GC Method:	CALIF. LUFT
		Date Sampled:	N/A

Total Petroleum Hydrocarbons

Compound		Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	POL (ug/l)
TPH (as Diesel Oil)	MS	17.71		78% Recovery	40.0

Surrogate Pentacosane (C-25) Recovery: 102%

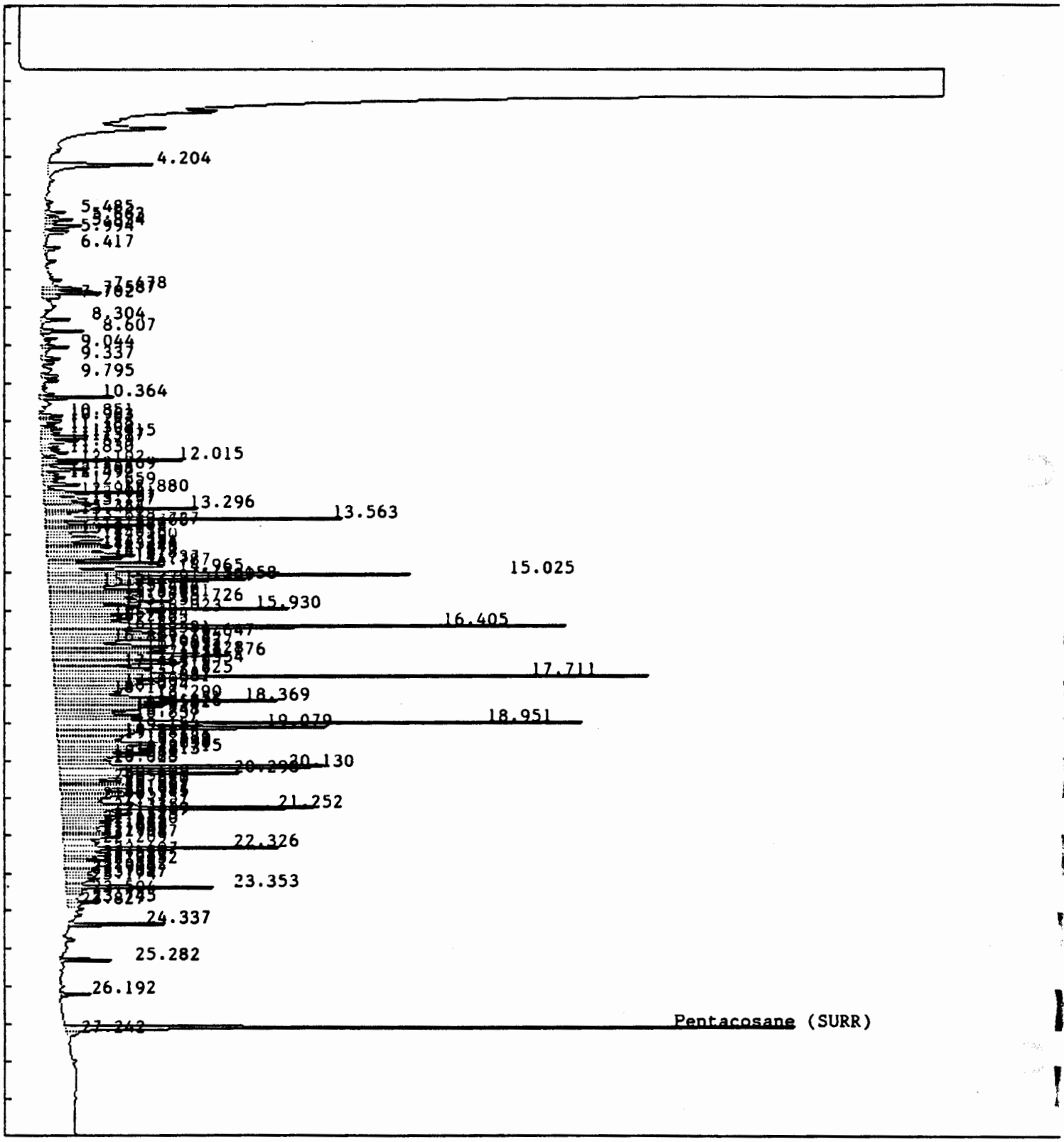
Corresponding Blank: D171A019

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/l):
Semivolatiles: 2000

Total Petroleum Hydrocarbons Analysis
Sample Name: R106NP03 Blank Spike

File ID: /DATA/LOOP/RESULT/D171A022.RES
Date Analyzed: 1819 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/12
Bottle : 22
Run Time: 30.00 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/16/91
Sample:	Extraction Blank	Date Analyzed:	06/21/91
	Blank Spike Duplicate	Time Analyzed:	18:56
Lab ID:	R106NP04	Analyst:	LSK
File ID:	D171A023	GC Method:	CALIF. LUFT
		Date Sampled:	N/A

Total Petroleum Hydrocarbons

Compound		Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)	MS	17.71		43% Recovery	40.0

Surrogate Pentacosane (C-25) Recovery: 64%

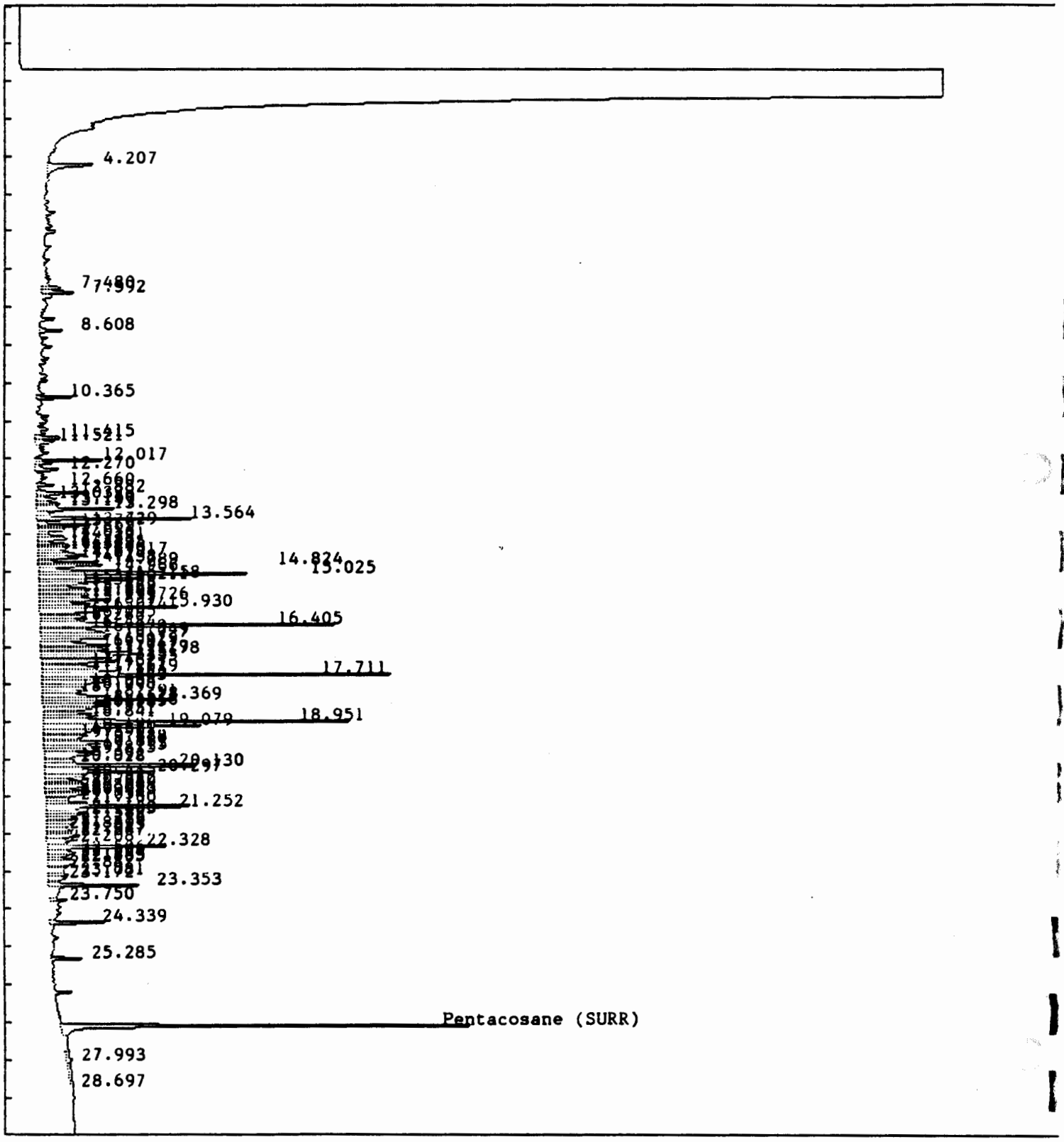
Corresponding Blank: D171A019

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/l):
Semivolatiles: 2000

Total Petroleum Hydrocarbons Analysis
Sample Name: R106NP04 Blank Spike Duplicate

File ID: /DATA/LOOP/RESULT/D171A023.RES
Date Analyzed: 1856 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/13
Bottle : 23
Run Time: 30.00 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/16/91
Sample:	MW-1	Date Analyzed:	06/21/91
	Matrix Spike	Time Analyzed:	19:33
Lab ID:	R106NP05	Analyst:	LSK
File ID:	D171A024	GC Method:	CALIF. LUFT
		Date Sampled:	06/11/91

Total Petroleum Hydrocarbons

Compound		Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	POL (ug/l)
TPH (as Diesel Oil)	MS	17.71		4% Recovery	235

Surrogate Pentacosane (C-25) Recovery: 18%

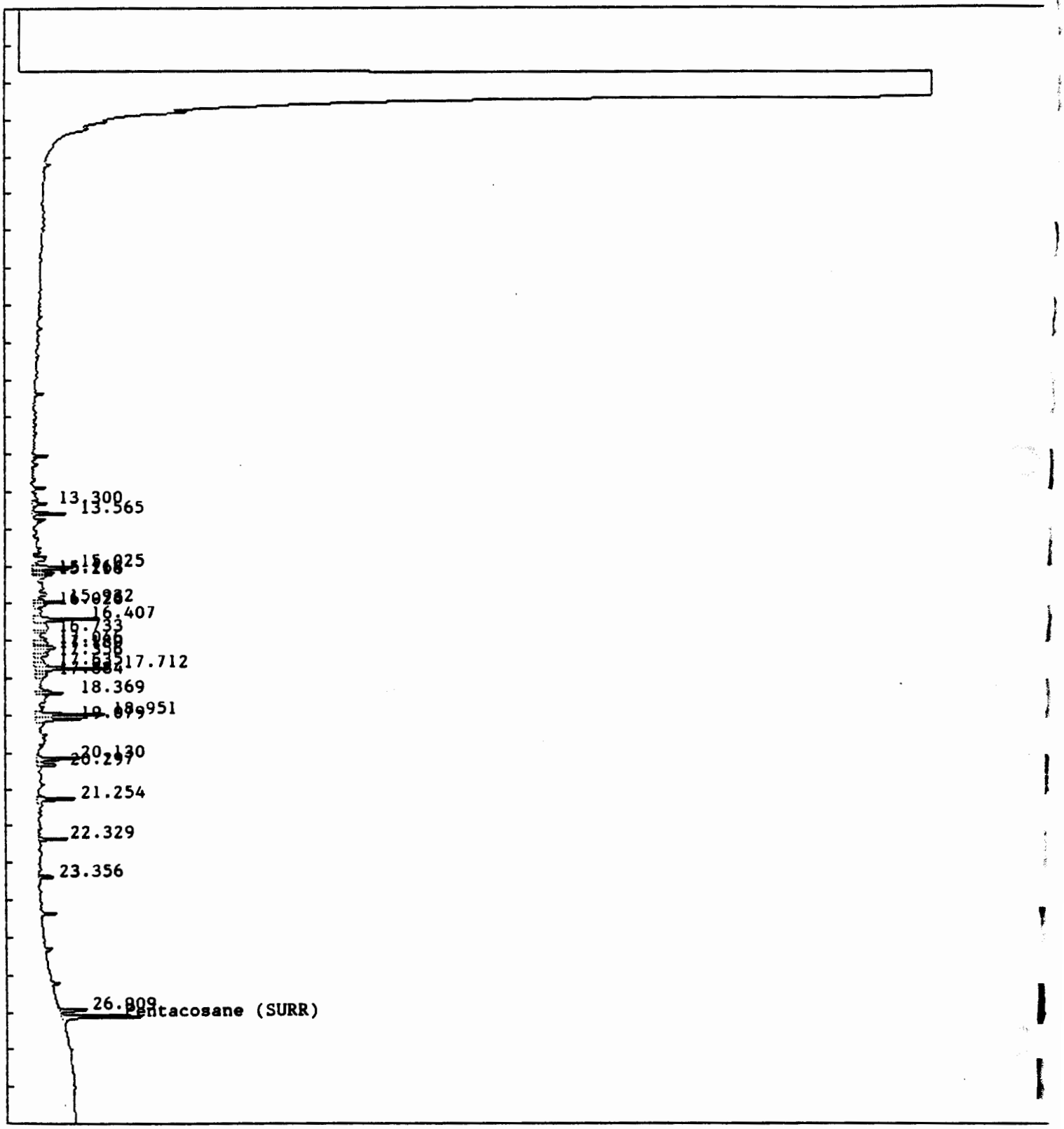
Corresponding Blank: D171A019

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/l):
Semivolatiles: 11800

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106MP05** **MW-1** **Matrix Spike**

File ID: /DATA/LOOP/RESULT/D171A024.RES
Date Analyzed: 1933 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/14
Bottle : 24
Run Time: 30.02 min.



Client:	Murphy Oil Inc.	Date Extracted:	06/16/91
Sample:	MS-MW-1 (Reanalysis)	Date Analyzed:	06/28/91
	Matrix Spike	Time Analyzed:	18:10
Lab ID:	R106NP05	Analyst:	PRM
File ID:	D179A003	GC Method:	CALIF. LUFT

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	POL (ug/l)
TPH (as Gasoline)			BQL	235
TPH (as Diesel Oil)	MS	15.03	6% Recovery	235

Surrogate Pentacosane (C-25) Recovery: 23%

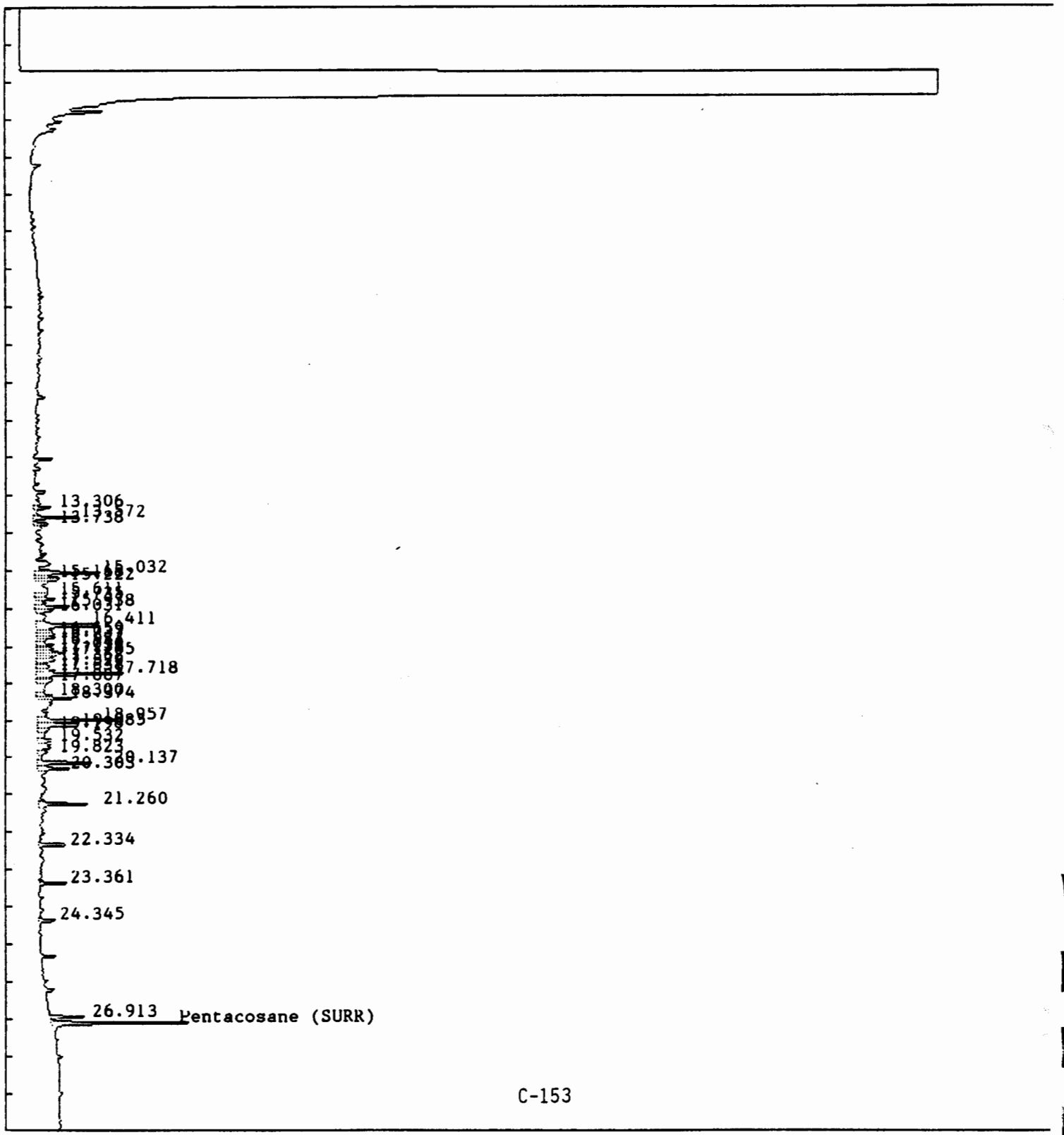
Corresponding Blank: D179A002

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 25 M x 0.32 mm HP-1 (FSCC)
Col. 2: 30 M x 0.32 mm DB-1301 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/l):
Semivolatiles: 11800

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NP05** **MS-MW-1**

File ID: /DATA/LOOP/RESULT/D179A003.RES
Date Analyzed: 1810 28Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 1/ 3
Bottle : 3
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: MW-1
Matrix Spike Duplicate
Lab ID: R106NP06
File ID: D171A025

Date Extracted: 06/16/91
Date Analyzed: 06/21/91
Time Analyzed: 20:11
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/11/91

Total Petroleum Hydrocarbons

Compound		Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)	MS	17.71	85% Recovery	235

Surrogate Pentacosane (C-25) Recovery: 100%

Corresponding Blank: D171A019

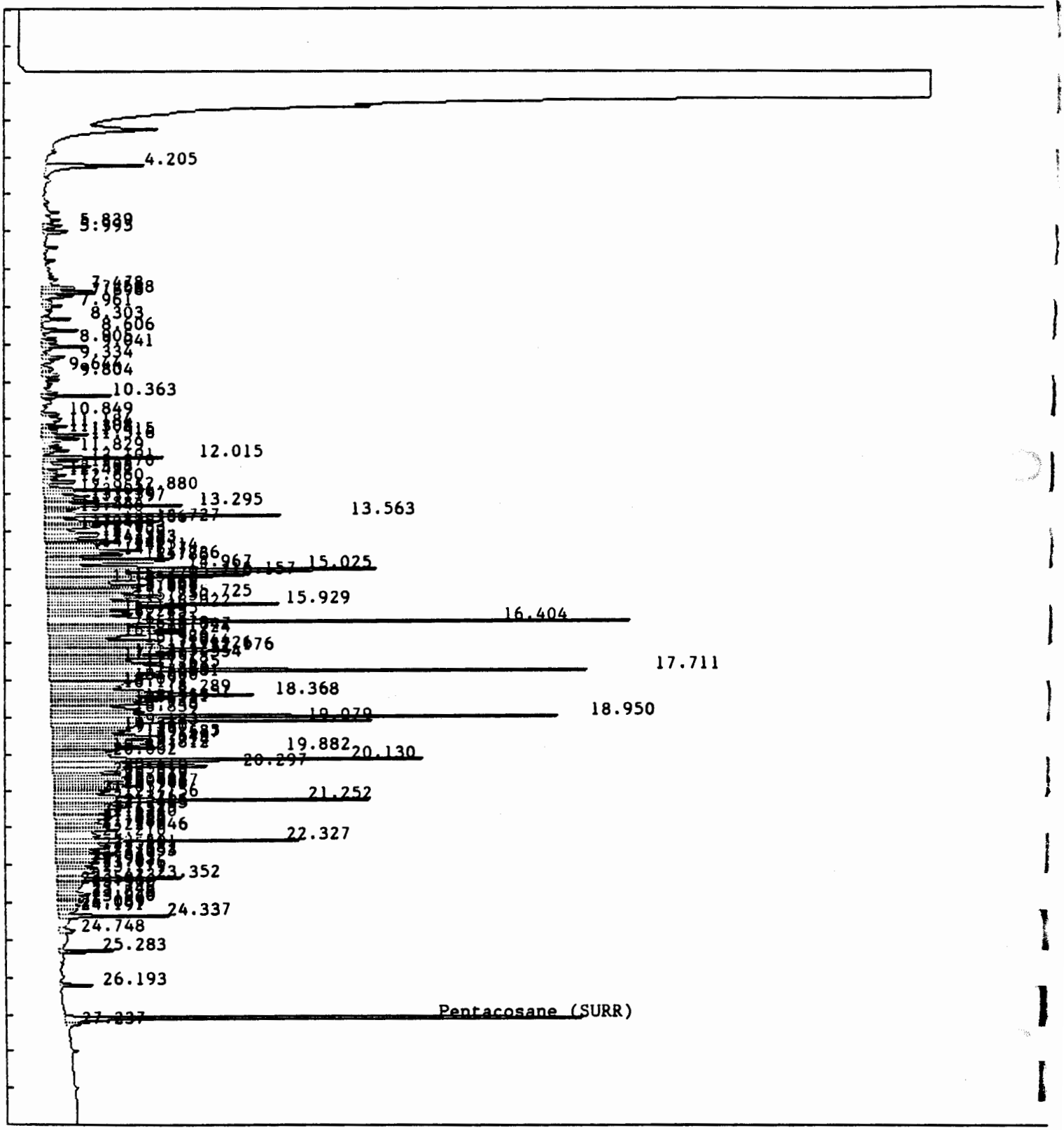
NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/l):
Semivolatiles: 11800

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Total Petroleum Hydrocarbons Analysis
Sample Name: R106MP06 MW-1 Matrix Spike Duplicate

File ID: /DATA/LOOP/RESULT/D171A025.RES
Date Analyzed: 2011 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/15
Bottle : 25
Run Time: 30.02 min.



Client: Walk Haydel and Assoc.
Sample: MW-2

Lab ID: R106NP07
File ID: D171A026

Date Extracted: 06/16/91
Date Analyzed: 06/21/91
Time Analyzed: 20:48
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/11/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)			BQL	154

Surrogate Pentacosane (C-25) Recovery: 59%

Corresponding Blank: D171A019

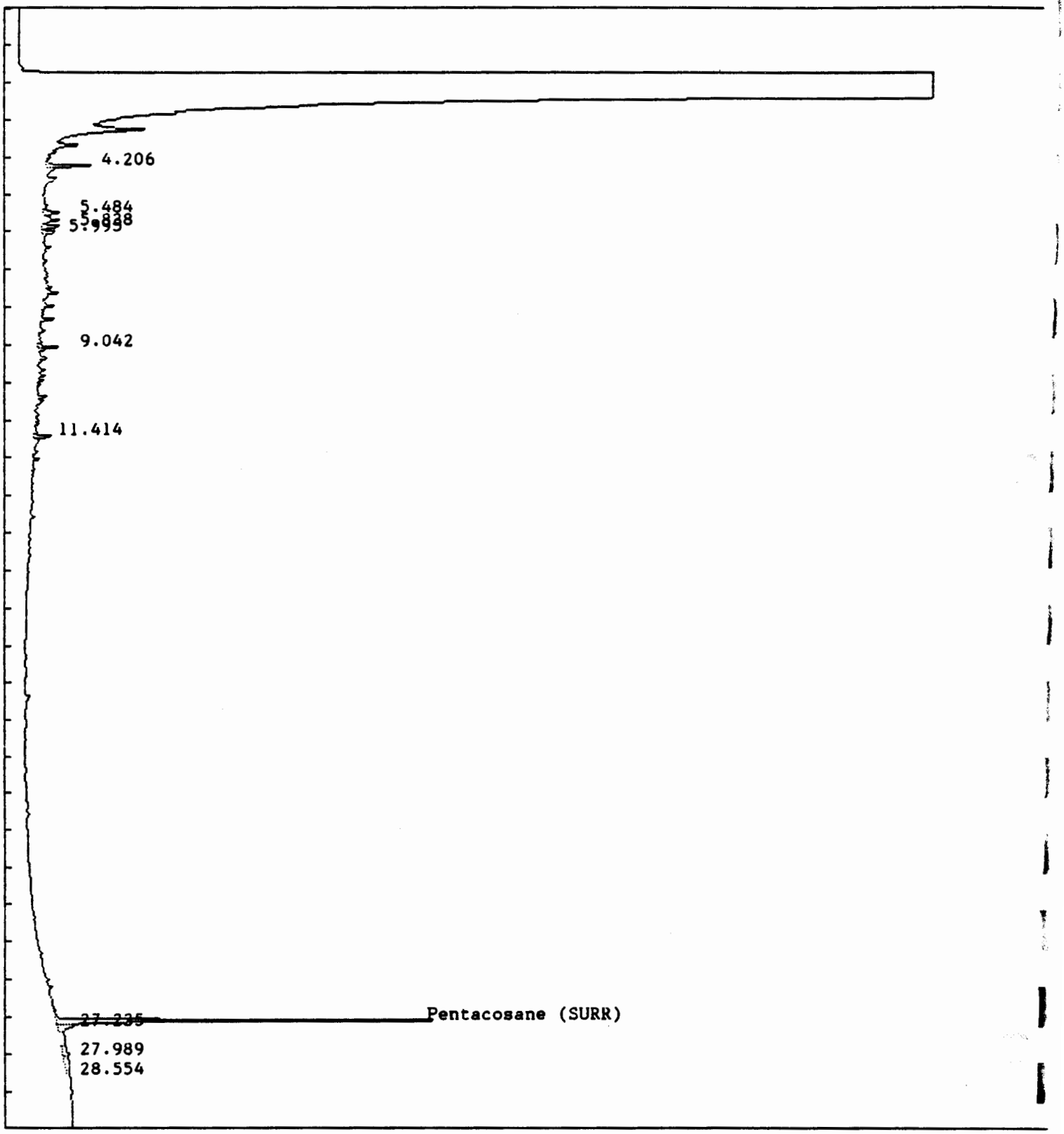
NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106MP07** **MW-2**

File ID: /DATA/LOOP/RESULT/D171A026.RES
Date Analyzed: 2048 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/16
Bottle : 26
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: MW-5

Lab ID: R106NP08
File ID: D171A027

Date Extracted: 06/16/91
Date Analyzed: 06/21/91
Time Analyzed: 21:25
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/11/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)	9.00		2620	154

Surrogate Pentacosane (C-25) Recovery: 88%

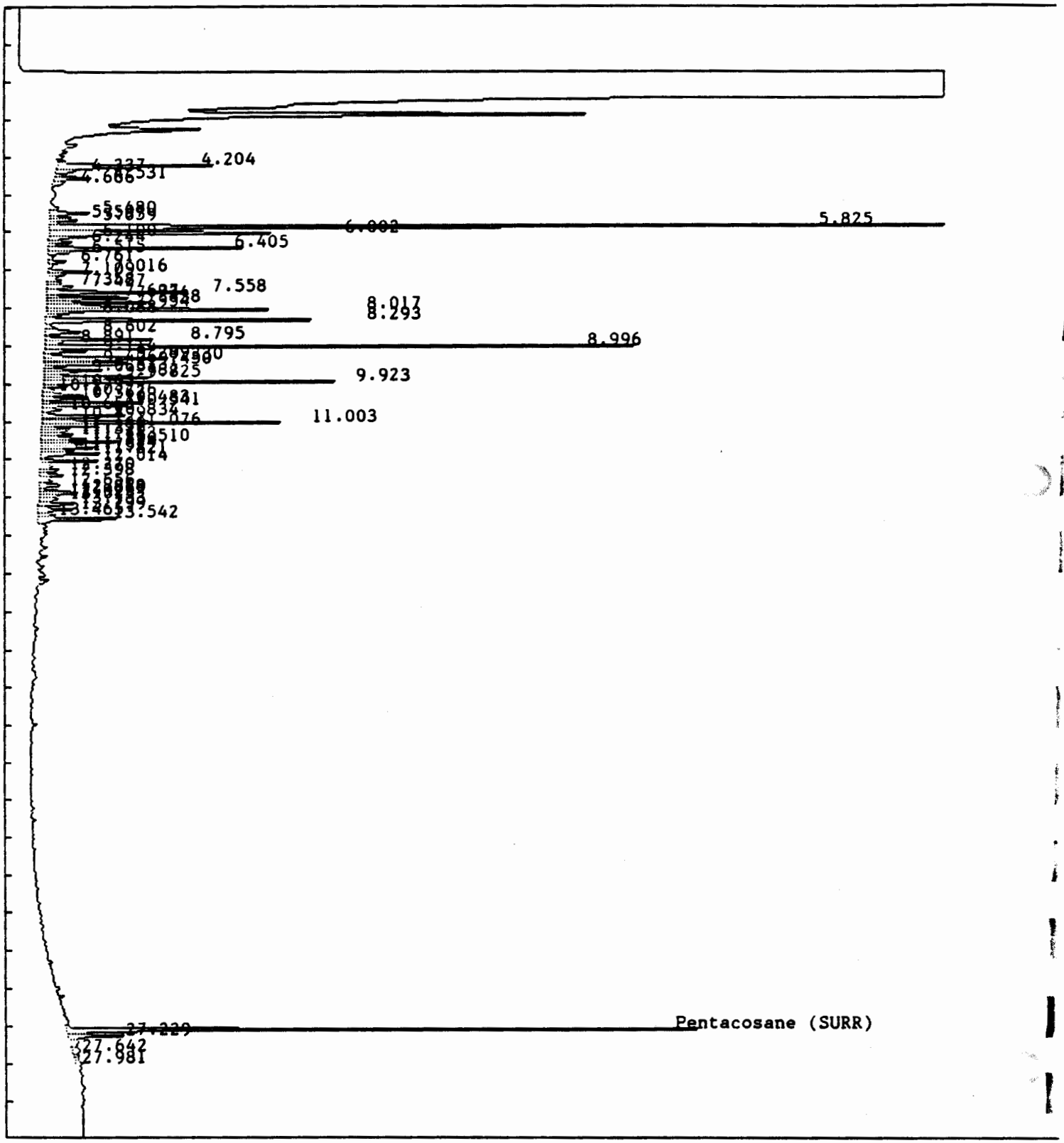
Corresponding Blank: D171A019

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106MP08** **MW-5**

File ID: /DATA/LOOP/RESULT/D171A027.RES
Date Analyzed: 2125 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 589C
Seq/Smpl: 2/17
Bottle : 27
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: Trip Blank #4

Lab ID: R106NP09
File ID: D171A028

Date Extracted: 06/16/91
Date Analyzed: 06/21/91
Time Analyzed: 22:02
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/10/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)		BQL	154

Surrogate Pentacosane (C-25) Recovery: 65%

Corresponding Blank: D171A019

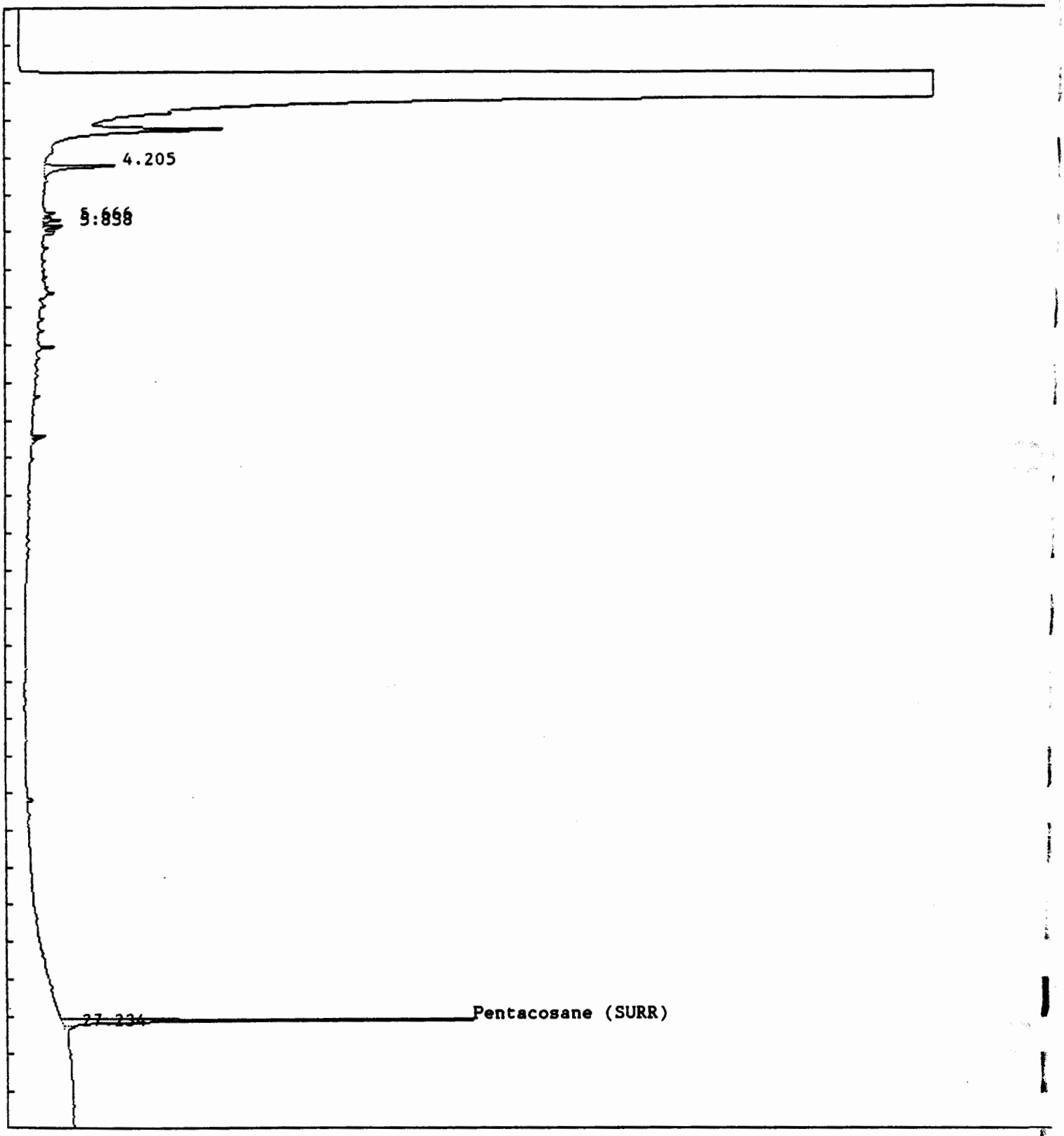
NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NP09** **Trip Blank #4**

File ID: /DATA/LOOP/RESULT/D171A028.RES
Date Analyzed: 2202 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/18
Bottle : 28
Run Time: 30.00 min.



Client: Walk Haydel and Assoc.
Sample: Effluent

Lab ID: R106NP17
File ID: D171A030

Date Extracted: 06/16/91
Date Analyzed: 06/21/91
Time Analyzed: 23:16
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/10/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)	8.99		10300	233

Surrogate Pentacosane (C-25) Recovery: 82%

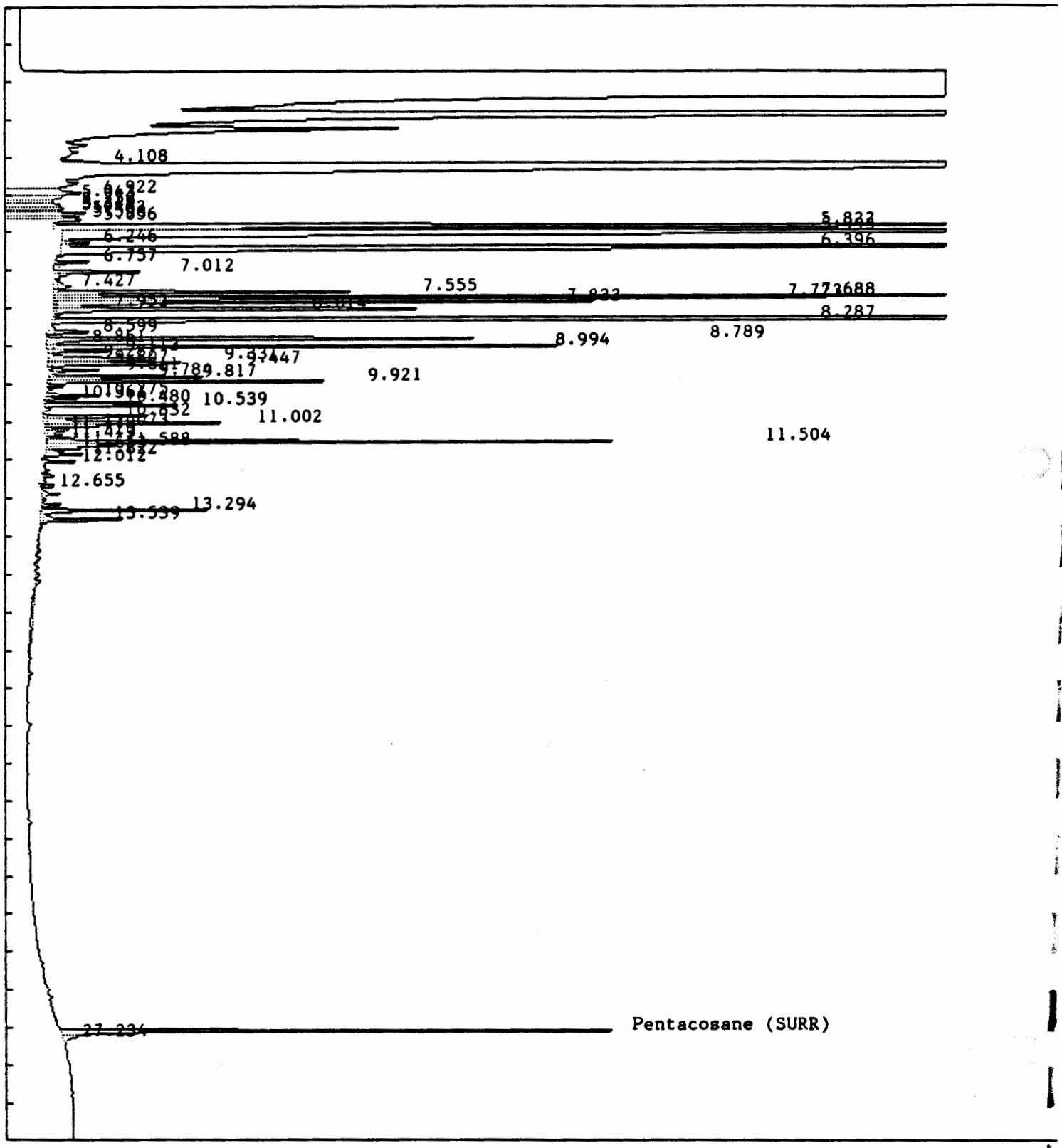
Corresponding Blank: D171A019

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NP17** **Effluent**

File ID: /DATA/LOOP/RESULT/D171A030.RES
Date Analyzed: 2316 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/20
Bottle : 30
Run Time: 30.00 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/16/91
Sample:	Extraction Blank	Date Analyzed:	06/21/91
	Blank Spike	Time Analyzed:	23:53
Lab ID:	R106NP18	Analyst:	LSK
File ID:	D171A031	GC Method:	CALIF. LUFT
		Date Sampled:	06/10/91

Total Petroleum Hydrocarbons

Compound		Chrom. Ret. Time Col. 1 (min.)	Col. 2 *	Sample Concentration (ug/l)	POL (ug/l)
TPH (as Diesel Oil)	MS	17.71		22% Recovery	40.0

Surrogate Pentacosane (C-25) Recovery: 41%

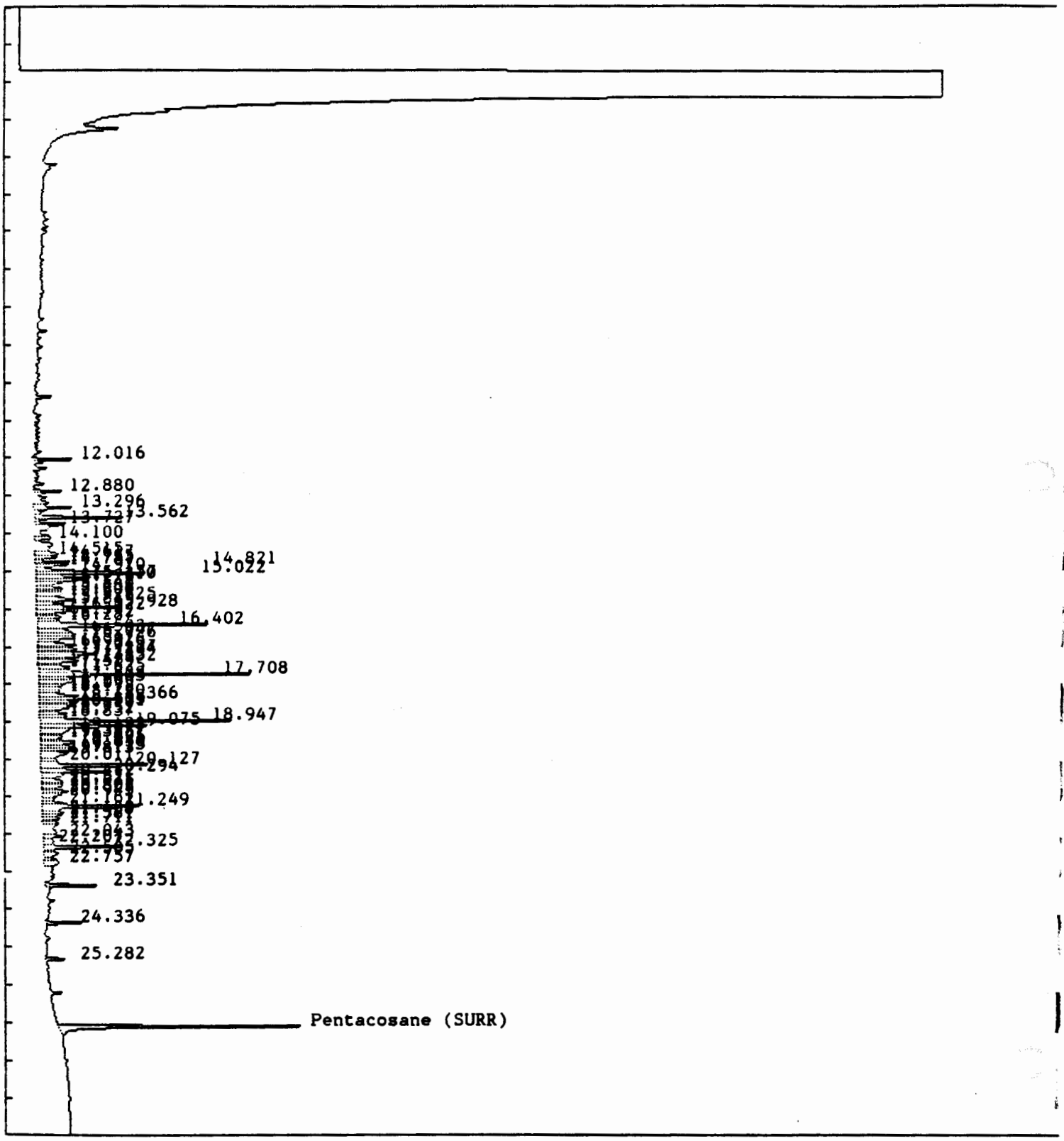
Corresponding Blank: D171A119

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/l):
Semivolatiles: 2000

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NP18** **Blank Spike**

File ID: /DATA/LOOP/RESULT/D171A031.RES
Date Analyzed: 2353 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/21
Bottle : 31
Run Time: 30.00 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/16/91
Sample:	Extraction Blank	Date Analyzed:	06/22/91
	Blank Spike Duplicate	Time Analyzed:	00:31
Lab ID:	R106NP19	Analyst:	LSK
File ID:	D171A032	GC Method:	CALIF. LUFT
		Date Sampled:	06/10/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1	Col. 2 * (min.)	Sample Concentration (ug/l)	POL (ug/l)
TPH (as Diesel Oil)	MS	17.71	85% Recovery	40.0

Surrogate Pentacosane (C-25) Recovery: 100%

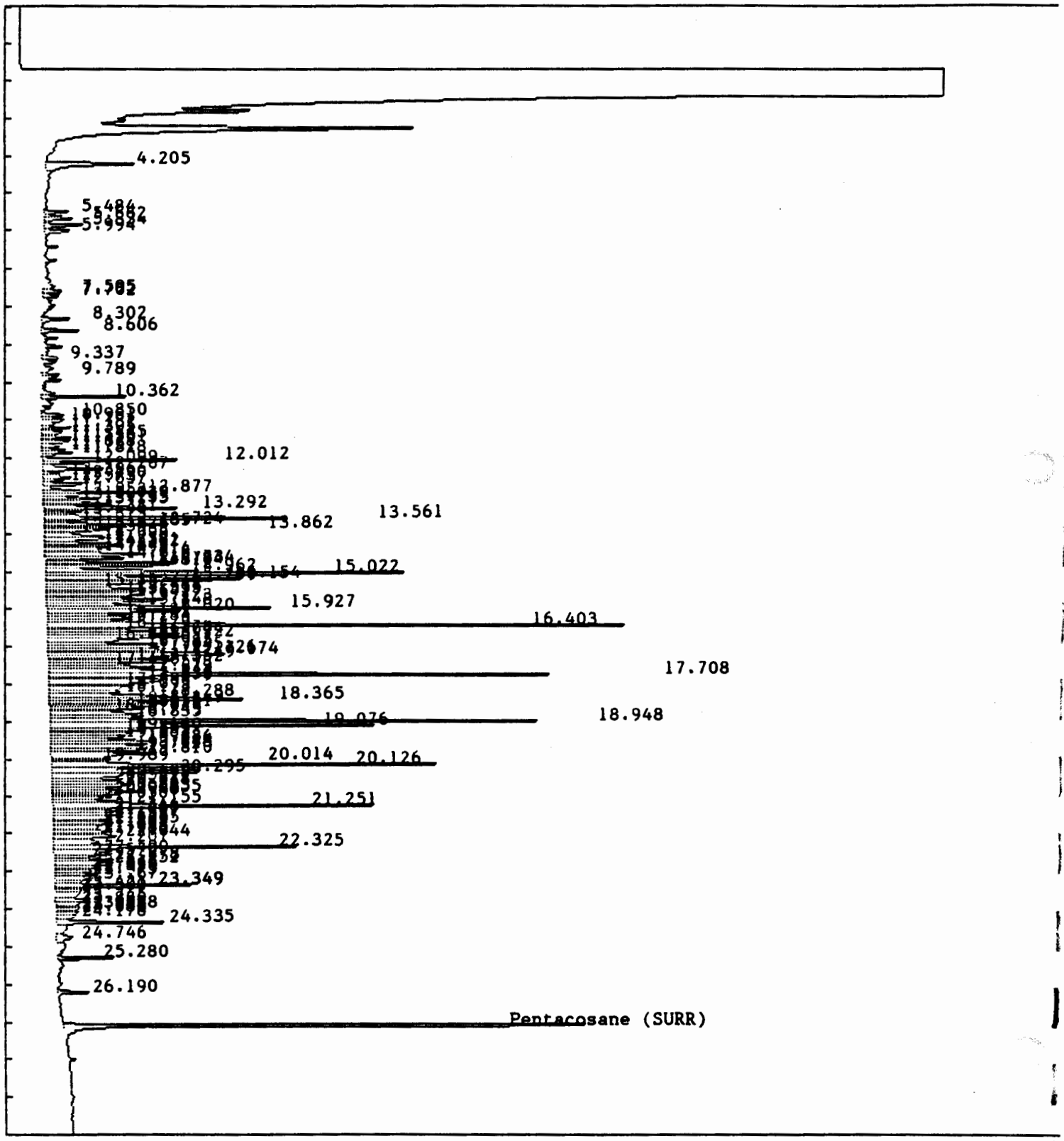
Corresponding Blank: D171A119

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/l):
Semivolatiles: 2000

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106MP19** **Blank Spike Duplicate**

File ID: /DATA/LOOP/RESULT/D171A032.RES
Date Analyzed: 0031 22Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/22
Bottle : 32
Run Time: 30.02 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/16/91
Sample:	Effluent	Date Analyzed:	06/22/91
	Matrix Spike	Time Analyzed:	01:08
Lab ID:	R106NP20	Analyst:	LSK
File ID:	D171A033	GC Method:	CALIF. LUFT
		Date Sampled:	06/10/91

Total Petroleum Hydrocarbons

Compound		Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)	MS	8.99		82% Recovery	233

Surrogate Pentacosane (C-25) Recovery: 83%

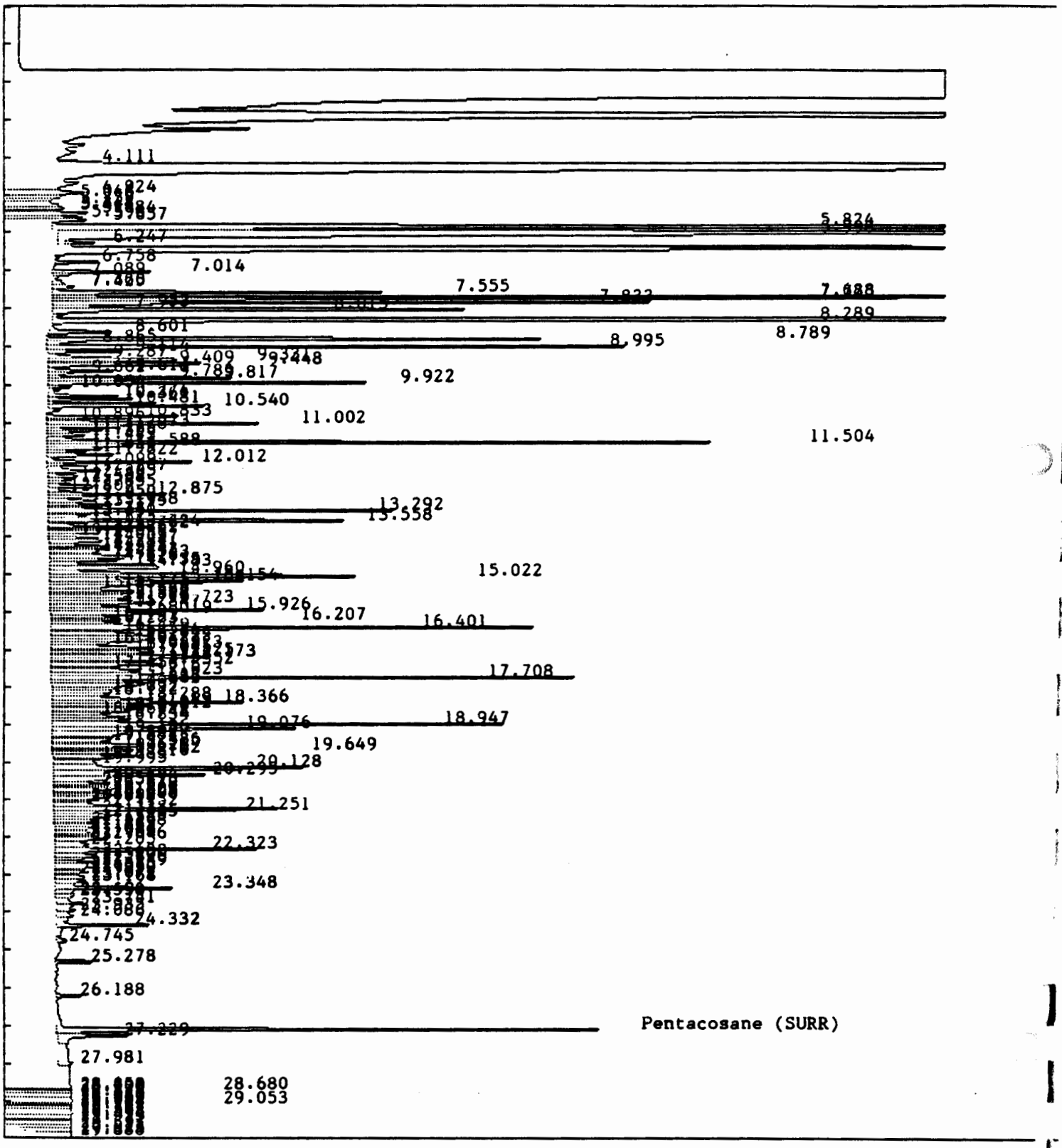
Corresponding Blank: D171A119

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/l):
Semivolatiles: 11600

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106MP20 Effluent Matrix Spike**

File ID: /DATA/LOOP/RESULT/D171A033.RES
Date Analyzed: 0108 22Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/23
Bottle : 33
Run Time: 30.00 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/16/91
Sample:	Effluent	Date Analyzed:	06/22/91
	Matrix Spike Duplicate	Time Analyzed:	01:45
Lab ID:	R106NP21	Analyst:	LSK
File ID:	D171A034	GC Method:	CALIF. LUFT
		Date Sampled:	06/10/91

Total Petroleum Hydrocarbons

Compound		Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	POL (ug/l)
TPH (as Diesel Oil)	MS	9.00		134% Recovery	233

Surrogate Pentacosane (C-25) Recovery: 89%

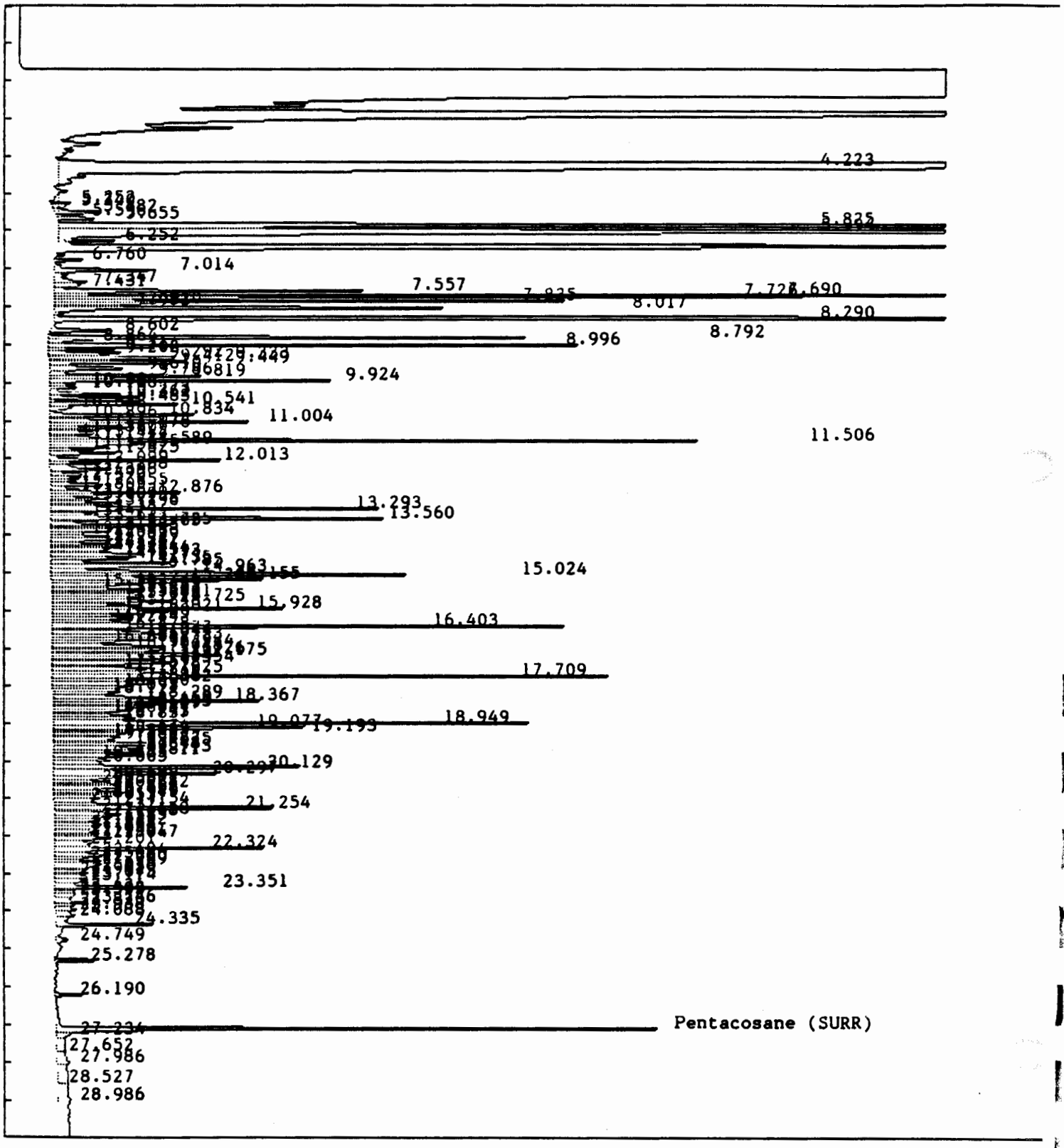
Corresponding Blank: D171A119

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)
MS : Matrix Spike Compound, Spike Level (ug/l):
Semivolatiles: 11600

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NP21** **Effluent** **Matrix Spike Duplicate**

File ID: /DATA/LOOP/RESULT/D171A034.RES
Date Analyzed: 0145 22Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/24
Bottle : 34
Run Time: 30.00 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/18/91
Sample:	Trip Blank #2	Date Analyzed:	06/22/91
		Time Analyzed:	06:42
Lab ID:	R106NP27	Analyst:	LSK
File ID:	D171A042	GC Method:	CALIF. LUFT
		Date Sampled:	06/10/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)			BQL	250

Surrogate Pentacosane (C-25) Recovery: 106%

Corresponding Blank: D171A041

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

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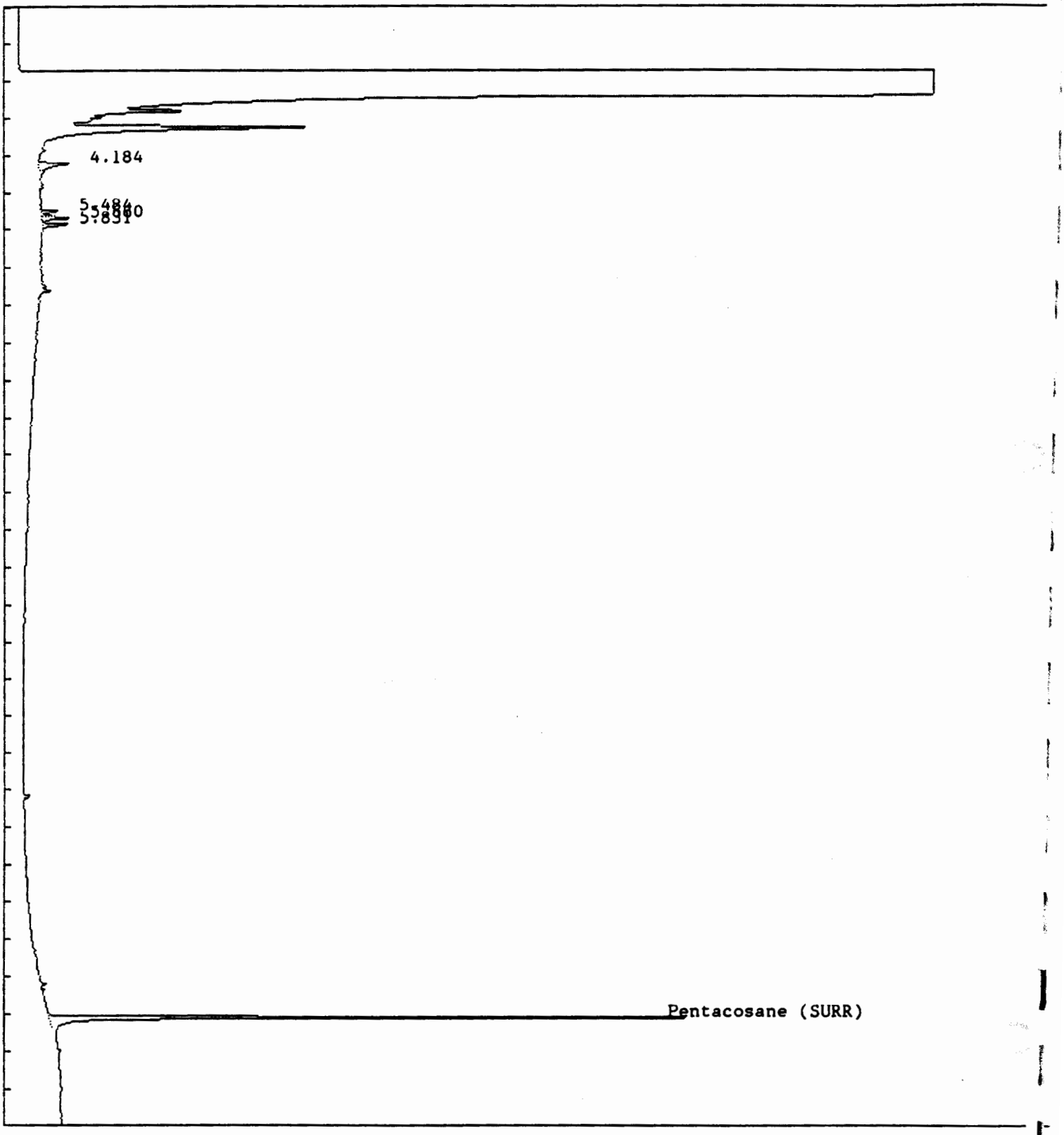
Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NP27** **Trip Blank #2**

File ID: /DATA/LOOP/RESULT/D171A042.RES
Date Analyzed: 0642 22Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/32
Bottle : 42
Run Time: 30.00 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/16/91
Sample:	Extraction Blank	Date Analyzed:	06/21/91
		Time Analyzed:	16:28
Lab ID:	SBLK01	Analyst:	LSK
File ID:	D171A019	GC Method:	CALIF. LUFT

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	POL (ug/l)
TPH (as Diesel Oil)			BQL	40.0

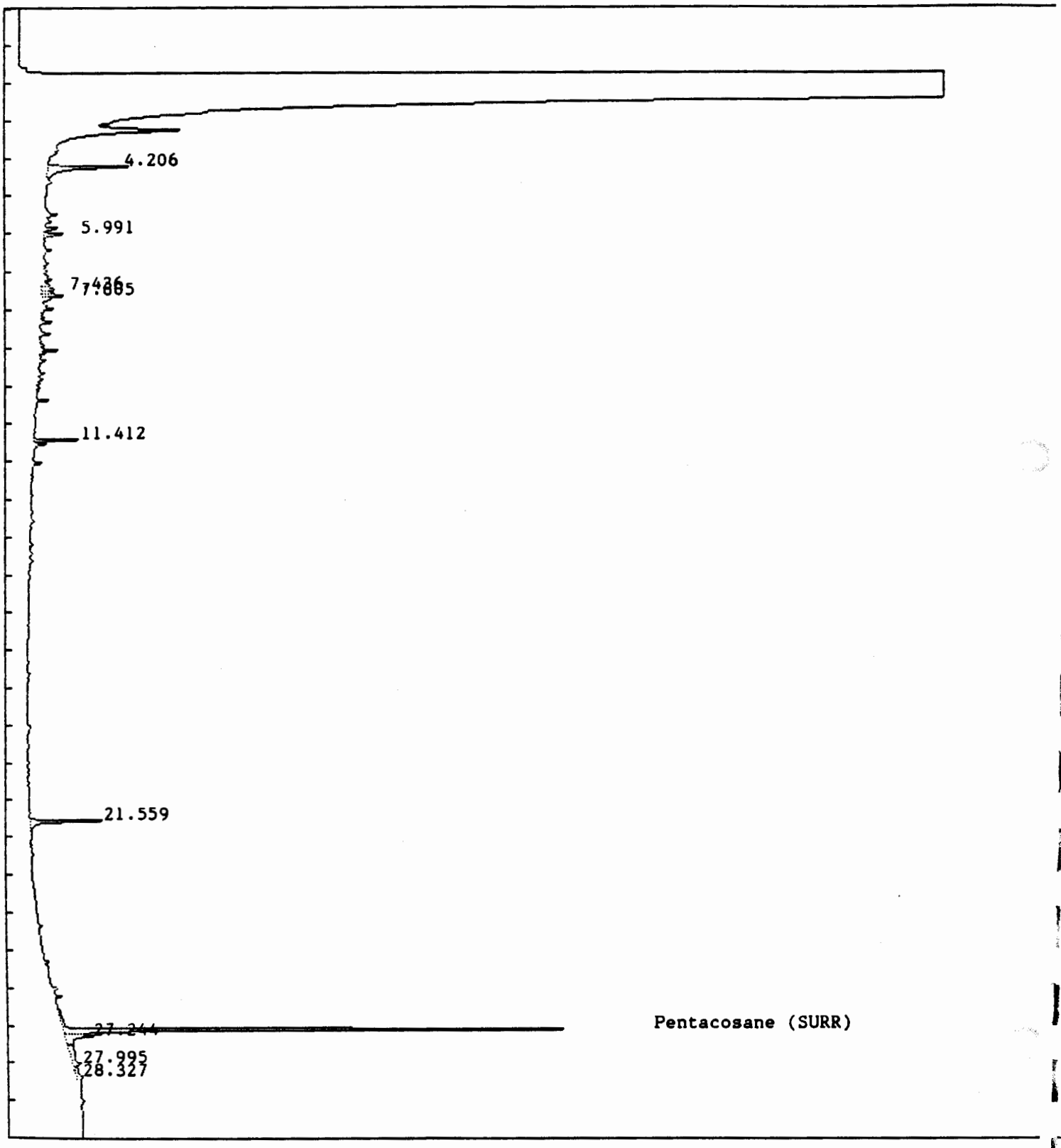
Surrogate Pentacosane (C-25) Recovery: 88%

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: **SBLK01** **Extraction Blank**

File ID: /DATA/LOOP/RESULT/D171A019.RES
Date Analyzed: 1628 21Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/ 9
Bottle : 19
Run Time: 30.02 min.



Client:	Walk Haydel and Assoc.	Date Extracted:	06/18/91
Sample:	Extraction Blank #2	Date Analyzed:	06/22/91
		Time Analyzed:	06:05
Lab ID:	SBLK02	Analyst:	LSK
File ID:	D171A041	GC Method:	CALIF. LUFT

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)		BQL	40.0

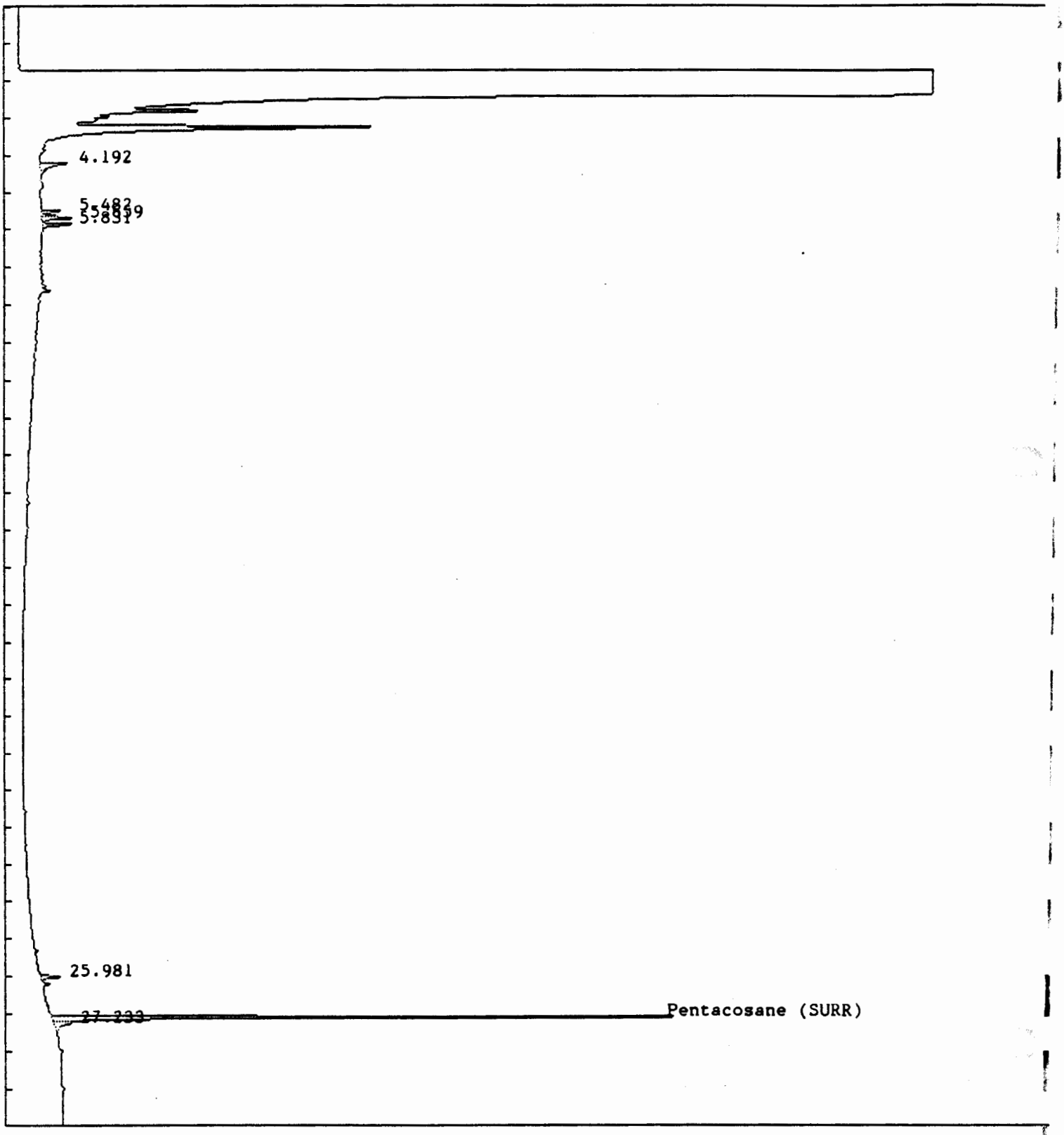
Surrogate Pentacosane (C-25) Recovery: 95%

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: **SBLK02** **Extraction Blank #2**

File ID: /DATA/LOOP/RESULT/D171A041.RES
Date Analyzed: 0605 22Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/31
Bottle : 41
Run Time: 30.00 min.



ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 James Drive West, Suite 100
St. Rose, Louisiana 70087
(504) 469-0333

GAS CHROMATOGRAPHY BLANK SPIKE QC RESULTS SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL (ug/l)	BS % RECOVERY	BSD % RECOVERY	QC RANGE	RPD	RPD LIMIT
TPH (as Diesel Oil)	R106NP	2000	22% *	85%	50-150	117 *	25

GAS CHROMATOGRAPHY MATRIX SPIKE QC RESULTS SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL (ug/l)	MS % RECOVERY	MSD % RECOVERY	QC RANGE	RPD	RPD LIMIT
TPH (as Diesel Oil)	R106NP	11600	82%	134%	50-150	48 *	25

NOTES:

* Value Exceeds QC Criteria

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 James Drive West, Suite 100
St. Rose, Louisiana 70087
(504) 469-0333

GAS CHROMATOGRAPHY BLANK SPIKE QC RESULTS SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL (ug/l)	BS % RECOVERY	BSD % RECOVERY	QC RANGE	RPD	RPD LIMIT
TPH (as Diesel Oil)	R106NP	2000	78%	43% *	50-150	57 *	25

GAS CHROMATOGRAPHY MATRIX SPIKE QC RESULTS SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL (ug/l)	MS % RECOVERY	MSD % RECOVERY	QC RANGE	RPD	RPD LIMIT
TPH (as Diesel Oil)	R106NP	11800	4% *	85%	50-150	182 *	25

NOTES:

* Value Exceeds QC Criteria

Lab Number: R106NP

PROCEDURE RECORDS

Test Methods for Evaluating Solid Waste,
Physical/Chemical Methods, SW-846, USEPA 3rd Edition, Revised November, 1986

Test	Method	Analyst	Date/Time Analyzed
Lead (graphite furnace)	3020/7421	LH	06/20/91 15:02
GC/MS Volatile Organics	8240	AS	SEE COMP. LIST
Flash Point	1010	LV	06/21/91 10:00

Leaking Underground Fuel Tank Field Manual:
Guidelines For Site Assessment, Cleanup, and Underground Storage
Tank Closure, December 1987, State of California

Test	Method	Analyst	Date/Time Analyzed
Total Petroleum Hydrocarbons	Modified 8015	RM	SEE COMP. LIST

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC. COOLER RECEIPT FORM
161 JAMES DRIVE WEST • SUITE 100
ST. ROSE, LA 70087

PROJECT: WALK Hayden HAFB Site SS-17 Date received: 6-12-91

USE OTHER SIDE OF THIS FORM TO NOTE DETAILS CONCERNING CHECK-IN PROBLEMS.

A. PRELIMINARY EXAMINATION PHASE: Date cooler was opened: 6-12-91

by (print) JACK Carter (sign) [signature]

1. Did cooler come with a shipping slip (air bill, etc.)? ..... (YES) NO

   If YES, enter carrier name & air bill number here: FedEX #0728922114

2. Were custody seals on outside of cooler? ..... (YES) NO

   If YES, how many & where: 2 ; one on Front-Right ; one on Back-Left

   If YES, enter the following: seal date: 6-11-91, seal name: CH

3. Were custody seals unbroken and intact at the date and time of arrival? ..... (YES) NO
4. Were custody papers sealed in a plastic bag & taped inside to the lid? ..... (YES) NO
5. Were custody papers filled out properly (ink, signed, etc.)? ..... (YES) NO
6. Did you sign custody papers in the appropriate place? ..... (YES) NO
7. Was project identifiable from custody papers? If YES, enter project name at the top of this form. (YES) NO
8. If required, was enough ice used? ..... (YES) NO
9. Have designated person initial here to acknowledge receipt of cooler: JC (date) 6-12-91

B. LOG-IN PHASE: Date samples were logged-in: 6-12-91

by (print) JACK Carter (sign) [signature]

10. Describe type of packing in cooler: wood shavings
11. Were all bottles sealed in separate plastic bags? ..... (YES) NO
12. Did all bottles arrive unbroken & were labels in good condition? ..... (YES) NO
13. Were all bottle labels complete (ID, date, time, signature, preservative, etc.)? ..... (YES) NO
14. Did all bottle labels agree with custody papers? ..... (YES) NO
15. Were correct containers used for the tests indicated? ..... (YES) NO
16. Were correct preservatives added to samples? ..... (YES) NO
17. Was a sufficient amount of sample sent for tests indicated? ..... (YES) NO
18. Were bubbles absent in VOA samples? If NO, list by CA#: _____ (YES) NO
19. Was the shipment accepted? ..... (YES) NO
20. Was the project manager called and status discussed? If YES, give details on the back of this form. YES NO

21. Who was called ? By whom ? (date)

EIRA Chest

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

CHAIN OF CUSTODY RECORD

161 James Drive West
St. Rose, LA 70087
(504) 469-0333

PROJ. NO. 5362.51

CLIENT: WHHA HAFB Site SS-17

SAMPLES: (Signature and Initials)

SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	COMP	GRAB	SAMPLE I.D.	NO. OF CONTAINERS	SAMPLES PRESERVED (Y/N)	ANALYSIS REQUESTED: TPH-L	VOA	Total Lead			REMARKS	FOR LAB USE ONLY: LAB I.D. #
	6/11/91	0925			TH-20	6	Y	/	/	/				01
	6/11/91	1032			MW-1	6	Y	/	/	/				02
	6/11/91	1032			MW-1-QC	6	Y	/	/	/				02
	6/11/91	1130			MW-2	6	Y	/	/	/				07
	6/11/91	1245			MW-5	6	Y	/	/	/				08
	5/10/91	1620			Trip Blank #4	3	Y	/						09
	5/21/91	1355			Trip Blank #3	1	Y		/				One VOA run from	10
	5/21/91	1356			Trip Blank #3	1	Y		/				2 40ml Vials	10

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)

Requested Turnaround: ____24 - 48 hours; ____Less than 5 days; ____Less than standard; ____Standard

Regulatory Concerns: ____RCRA; ____NPDES; ____Drinking Water; ____CLP; ____None; ____Other____

EPISODE ID: R186NP

LABORTARY APPROVAL REQUIRED PRIOR TO SAMPLE SUBMISSION

Date/Time: 6-12-91 1000

CONTACT NAME AND PHONE NUMBER

White Copy____ Canary Copy____ Pink Copy____

#3

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

161 James Drive West
St. Rose, LA 70087
(504) 469-0333

CHAIN OF CUSTODY RECORD

PROJ. NO.: 5362.57

CLIENT: Wally Hangar - Site SS-17, NAFB

SAMPLES: (Signature and Initials)

SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	COMP	GRAB	SAMPLE I.D.	NO. OF CONTAINERS	SAMPLES PRESERVED (Y/N)	ANALYSIS REQUESTED: Flashpoint	ANALYSIS REQUESTED: Lead				REMARKS	FOR LAB USE ONLY: LAB I.D. #
1	6-10-91	1918		X	UST No. 2	1		X					Product	P1
2	6-10-91	1918		X	UST No. 2	1	X		X				Product	P1
3	6-10-91	1918		X	UST No. 2 QC	1		X					Product	P1
4	6-10-91	1918		X	UST No. 2 QC	1	X		X				Product	P1

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)

Requested Turnaround
- ____ 24 - 48 hours
- ____ Less than 5 days
- ____ Less than standard
- ____ Standard

Date/Time

Regulatory Concerns
- ____ RCRA
- ____ NPDES
- ____ Drinking Water
- ____ CLP
- ____ None
- ____ Other ____

EPISODE ID: R106NP

LABORATORY APPROVAL REQUIRED PRIOR TO SAMPLE SUBMISSION

CONTACT NAME AND PHONE NUMBER

White Copy ____ Canary Copy ____ Pink Copy ____

#6

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

161 James Drive West
St. Rose, LA 70087
(504) 469-0333

CHAIN OF CUSTODY RECORD

PROJ. NO.

CLIENT WHA
HAFB site SS-17

SAMPLES: (Signature and Initials)

SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	COMP	GRAB	SAMPLE I.D.	NO. OF CONTAINERS	SAMPLES PRESERVED (Y/N)	ANALYSIS REQUESTED: ~~FAP~~ TPH-L	Total Pb	VOA			REMARKS	FOR LAB USE ONLY LAB I.D. #
	6/10/91	1649		/	Effluent	4		/	/					17
	6/10/91	1723		/	Effluent	2				/				22
	6/10/91	1653		/	Effluent -QC	4		/	/					17
	6/10/91	1725		/	Effluent -QC	2				/				22
	6/10/91	1620			Trip Blank #2	3		/						27
	5/21/91	1436			Trip Blank 2 #1	1				/			one VOA run from	28
	5/21/91	1148			Trip Blank 3	1				/			2-40ml sample vials	28

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature) — Date/Time

Requested Turnaround
_____24 - 48 hours
_____Less than 5 days
_____Less than standard
_____Standard

Regulatory Concerns
_____RCRA
_____NPDES
_____Drinking Water
_____CLP
_____None
_____Other_____

EPISODE ID R186NP

LABORTARY APPROVAL REQUIRED PRIOR TO SAMPLE SUBMISSION

CONTACT NAME AND PHONE NUMBER

White Copy_____ Canary Copy_____ Pink Copy_____

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 James Drive West, Suite 100
St. Rose, Louisiana 70087
(504) 469-0333

LABORATORY REPORT

Prepared for: WALK HAYDEL & ASSOC.
Attention: MR. RAY VACHON
600 CARONDELET ST.
NEW ORLEANS, LA 70130

Lab Episode Number: R106NS
Work Order Number: 5383
Date Received: 06/13/91

Task Order Number: 063
Job Number: 5362.51
Subcontract Number: 8889-001

NARRATIVE

SAMPLE ID	LAB ID	MATRIX
MW-3	R106NS01	WATER
MW-2	R106NS02	WATER
W-2	R106NS03	WATER
MW-4	R106NS04	WATER

The above samples were received for the Holloman AFB Site SS-17 Project, and the samples were assigned the lab identification numbers as indicated. This Lab Episode is one of three belonging to this project: R106NP received 06/12/91, R106NS received 06/13/91 and R106PM received 06/14/91.

Each sample in this episode R106NS was analyzed for Volatile Organics by Method 8240, Total Petroleum Hydrocarbons by Modified Method 8015, and Total Lead by Method 3050/7421.

No problems were noted with the analyses reported here.

The chain of custody record is included with this report.

If you have any questions regarding this analysis, please contact the Project Coordinator.

Technical Review/Clerical Accuracy/Report Completeness Certified By:

Richard C. Koch

Richard C. Koch, PhD
Project Coordinator

6-27-91
Date

Method Compliance Certified/Data Released By:

John R. Troost
V.P./Operations General Manager

6/27/91
Date

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Lab Number: R106NS
Page Number: 2

GENERAL CHEMISTRY RESULTS

MW-3
DATE/TIME SAMPLED: 06/11/91 17:00:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	0.008	mg/l (ppm)	0.005	-

MW-2
DATE/TIME SAMPLED: 06/11/91 17:56:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	0.008	mg/l (ppm)	0.005	-

W-2
DATE/TIME SAMPLED: 06/12/91 10:18:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	BQL	mg/l (ppm)	0.005	-

MW-4
DATE/TIME SAMPLED: 06/12/91 11:07:00

Test	Concentration	Units	PQL	DF
Lead (graphite furnace)	BQL	mg/l (ppm)	0.005	-

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	PQL
Lead (graphite furnace)	BQL	mg/l (ppm)	0.005

BQL: Below Quantitation Limit
DF: Dilution Factor
PQL: Practical Quantitation Limit
SL: Spike Level

Lab Number: R106NS
Page Number: 3

POSITIVE FINDINGS SUMMARY REPORT

	06NS01 MW-3 (W)	06NS02 MW-2 (W)	06NS03 W-2 (W)	06NS04 MW-4 (W)
PB-G-L	0.008	0.008	BQL	BQL

Lab Number: R106NS
Page Number: 4

QC REPORT

BLANK SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% Recovery	Dup. % Recovery	QC Range	RPD	RPD Limit
Lead (graphite furnace)	06MN03	0.04 mg/l	96	92	80-120	4	20

RPD: Relative Percent Difference
NOTE: A set of blank spikes is analyzed after every twentieth sample. Blank spike recoveries exceeding an established "QC Range" or "RPD Limit" trigger reanalysis of all samples in the batch. Results of matrix spikes, performed in duplicate on the twentieth field sample in a batch, exceeding "ADVSY Range" or "ADVSY RPD", are generally reported without remediation. Established ranges and limits are actual registers of the precision and accuracy capabilities of the methods on clean matrices and genuine field samples.

Client: WALK HAYDEL & ASSOC.
Sample: MW-3
Lab ID: R106NS01
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/17/91
Date Sampled: 06/11/91
Data File ID: RA168U

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride	5.27	6.	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane	10.09	12.	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	104	76-114
Toluene-d8	101	88-110
4-Bromofluorobenzene	102	86-115

pH 2

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RA1680

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

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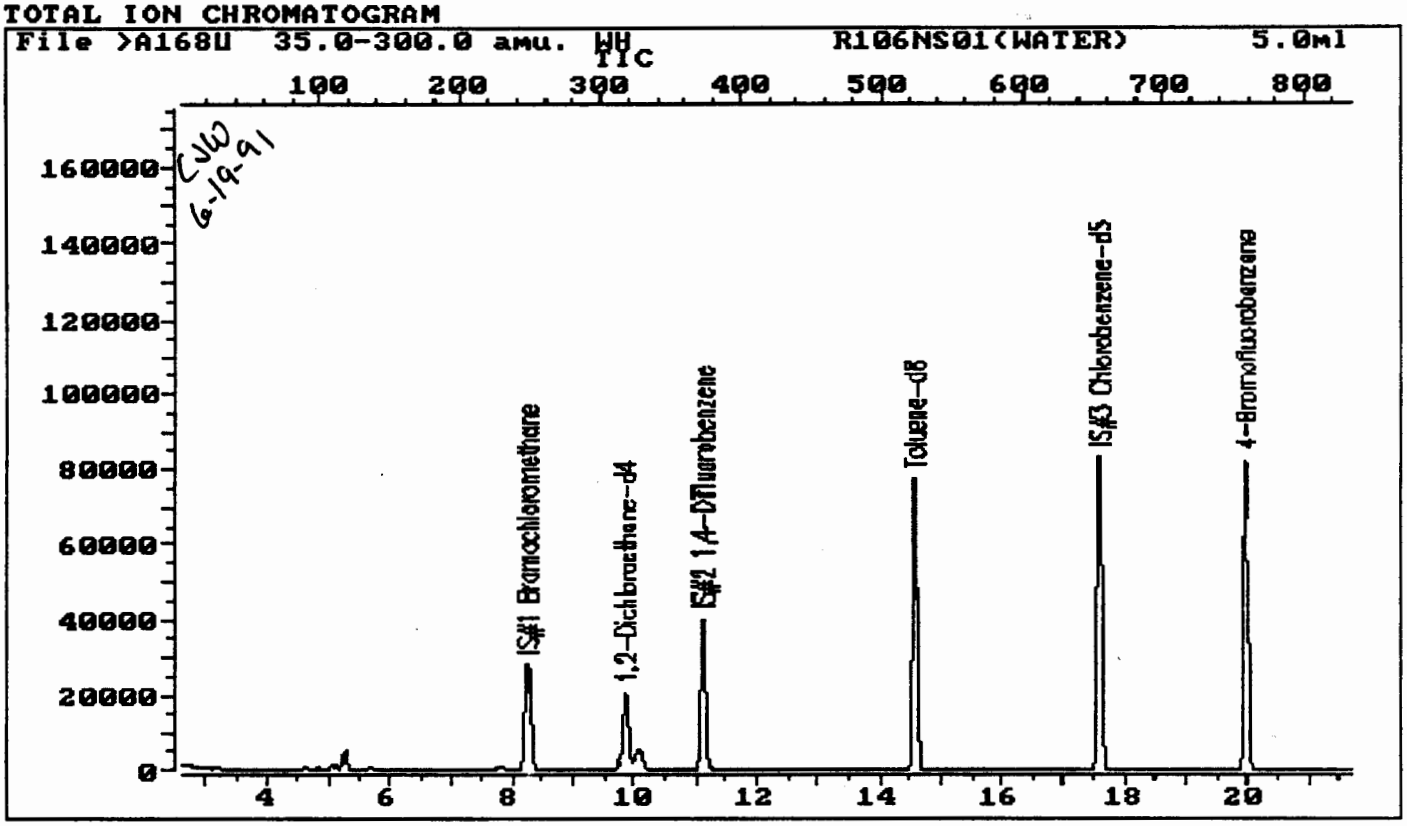
TOTAL ION CHROMATOGRAM



Data File: >A168U::D4 Quant Output File: ^A168U::QT
Name: WH R106NS01
Misc: (WATER) 5.0ml MW-3 INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910617 18:03

Operator ID: JOHN
Quant Time: 910617 23:09
Injected at: 910617 22:46

Client: WALK HAYDEL & ASSOC.
Sample: MW-2
Lab ID: R106NS02
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/17/91
Date Sampled: 06/11/91
Data File ID: RA168V

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene	14.68	6.	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)	18.18-18.92	6.	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	105	76-114
Toluene-d8	97	88-110
4-Bromofluorobenzene	101	86-115

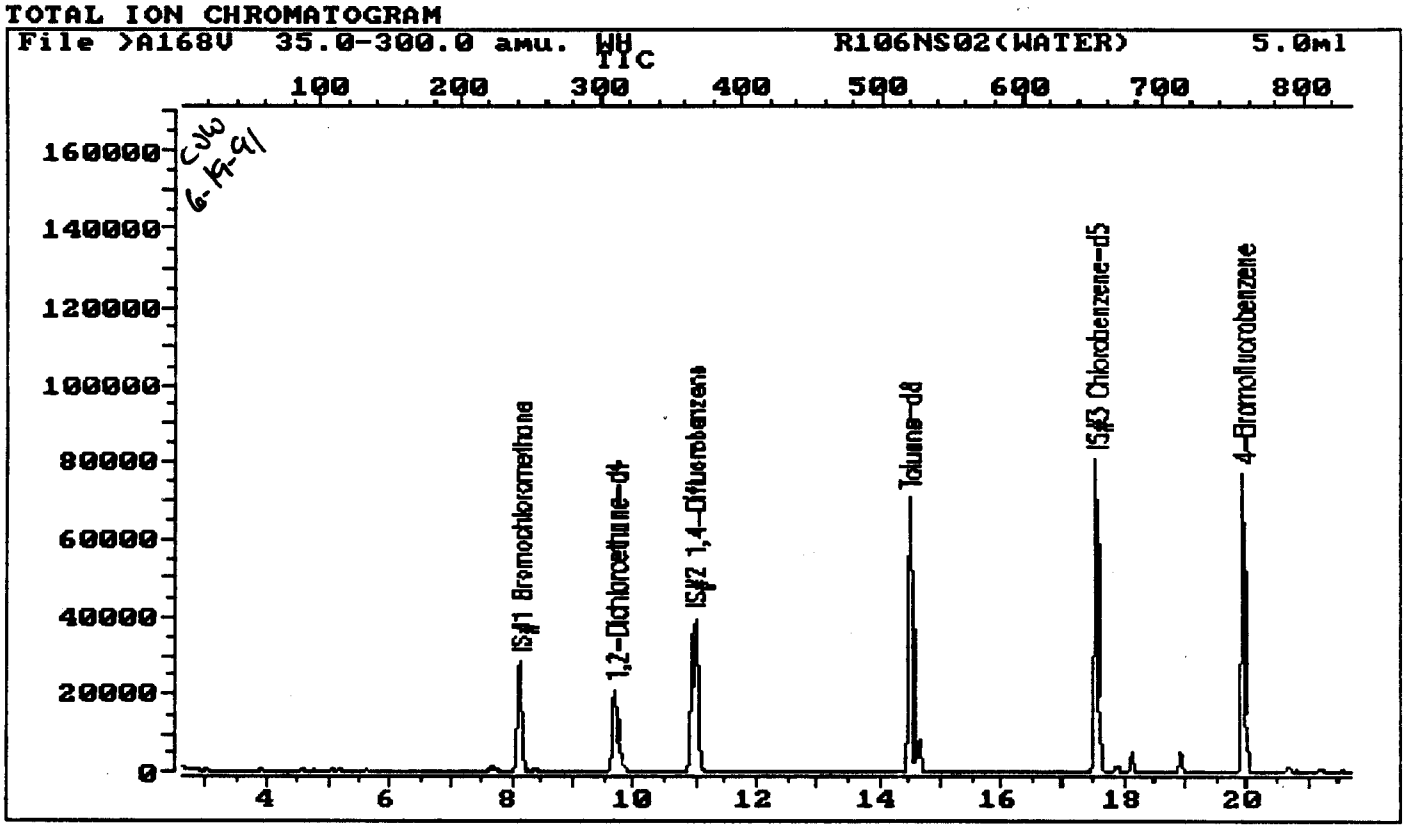
pH 2

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RA1680

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A168V::D4 Quant Output File: ^A168V::QT
Name: WH R106NS02
Misc: (WATER) 5.0ml MW-2 INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910617 18:03

Operator ID: JOHN
Quant Time: 910617 23:51
Injected at: 910617 23:29

Client: WALK HAYDEL & ASSOC.
Sample: W-2
Lab ID: R106NS03
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/18/91
Date Sampled: 06/12/91
Data File ID: RA169H

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform	8.11	5.	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	108	76-114
Toluene-d8	103	88-110
4-Bromofluorobenzene	102	86-115

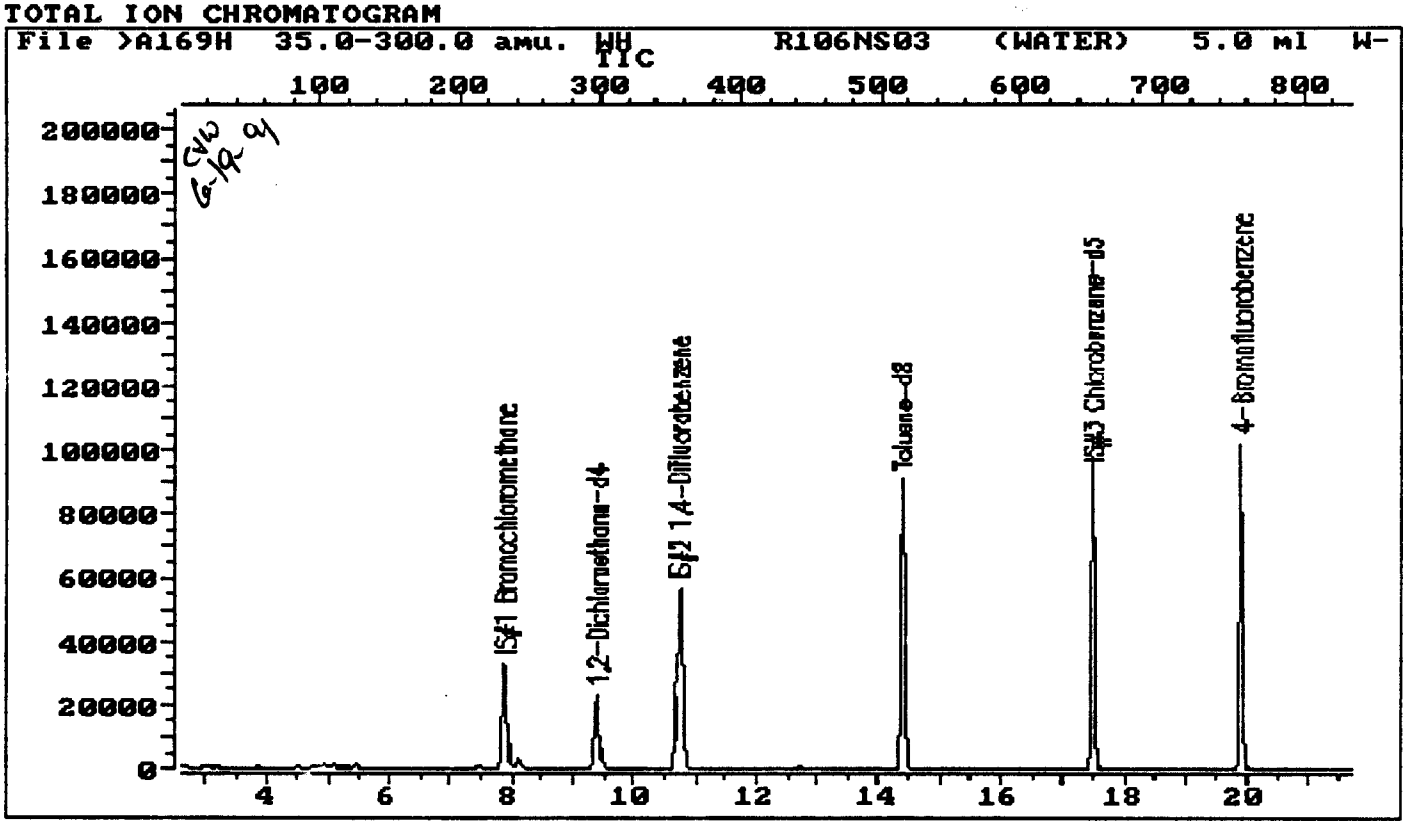
pH 2

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RA169E

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A169H::D4 Quant Output File: ^A169H::QT
Name: WH R106NS03
Misc: (WATER) 5.0 ml W-2 INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910618 10:18

Operator ID: JOE
Quant Time: 910618 15:35
Injected at: 910618 15:13

Client: WALK HAYDEL & ASSOC.
Sample: MW-4
Lab ID: R106NS04
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/18/91
Date Sampled: 06/12/91
Data File ID: RA169I

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	106	76-114
Toluene-d8	105	88-110
4-Bromofluorobenzene	107	86-115

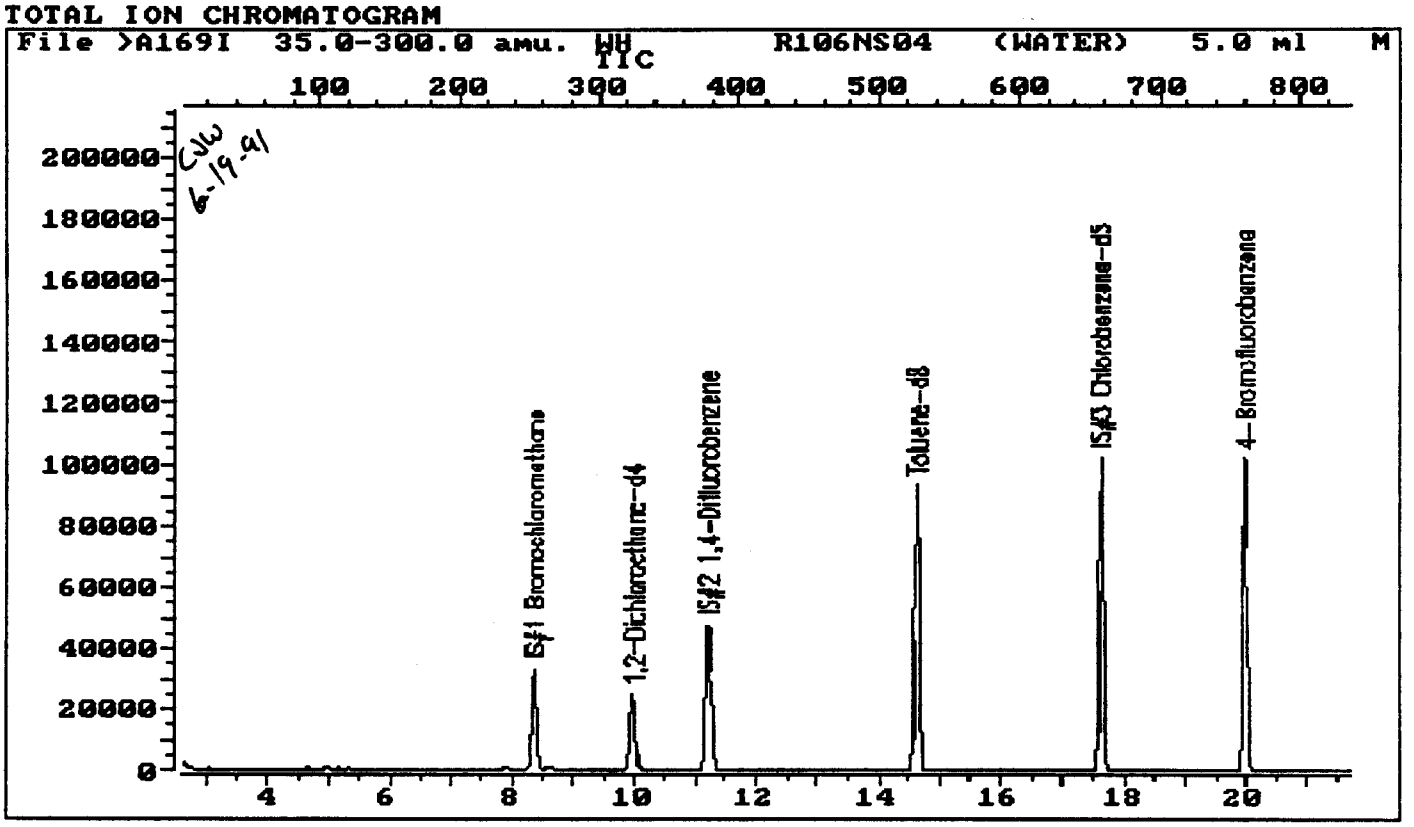
pH 2

Surrogate Spike Level: 50 ug/l
Associated Blank: VOA RA169E

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A169I::D4 Quant Output File: ^A169I::QT
Name: WH R106NS04
Misc: (WATER) 5.0 ml MW-4 INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910618 10:18

Operator ID: JOE
Quant Time: 910618 16:18
Injected at: 910618 15:56

Client: WALK HAYDEL & ASSOC.
Sample: VOA LAB BLANK RA1680
Lab ID: R106NS
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/17/91
Date Sampled: NA
Data File ID: RA1680

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	102	76-114
Toluene-d8	102	88-110
4-Bromofluorobenzene	102	86-115

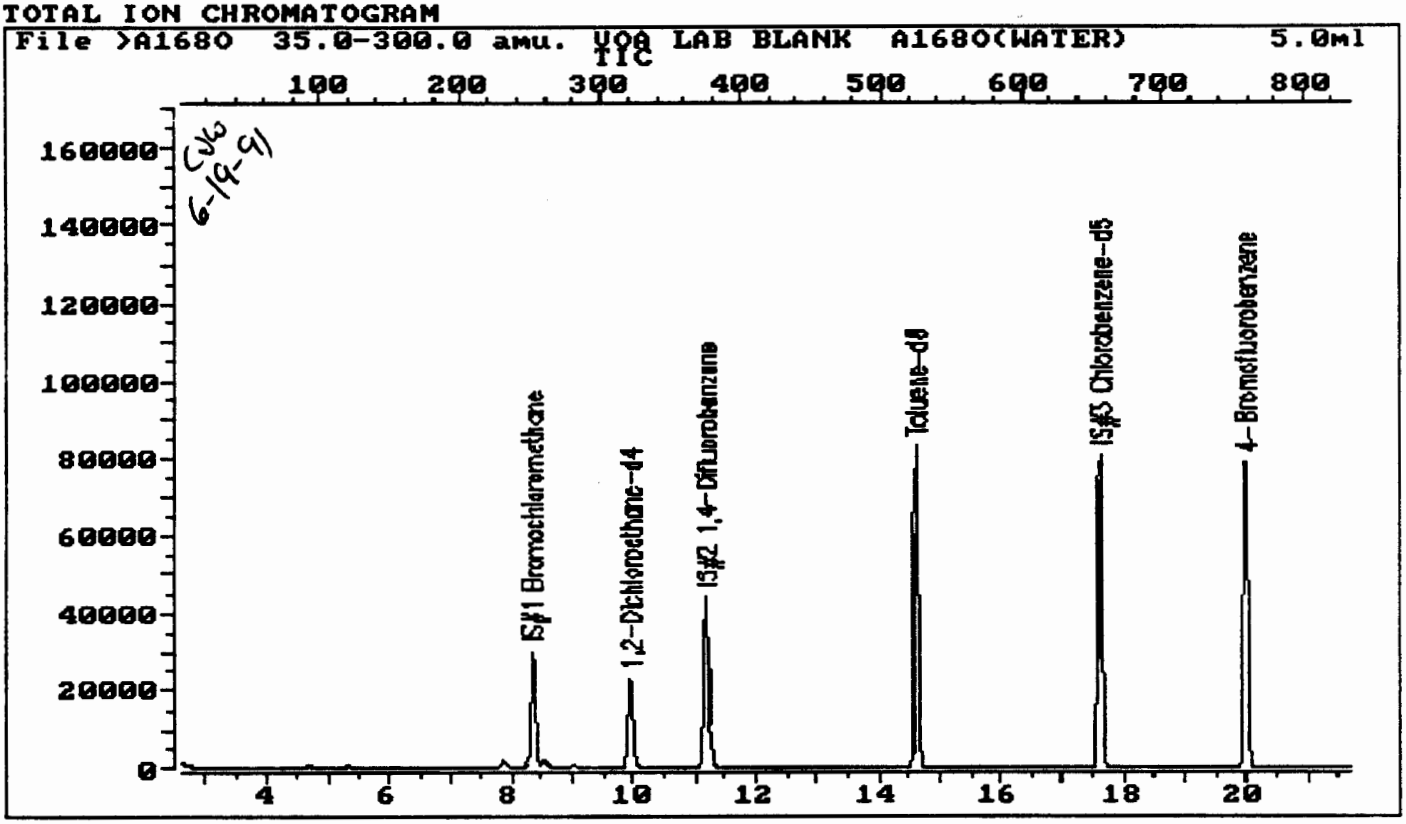
pH NA

Surrogate Spike Level: 50 ug/l
Associated Blank: NA

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A1680::D4 Quant Output File: ^A1680::QT
Name: VOA LAB BLANK A1680
Misc: (WATER) 5.0ml INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910617 18:03

Operator ID: JOHN
Quant Time: 910617 18:49
Injected at: 910617 18:26

Client: WALK HAYDEL & ASSOC.
Sample: VOA LAB BLANK RA169E
Lab ID: R106NS
Method: SW 846-8240

Date Extracted: NA
Date Analyzed: 06/18/91
Date Sampled: NA
Data File ID: RA169E

GC/MS
VOLATILE PRIORITY POLLUTANTS/HAZARDOUS SUBSTANCE LIST COMPOUNDS

Compound	Chromatographic Retention Time (min.)	Concentration (ug/l)	PQL (ug/l)
Acrolein		BQL	50.
Acrylonitrile		BQL	50.
Chloromethane		BQL	10.
Bromomethane		BQL	10.
Vinyl Chloride		BQL	10.
Chloroethane		BQL	10.
Methylene Chloride		BQL	5.
1,1-Dichloroethene		BQL	5.
1,1-Dichloroethane		BQL	5.
1,2-Dichloroethene (total)		BQL	5.
Trichlorofluoromethane		BQL	5.
Chloroform		BQL	5.
1,2-Dichloroethane		BQL	5.
1,1,1-Trichloroethane		BQL	5.
Carbon Tetrachloride		BQL	5.
Bromodichloromethane		BQL	5.
1,2-Dichloropropane		BQL	5.
trans-1,3-Dichloropropene		BQL	5.
Trichloroethene		BQL	5.
Dibromochloromethane		BQL	5.
1,1,2-Trichloroethane		BQL	5.
Benzene		BQL	5.
cis-1,3-Dichloropropene		BQL	5.
Bromoform		BQL	5.
Tetrachloroethene		BQL	5.
1,1,2,2-Tetrachloroethane		BQL	5.
Toluene		BQL	5.
Chlorobenzene		BQL	5.
Ethylbenzene		BQL	5.
2-Chloroethylvinyl ether (1)		BQL	10.
Acetone		BQL	10.
Carbon Disulfide		BQL	5.
2-Butanone		BQL	10.
Vinyl Acetate		BQL	10.
2-Hexanone		BQL	10.
4-Methyl-2-Pentanone		BQL	10.
Styrene		BQL	5.
Xylene (total)		BQL	5.

(1) Known to Hydrolyze in Presence of Dilute Acid

SURROGATE RECOVERY	(%)	QC Range
1,2-Dichloroethane-d4	108	76-114
Toluene-d8	107	88-110
4-Bromofluorobenzene	106	86-115

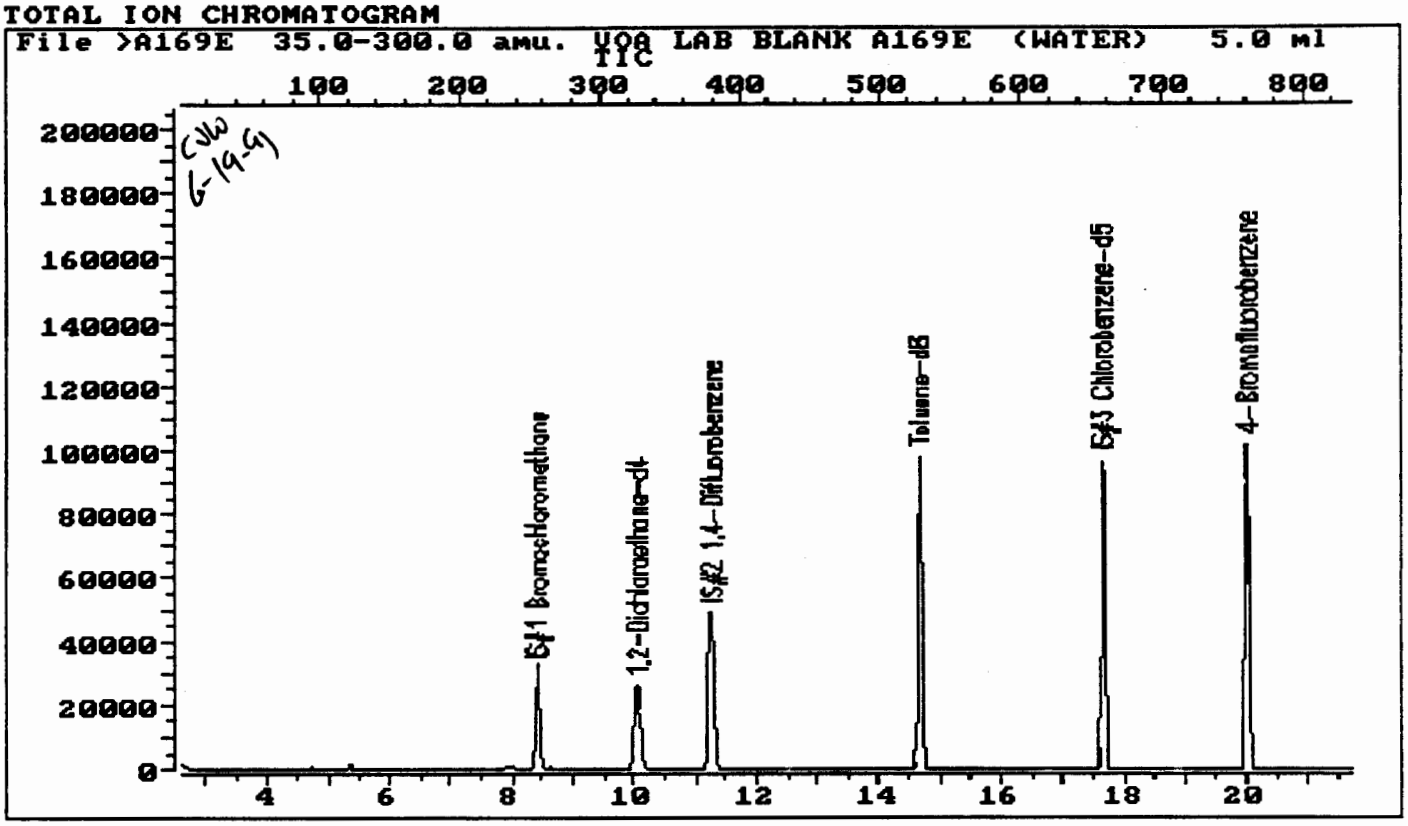
pH NA

Surrogate Spike Level: 50 ug/l
Associated Blank: NA

B : Detected in blank
D : Quantitated by a Secondary Dilution
** : Detected Below Quantitation Limit
CI : Cannot Calculate Recovery due to Coeluting Interference
DO : Diluted Out
BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit
MS : Matrix Spike Compound Level: NA

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

TOTAL ION CHROMATOGRAM



Data File: >A169E::D4 Quant Output File: ^A169E::QT
Name: VOA LAB BLANK A169E
Misc: (WATER) 5.0 ml INST 9601A

Id File: ID_CV1::DB
Title: VOLATILE PRIORITY POLLUTANT ANALYSIS (CAPILLARY) MARCH 91
Last Calibration: 910618 10:18

Operator ID: JOE
Quant Time: 910618 12:31
Injected at: 910618 12:08

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES,INC.
161 James Drive West, Suite 100
St Rose, Louisiana 70087
(504) 469-0333

QC REPORT

VOA BLANK SPIKE RESULT SUMMARY

TEST	BATCH QC SAMPLE	SPIKE LEVEL/UNIT	% RECOVERY	DUP. % RECOVERY	QC RANGE	RPD	RPD LIMIT
1,1 Dichloroethene	05GW03	50 ug/l	89%	96%	61-145	7	14
Trichloroethene	05GW03	50 ug/l	78%	81%	71-120	4	14
Benzene	05GW03	50 ug/l	99%	100%	76-127	1	11
Toluene	05GW03	50 ug/l	96%	98%	76-125	2	13
Chlorobenzene	05GW03	50 ug/l	98%	95%	75-130	2	13

Client: Walk Haydel & Assoc.
Sample: MW-3

Lab ID: R106NS01
File ID: D171A036

Date Extracted: 06/17/91
Date Analyzed: 06/22/91
Time Analyzed: 02:59
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/11/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)			BQL	154

Surrogate Pentacosane (C-25) Recovery: 100%

Corresponding Blank: D171A035

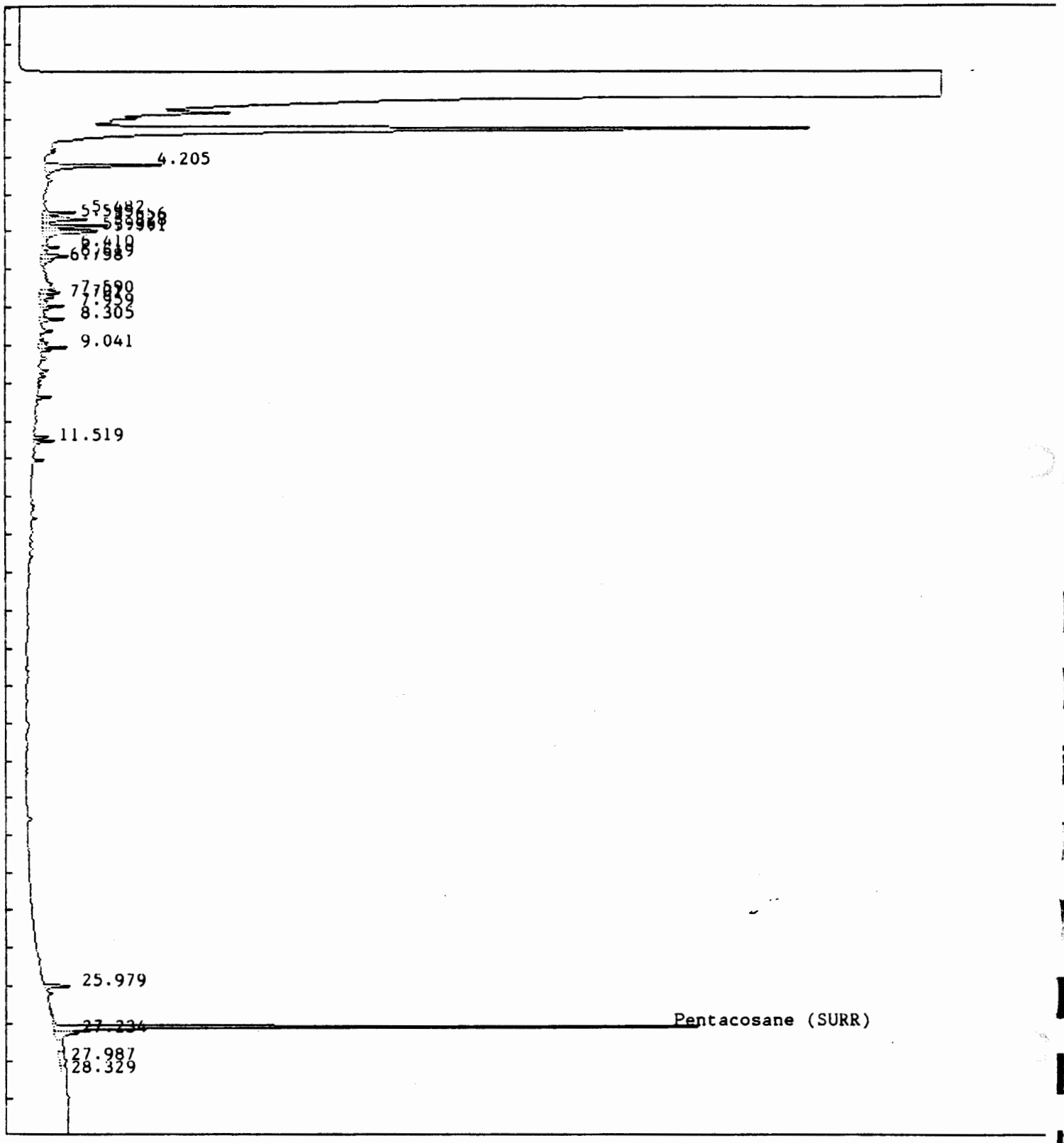
NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NS01** **MW-3**

File ID: /DATA/LOOP/RESULT/D171A036.RES
Date Analyzed: 0259 22Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/26
Bottle : 36
Run Time: 30.00 min.



Client: Walk Haydel & Assoc.
Sample: MW-2

Lab ID: R106NS02
File ID: D171A037

Date Extracted: 06/17/91
Date Analyzed: 06/22/91
Time Analyzed: 03:36
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/11/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	POL (ug/l)
TPH (as Diesel Oil)			BQL	154

Surrogate Pentacosane (C-25) Recovery: 69%

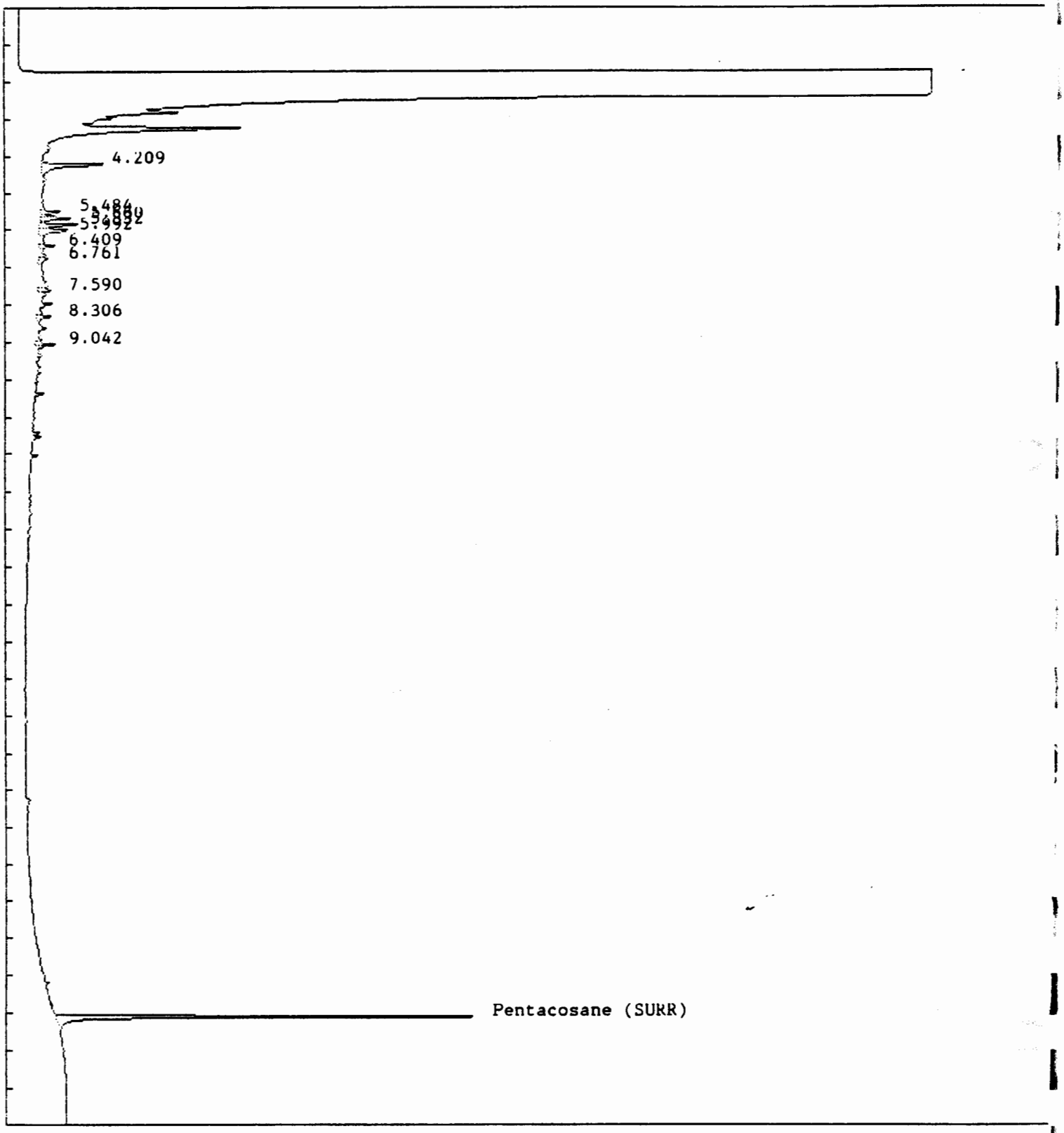
Corresponding Blank: D171A035

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NS02** **MW-2**

File ID: /DATA/LOOP/RESULT/D171A037.RES
Date Analyzed: 0336 22Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/27
Bottle : 37
Run Time: 30.00 min.



Client: Walk Haydel & Assoc.
Sample: W-2

Lab ID: R106NS03
File ID: D171A038

Date Extracted: 06/17/91
Date Analyzed: 06/22/91
Time Analyzed: 04:13
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/12/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1	Col. 2 * (min.)	Sample Concentration (ug/l)	POL (ug/l)
TPH (as Diesel Oil)			BQL	154

Surrogate Pentacosane (C-25) Recovery: 68%

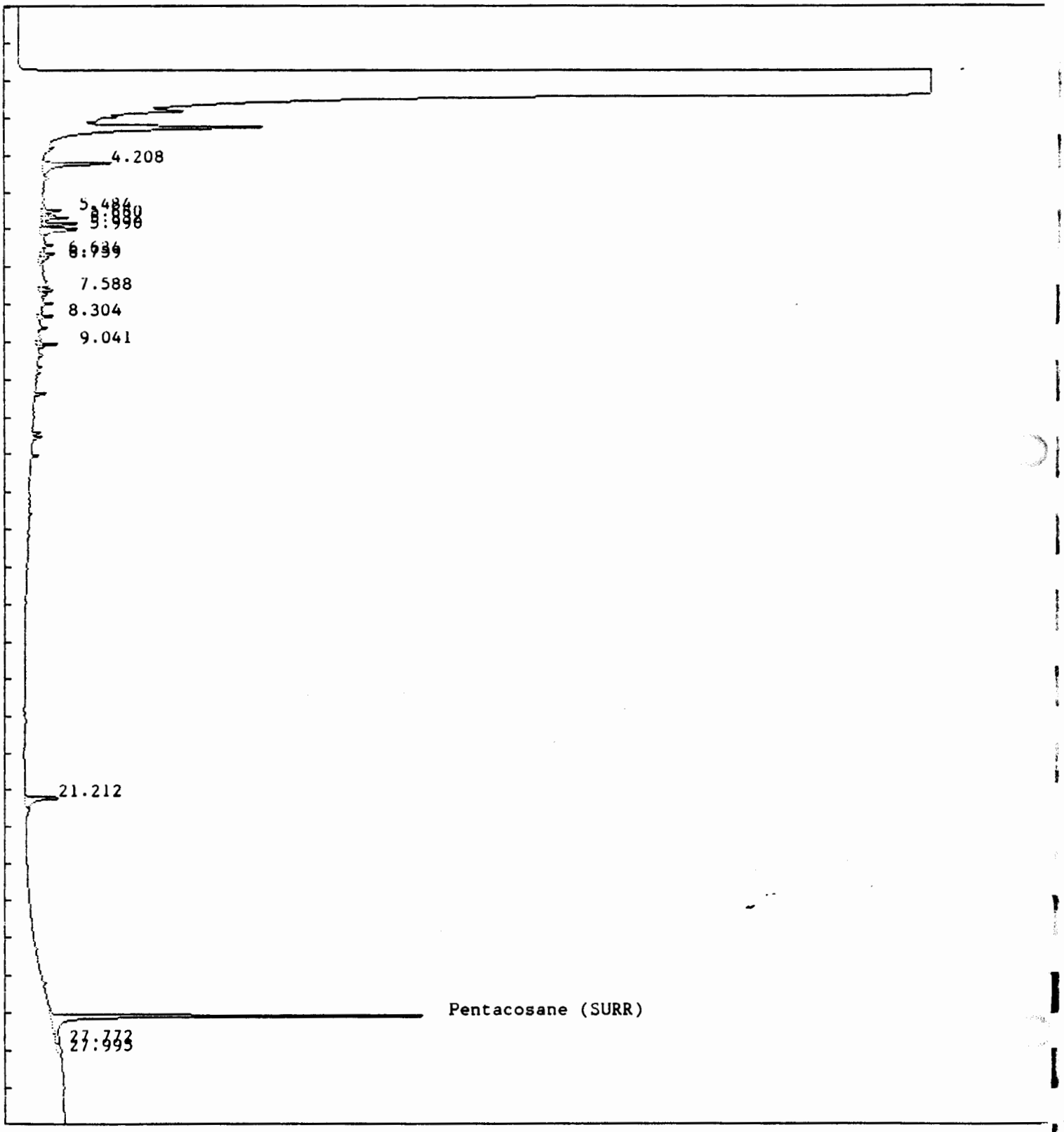
Corresponding Blank: D171A035

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NS03** **W-2**

File ID: /DATA/LOOP/RESULT/D171A038.RES
Date Analyzed: 0413 22Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/28
Bottle : 38
Run Time: 30.00 min.



Client: Walk Haydel & Assoc.
Sample: MW-4

Lab ID: R106NS04
File ID: D171A039

Date Extracted: 06/17/91
Date Analyzed: 06/22/91
Time Analyzed: 04:50
Analyst: LSK
GC Method: CALIF. LUFT
Date Sampled: 06/12/91

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	PQL (ug/l)
TPH (as Diesel Oil)			BQL	154

Surrogate Pentacosane (C-25) Recovery: 72%

Corresponding Blank: D171A035

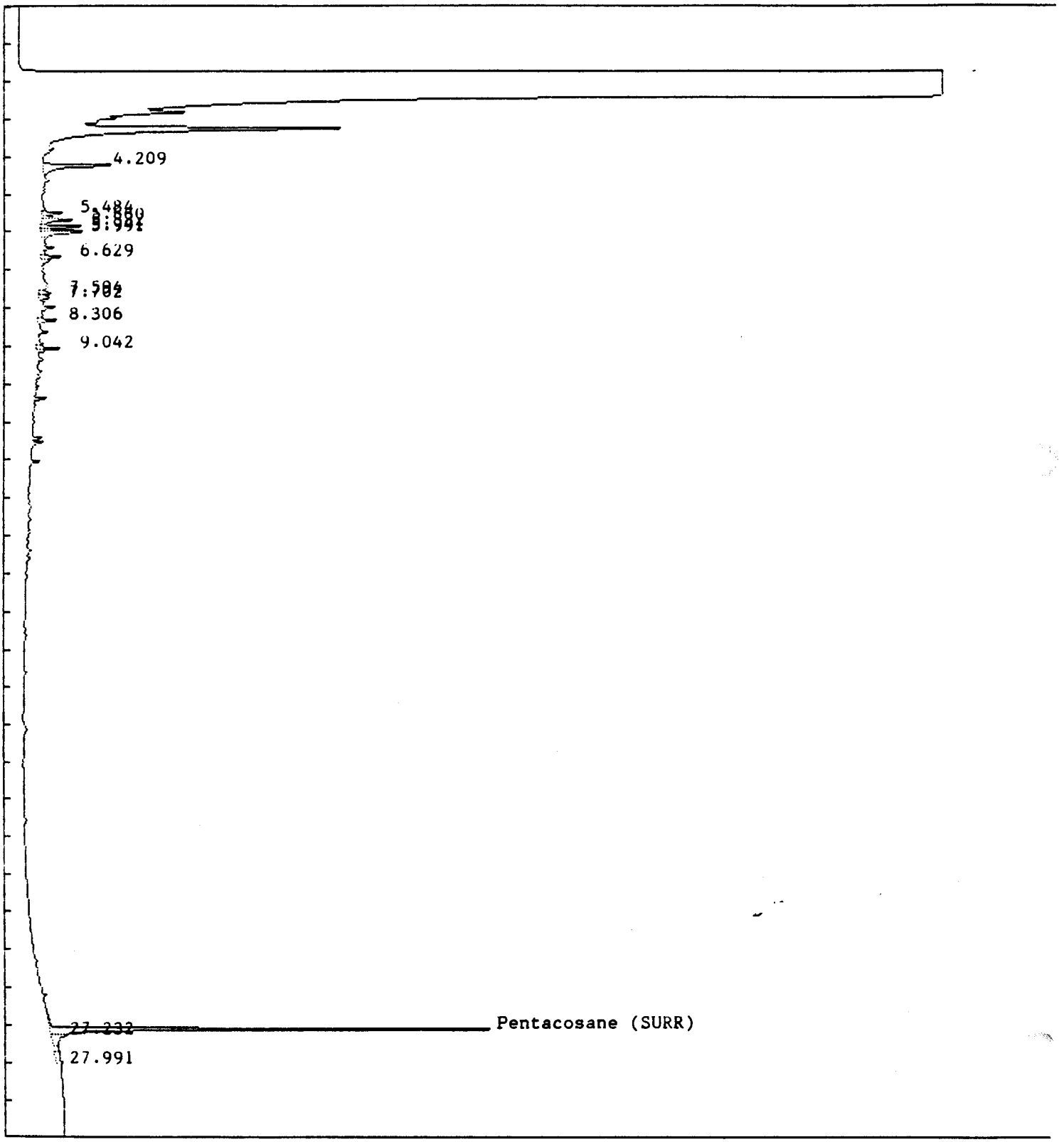
NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

Total Petroleum Hydrocarbons Analysis
Sample Name: **R106NS04** **MW-4**

File ID: /DATA/LOOP/RESULT/D171A039.RES
Date Analyzed: 0450 22Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/29
Bottle : 39
Run Time: 30.00 min.



Client:	Walk Haydel & Assoc.	Date Extracted:	06/17/91
Sample:	Extraction Blank	Date Analyzed:	06/22/91
		Time Analyzed:	02:22
Lab ID:	SBLK01	Analyst:	LSK
File ID:	D171A035	GC Method:	CALIF. LUFT

Total Petroleum Hydrocarbons

Compound	Chrom. Ret. Time Col. 1 (min.)	Chrom. Ret. Time Col. 2 * (min.)	Sample Concentration (ug/l)	POL (ug/l)
TPH (as Diesel Oil)			BQL	40.0

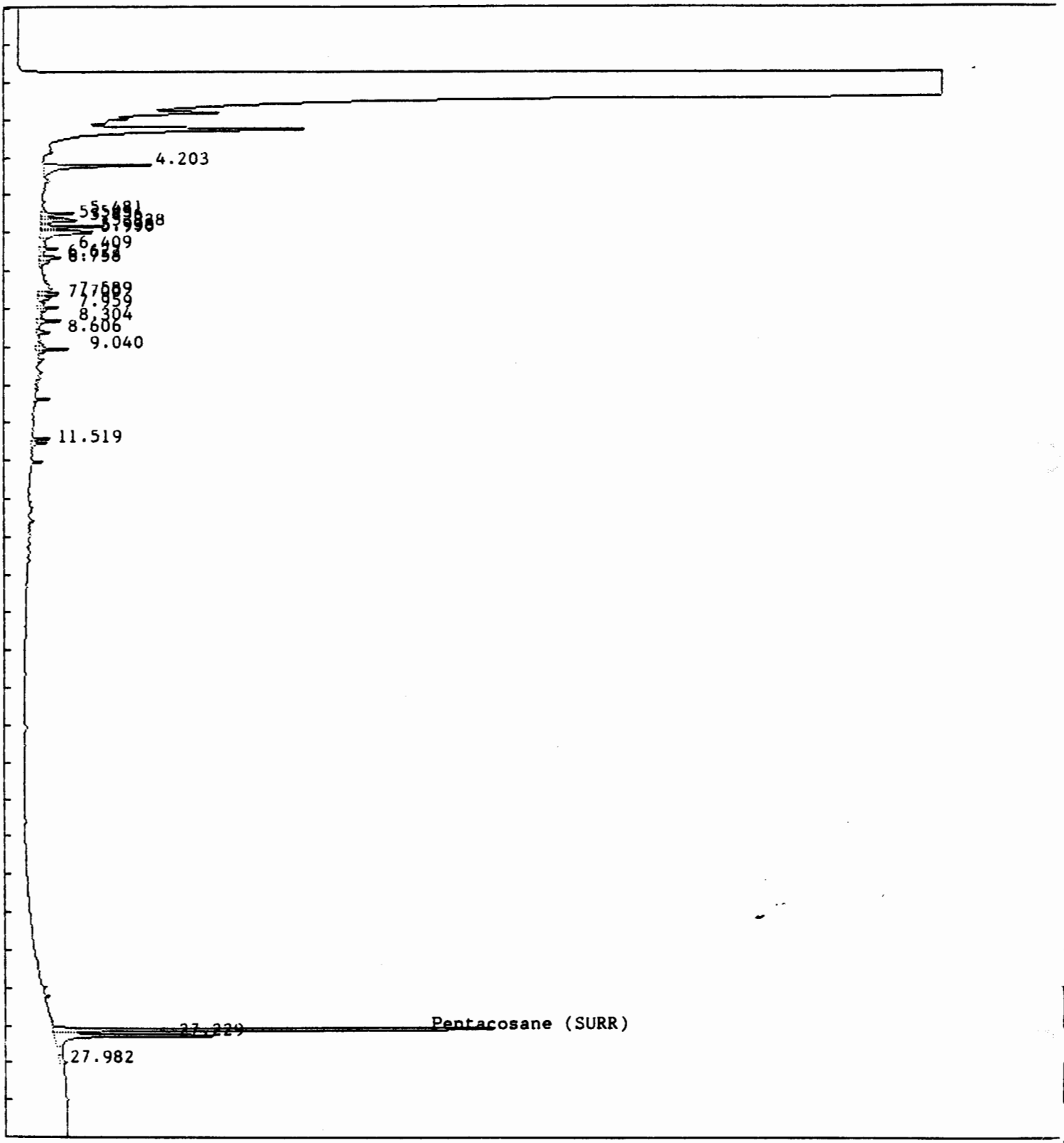
Surrogate Pentacosane (C-25) Recovery: 88%

NOTES: PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
* : Col. 1: 30.0 M x .32 mm DB-1 (FSCC)

Total Petroleum Hydrocarbons Analysis
Sample Name: **SBLK01** **Extraction Blank**

File ID: /DATA/LOOP/RESULT/D171A035.RES
Date Analyzed: 0222 22Jun1991
Column: 30 M x 0.32 mm DB-1 (FSCC)
Detector: Flame Ionization (FID)
Inj. Volume: 2.0 uL

Dil. Factor: _____
Instrument: GC-D (HP 5890A)
Seq/Smpl: 2/25
Bottle : 35
Run Time: 30.02 min.



Lab Number: R106NS

PROCEDURE RECORDS

Test Methods for Evaluating Solid Waste,
Physical/Chemical Methods, SW-846, USEPA 3rd Edition, Revised November, 1986

Test	Method	Analyst	Date/Time Analyzed
Lead (graphite furnace)	7421	LH	06/20/91 14:42
GC/MS Volatile Organics	8240	AS	SEE COMP. LIST

Leaking Underground Fuel Tank Field Manual:
Guidelines For Site Assessment, Cleanup, and Underground Storage
Tank Closure, December 1987, State of California

Test	Method	Analyst	Date/Time Analyzed
Total Petroleum Hydrocarbons	Modified 8015	RM	SEE COMP. LIST

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 JAMES DRIVE WEST • SUITE 100
ST. ROSE, LA. 70087

COOLER RECEIPT FORM

MRD Cooler # _____

PROJECT: WALK Haydel + ASSOC. HAFB site SS-17 Date received: 6-13-91

USE OTHER SIDE OF THIS FORM TO NOTE DETAILS CONCERNING CHECK-IN PROBLEMS.

A. PRELIMINARY EXAMINATION PHASE: Date cooler was opened: 6-13-91

by (print) Jamica Duffard (sign) Jamica Duffard

1. Did cooler come with a shipping slip (air bill, etc.)? ..... (YES) NO

   If YES, enter carrier name & air bill number here: Fed. EX. #728927441

2. Were custody seals on outside of cooler? ..... (YES) NO

   If YES, how many & where: 2 : ONE ON RIGHT-FRONT + ONE ON BACK-LEFT

   If YES, enter the following: seal date: 6-12-91, seal name: GH

3. Were custody seals unbroken and intact at the date and time of arrival? ..... (YES) NO
4. Were custody papers sealed in a plastic bag & taped inside to the lid? ..... (YES) NO
5. Were custody papers filled out properly (ink, signed, etc.)? ..... (YES) NO
6. Did you sign custody papers in the appropriate place? ..... (YES) NO
7. Was project identifiable from custody papers? If YES, enter project name at the top of this form. (YES) NO
8. If required, was enough ice used? ..... (YES) NO
9. Have designated person initial here to acknowledge receipt of cooler: JG (date) 6-13-91

B. LOG-IN PHASE: Date samples were logged-in: 6-13-91

by (print) Jamica Duffard (sign) Jamica Duffard

10. Describe type of packing in cooler: WOOD SHAVINGS
11. Were all bottles sealed in separate plastic bags? ..... (YES) NO
12. Did all bottles arrive unbroken & were labels in good condition? ..... (YES) NO
13. Were all bottle labels complete (ID, date, time, signature, preservative, etc.)? ..... (YES) NO
14. Did all bottle labels agree with custody papers? ..... (YES) NO
15. Were correct containers used for the tests indicated? ..... (YES) NO
16. Were correct preservatives added to samples? ..... (YES) NO
17. Was a sufficient amount of sample sent for tests indicated? ..... (YES) NO
18. Were bubbles absent in VOA samples? If NO, list by CA#: _____ YES NO
19. Was the shipment accepted? ..... (YES) NO
20. Was the project manager called and status discussed? If YES, give details on the back of this form. YES NO

21. Who was called ? By whom ? (date)

EIRA ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.

CHAIN OF CUSTODY RECORD

161 James Drive West
St. Rose, LA 70087
(504) 469-0333

PROJ. NO. 5362.51

CLIENT WH&A-HAFB Site SS-17

SAMPLES: (Signature and Initials) [signature]

SAMPLE NO.	DATE SAMPLED	TIME SAMPLED	COMP	GRAB	SAMPLE I.D.	NO. OF CONTAINERS	SAMPLES PRESERVED (Y/N)	ANALYSIS REQUESTED						REMARKS	FOR LAB USE ONLY LAB I.D. #
									TPH-L	VOA	Total Lead				
	6/11/91	1700			MW-3	6	Y		/	/	/				01
	6/11/91	1756			MW-2	6	Y		/	/	/				02
	6/12/91	1018			W-2	6	Y		/	/	/				03
	6/12/91	1107			MW-4	6	Y		/	/	/				04

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]		
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)
		Jamica Duffard

Date/Time: 6/13 12:30

Requested Turnaround
- ____ 24 - 48 hours
- ____ Less than 5 days
- ____ Less than standard
- ____ Standard

Regulatory Concerns
- ____ RCRA
- ____ NPDES
- ____ Drinking Water
- ____ CLP
- ____ None
- ____ Other ____

EPISODE ID R1060103

LABORTARY APPROVAL REQUIRED PRIOR TO SAMPLE SUBMISSION

CONTACT NAME AND PHONE NUMBER

White Copy ____ Canary Copy ____ Pink Copy ____

END OF APPENDIX C

APPENDIX D

AIR MONITORING RESULTS

GERAGHTY
& MILLER, INC.
Environmental Services

Ground Water *Engineering* *Hydrocarbon* *Remediation* *Education*

August 10, 1991

Mr. Raymond F. Vachonè
Deputy Project Manager
Walk, Haydel & Associates, Inc.
600 Carondelet Street
New Orleans, Louisiana 70130-3587

Dear Mr. Vachone:

As you requested, Geraghty & Miller, Inc. has prepared the following letter report "Results of Organic Vapor Monitoring at Site SS-17, Holloman Air Force Base, New Mexico" documenting the field monitoring activities conducted from June 10, through June 13, 1991. If you have any questions concerning the following information please feel free to contact either Gary Wagner or me at (813) 961-1921.

Respectfully submitted,

GERAGHTY & MILLER, INC.

Francis L. Corden
Project Scientist

14497 North Dale Mabry, Suite 115 • Tampa, Florida 33618 • P.O. Box 273630 • Tampa, Florida 33688-3630
(813) 961-1921 • FAX (813) 961-2599

RESULTS OF ORGANIC VAPOR MONITORING AT SITE SS-17, HOLLOMAN AIR FORCE BASE NEW MEXICO

August 1991

Prepared for

Walk, Haydel & Associates, Inc.
600 Carondelet Street
New Orleans, Louisiana 70130

Prepared by

Geraghty & Miller, Inc.
14497 North Dale Mabry Highway, Suite 115
Tampa, Florida 33618
(813) 961-1921

INTRODUCTION

On May 23, 1991 Walk, Haydel & Associates contracted Geraghty & Miller, Inc. to conduct air and sewer gas monitoring at Holloman Air Force Base (Holloman AFB), Alamagorda, New Mexico (Figure 1). The monitoring was conducted in support of investigation and remediation efforts addressing hydrocarbon contamination at Site SS-17, the BX Service Station. Monitoring was to be conducted at four vacant residences, 12 manholes, the Car Wash Grit Chamber and at the Lift Station located north of First Street across from the BX Service Station (Figure 2).

MONITORING PROCEDURES

The sampling methodologies, locations, frequencies, and analysis equipment as well as operation and maintenance procedures used were specified in the "Comprehensive Environmental Response, Compensation, and Liability Act Corrective Action Plan/Chemical Data Aquisition Plan for Holloman AFB, New Mexico, Site SS-17, BX Service Station", (CDAP) prepared by Walk Haydel & Associates in May 1991. Field conditions resulted in a number of changes/modifications to the procedures presented in the CDAP. An explanation of the field difficulties requiring modifications to the field program along with the procedures actually used are presented below. Field documentation completed during the implementation of the CDAP is provided in the Daily Quality Control Reports, and Daily Logs provided as Attachment I and Attachment II to this report, respectively.

EQUIPMENT UTILIZATION

During the first two days of monitoring the Industrial Scientific Model MX251 Explosimeter (MX251) did not maintain a sufficient battery charge to calibrate the instrument which necessitated the use of a Dynamation Model CGM Combustible Gas Meter (CGM) as a substitute. However, the CGM was not equipped with a remote sampling pump which prevented field calibration of the instrument and remote sampling with the meter. The CGM was equipped with a feature that allowed the peak reading for

percent of the lower explosive limit (LEL) to be held on the display. This enabled the CGM to be lowered into the manhole and measure the peak LEL reading. The instrument was allowed to stabilize for two minutes prior to returning it to the surface and the LEL reading was recorded. On the last two days of field work, the MX251 was sufficiently charged for use.

During the first day of monitoring, an attempt was made to use the Hnu Model PI-101 Photoionization Detector (PID) to measure organic vapors in the sewer gas at the locations specified in Figure 2. At each manhole location, the needle on the analog meter deflected off scale to the left indicating a negative reading. The instrument was calibrated repeatedly with no improvement. Since the PID readings were to be used to screen each location for subsequent analysis by the Photovac Model 10S50 Gas Chromatograph (GC), the decision was made to monitor all manholes with the GC and discontinue the use of the PID for sewer gas monitoring. However, the PID was used to monitor for organic vapors in the residences as specified in the work plan.

EQUIPMENT CALIBRATION

As indicated earlier, the CGM could not be field calibrated. However, prior to each use the instrument was checked according to the manufacturers recommendations and zeroed. The MX251 was calibrated before each use by first adjusting the zero and then pumping a commercially purchased mixture of pentane in air at 25% of the LEL across the detector. The potentiometer was then adjusted until the explosimeter displayed 25%. The calibration of the MX 251 was verified at the end of day of operation. The instrument read 23% and 24% of the LEL on day three and four, respectively.

The calibration of the PID was verified prior to each use with a commercial mixture of isobutylene in air at a concentration equal to 58ppm of benzene in air. The instrument was allowed to warm up for at least 10 minutes and then zeroed. A 600ml Tedlar bag was then filled with calibration gas and the PID probe was connected to the bag with a few

inches of Tygon™ tubing. After stabilization, the reading was recorded. Instrument readings during the calibration checks varied from 56ppm to 61ppm. Due to the stability of the PID response, the instrument was not adjusted.

The GC was calibrated prior to each monitoring event and then recalibrated every few hours due to substantial changes in ambient temperature. Analysis of a method blank was followed by a one point calibration using a field prepared standard of benzene, toluene, ethylbenzene, o-xylene, m-xylene and p-xylene (BTEX) in air. The standards were prepared according to the following protocol.

On the first day, the stock standard was prepared by diluting 50ul of each of the six constituents, benzene, toluene, ethylbenzene, and the three xylene isomers, into a 10ml volumetric flask containing approximately 9ml of refrigerated trihalomethane grade methanol. After diluting to volume with methanol and mixing, the stock standard was dispensed into four 2ml screw cap vials with teflon lined caps. The vials were refrigerated until ready for use. The concentration of this stock standard was 4 mg/ml for each constituent. Working standards were then prepared by injecting 5ul of stock standard into a 1.2L Tedlar bag and then filling the bag with zero air. The concentration of the working standard was approximately 16.7 ug/L for each constituent.

Prior to each calibration, a method blank was analyzed to verify that the system was free from contaminants. During day one and day two, analysis of method blanks indicated the presence of a peak that interfered with the instruments ability to quantitate low levels of xylenes. Efforts were made to minimize the interference and by the last two days of monitoring, the interference was no longer observed. It was also noted that, as the ambient temperature increased throughout the day, the instrument sensitivity decreased. Percent recoveries of standards analyzed as calibration checks varied from approximately 50% to 90% as total BTEX.

SAMPLING LOCATIONS AND FREQUENCIES

As indicated earlier, the locations proposed for monitoring are shown in Figure 2. However, throughout the duration of the field program man hole MH-88 was inaccessible and was not monitored. As indicated in the CDAP, an effort was made to sample each sanitary sewer location at three to four different times throughout the day. A complete round of monitoring in the sanitary sewer system required approximately five hours from collection of the first to last sample. Monitoring in the residences was conducted in the early morning, late morning, afternoon and in the early evening. Monitoring events within the residences were typically completed in 15 to 20 minutes.

SAMPLING METHODS

As required by the CDAP, each of the four residences was monitored for explosive vapors using either the CGM or the MX251 and organic vapors using the PID. The protocol entailed entering the residence and noting the readings of both instruments as the field analyst walked through each room of the house. When entering bathrooms and kitchens, the inlet of the drain fixtures was used as the monitoring point. After completing the walk through of the residence, the peak reading and its location were recorded. Consistent with the CDAP, GC monitoring of the residences was not required because the PID readings never exceeded 5 ppm.

As indicated earlier, methods for monitoring the sanitary sewer system were modified based on field conditions. PID monitoring of the sewer gases was not conducted. Explosimeter monitoring of the sewer gases in man holes and the lift station was performed using the following procedure. The lift station and man holes were accessed by opening the cover approximately half way and lowering the explosimeter into the man hole. When using the CGM, the instrument was placed in the "Hold Mode" and lowered to within approximately two feet of the bottom of the man hole. The manhole cover was then closed. The instrument was allowed to stabilize for two minutes and then was returned to ground

surface where the displayed readings were recorded. The same procedure was followed when using the MX251 except that after the stabilization period the instrument was rapidly withdrawn from the manhole and the reading recorded immediately upon retrieval of the instrument. The decision not to use the sampling pump with the MX251 was made in an effort to obtain results comparable to those obtained with the CGM. The Car Wash Grit Chamber was monitored by placing the explosimeter with a few inches of the water level at the Grit Chamber.

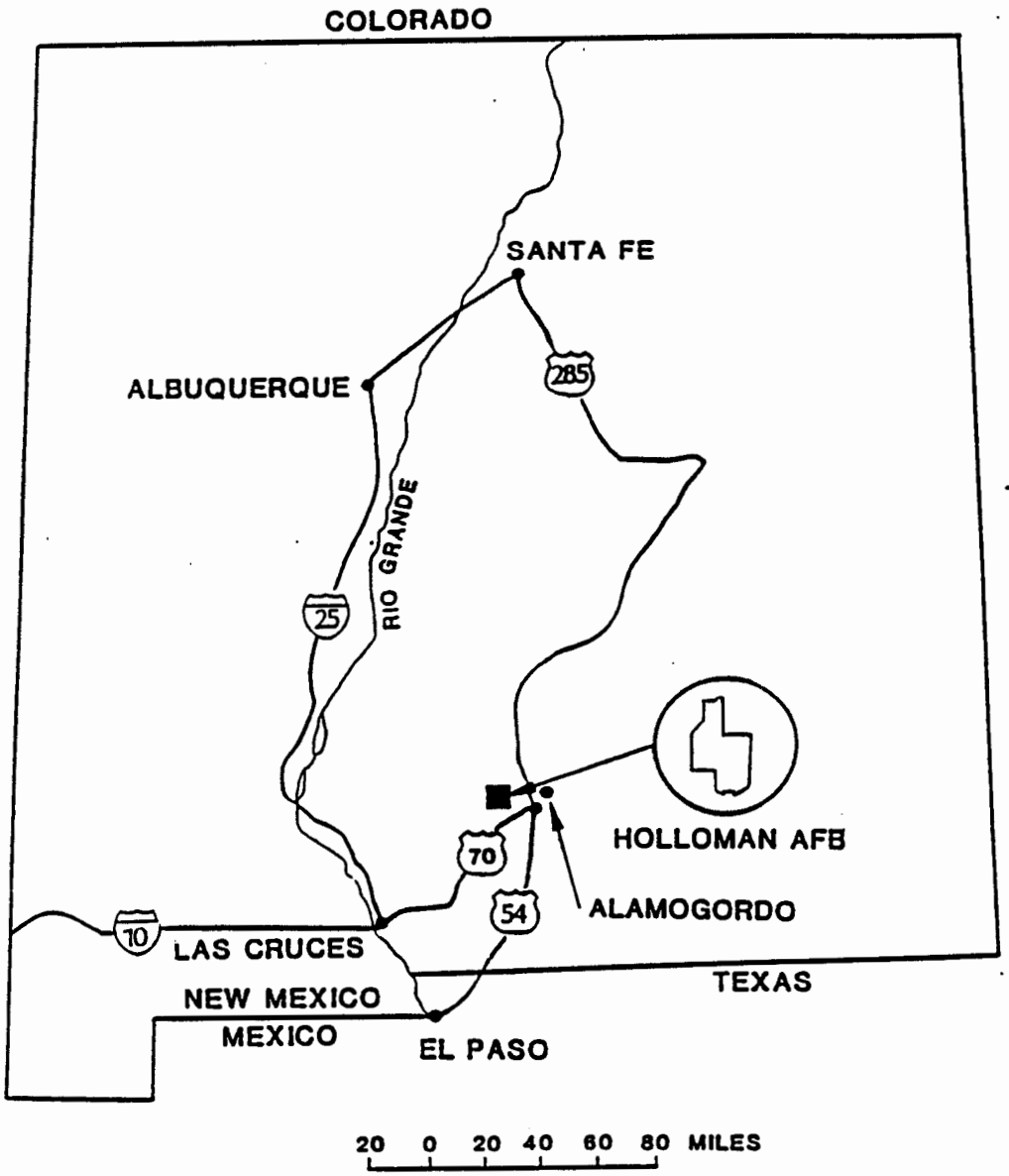
Samples were collected from the manholes and lift station for GC analysis using a Sensidyne Model 55HD personal air sampling pump, approximately four feet of 1/4 inch ID Tygon™ tubing, and a 500ul Hamilton Gas Tight Syringe. The tubing was connected to the air sampling pump and lowered into the half open manhole. The cover of the manhole was then closed as far as possible without crushing the sample tubing. The pump was turned on and allowed to operate for one minute thereby purging approximately two liters of air through the sample tubing. With the pump still operating, the syringe was used to pierce the tubing and the syringe was rinsed three times with sewer gas. The sample for analysis was then drawn into the syringe. The samples collected from the Car Wash Grit Chamber were taken without the use of a pump by directly drawing vapors from within a few inches of the water level in the chamber directly into the syringe. After the sample was collected, the syringe needle was sealed using a silicon septa and the syringe was transported back to the GC for analysis. The samples were held at room temperature until analysis. Samples were typically analyzed within a few minutes of collection. In selected instances, method blank analyses or instrument calibrations were performed between sample analyses and in these cases the samples were analyzed within approximately thirty minutes of collection.

RESULTS

The results of the explosimeter and organic vapor monitoring in the residences are presented in Table 1. As indicated previously, organic vapor readings within the residences did not exceed 5ppm. Readings were typically less than 0.5ppm with the highest reading

being 1.2ppm recorded in Building 2178. No explosive vapors were detected in the residences.

Results of sewer gas monitoring for explosive vapors and BTEX are presented in Table 2. Sewer gas monitoring results indicated the presence of both BTEX compounds and explosive vapors. The highest levels of explosive vapors were recorded in man hole MH-92 at 23% LEL and 35% LEL on June 12th and June 13th respectively. The highest reported concentrations of BTEX were detected in the Car Wash Grit Chamber followed by MH-91, MH-90 and MH-92, respectively.



SOURCE: Walk, Haydel & Associates, CDAP, May 1991.

GERAGHTY & MILLER, INC.
Environmental Services

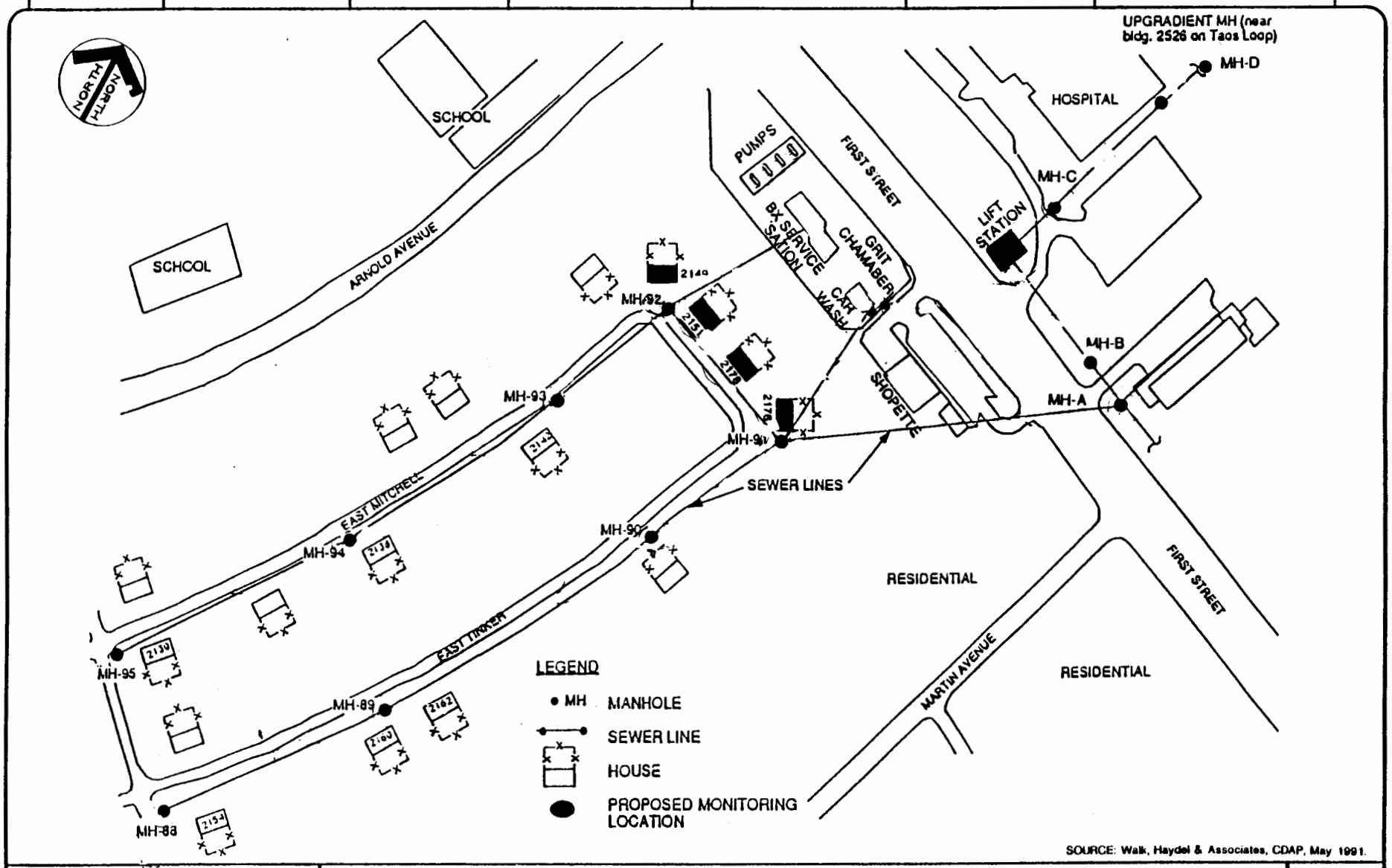
LOCATION OF HOLLOMAN AIR FORCE BASE

WALK, HAYDEL & ASSOCIATES, INC.
HOLLOMAN AFB,NM

FIGURE 1

DRAFTER: DN | APPROVED: FC | CHECKED: | CAD FILE: | FILE NO.: | PRJCT. NO.: TF48602 | DWG. DATE: 8-9-91

DATE: 8-9-91	PRJCT. NO.: TF48602	FILE NO.	CAD FILE: NON-CAD	COMPILER:	MGR.: FC	DRAFTER: DN



SOURCE: Walk, Haydel & Associates, CDAP, May 1991.

SCALE
N.T.S.

GERAGHTY & MILLER, INC.
Environmental Services

VAPOR MONITORING LOCATIONS, SITE SS-17

WALK, HAYDEL & ASSOCIATES, INC.
HOLLOMAN AFB, NM

FIGURE
2

156764

Table 1. Results of Explosimeter and Organic Vapor Monitoring in the Vacant Residences
Site SS-17, BX Service Station, Holloman AFB, New Mexico.

Building Number	Date	Time	Results Explosive Gases (%LEL)	Results Organic Vapors (PPM)	Location of Peak Reading
2149	6/10/91	1330	0	0.2	Back Bathroom
	6/11/91	1515	0	0.2	No Peak Reading
	6/12/91	1905	0	0.0	No peak Reading
	6/13/91	0556	0	0.1	No Peak Reading
	6/13/91	0948	0	0.0	No Peak Reading
2151	6/10/91	1331	0	0.6	Back Bathroom
	6/11/91	1519	0	0.2	No Peak Reading
	6/12/91	1909	0	0.3	Both Bathrooms
	6/13/91	0600	0	0.3	Back Bathroom
	6/13/91	0952	0	0.0	No Peak Reading
2176	6/10/91	1344	0	0.8	Back Bathroom
	6/11/91	1529	0	0.2	No Peak Reading
	6/12/91	1919	0	0.2	No Peak Reading
	6/13/91	0624	0	0.1	No Peak Reading
	6/13/91	1002	0	0.1	Back Bathroom
2178	6/10/91	1339	0	1.2	Hall Bathroom
	6/11/91	1524	0	0.4	Hall Bathroom
	6/12/91	1914	0	0.1	No Peak Reading
	6/13/91	0606	0	0.8	Both Bathrooms
	6/13/91	0957	0	0.6	Back Bathroom

LEL: Lower Explosive Limit
PPM: Concentration of organic vapors in parts per million on a volume to volume basis.

Table 2. Results of Vapor Monitoring in the Sanitary Sewer System, Site SS-17, BX Service Station Holloman AFB, New Mexico.

Sampling Location	Date	Time	Explosive Gases (%LEL)	Volatile Organic Aromatic Compounds (ug/l)				Notes
				Benzene	Toluene	Ethylbenzene	Xylenes	
MH-89	6/10/91	1750	0	<1	<1	<1	<3	Low Flow
	6/11/91	1119	0	<1	<1	<1*	<3*	Low Flow
	6/12/91	1720	0	<1	<1	<1	<3	Low Flow
	6/13/91	0712	0	4	3	<1	<3	Low Flow
MH-90	6/10/91	1705	0	<1	<1	<1	<3	Standing Water
	6/11/91	1138	0	17	16	5	14	Low Flow
	6/12/91	1734	3	19	18	5	17	Low Flow
	6/13/91	0723	0	8	5	<1	4	Low Flow
MH-91	6/10/91	1555	0	25	25	7	21	Moderate Flow
	6/11/91	1152	0	21	26	4	11	Heavy Flow
	6/12/91	1820	0	<1	<1	<1	<3	Moderate Flow
	6/13/91	0735	0	17	18	1	12	Low Flow
MH-92	6/10/91	1440	1	3	4	<1	<3	Dry
	6/11/91	1104	0	<1	2	<1	<3	Dry
	6/12/91	1800	35	12	18	4	13	Dry
	6/13/91	0803	23	<2	8	<2	<6	Dry
MH-93	6/10/91	1844	5	6	12	<1	<3	Moderate Flow
	6/11/91	1056	0	15	27	2	<3	Standing Water
	6/12/91	1624	1	<1	<1	<1	<3	Low Flow
	6/13/91	0656	0	<1	2	<1	<3	Low Flow

Table 2. Results of Vapor Monitoring in the Sanitary Sewer System, Site SS-17, BX Service Station Holloman AFB, New Mexico.

Sampling Location	Date	Time	Explosive Gases (%LEL)	Volatile Organic Aromatic Compounds (ug/l)				Notes
				Benzene	Toluene	Ethylbenzene	Xylenes	
MH-94	6/10/91	1827	0	<1	<1	<1	<3	Standing Water
	6/11/91	1039	0	<1	4	<1	<3*	Standing Water
	6/12/91	1638	3	<1	<1	<1	<3	Low Flow
	6/13/91	0631	1	<1	<1	<1	<3	Low Flow
MH-95	6/10/91	1812	0	<1	<1	<1	<3	Low Flow
	6/11/91	1024	0	<1	<1	<1	<3*	Low Flow
	6/12/91	1702	0	<1	<1	<1	<3	Low Flow
	6/13/91	0616	0	<1	<1	<1	<3	Moderate Flow
MH-A	6/10/91	1525	0	<1	<1	<1	<3	Dry
	6/11/91	1251	0	<1	<1	<1	<3	Dry
	6/12/91	1610	0	<1	<1	<1	<3	Dry
	6/13/91	0912	0	<1	<1	<1	<3	Dry
MH-B	6/10/91	1540	0	<1	<1	<1	<3	Heavy Flow Before Sampling
	6/11/91	1311	0	<1	<1	<1	<3	Low Flow
	6/12/91	1547	1	<1	<1	<1	<3	Moderate Flow
	6/13/91	1024	0	<1	<1	<1	<3	Heavy Flow Before Sampling
MH-C	6/10/91	1911	0	<1	<1	<1	<3	Low Flow
	6/11/91	1431	0	<1	<1	<1	<3	Low Flow
	6/12/91	1528	0	<1	<1	<1	<3	Low Flow
	6/13/91	1040	0	<1	<1	<1	<3	Low Flow

Table 2. Results of Vapor Monitoring in the Sanitary Sewer System, Site SS-17, BX Service Station
Holloman AFB, New Mexico.

Sampling Location	Date	Time	Explosive Gases (%LEL)	Volatile Organic Aromatic Compounds (ug/l)				Notes
				Benzene	Toluene	Ethylbenzene	Xylenes	
MH-D	6/10/91	1944	0	<1	<1	<1	<3	Standing Water
	6/11/91	1452	0	<1	<1	<1	<3	Standing Water
	6/12/91	1512	0	<1	<1	<1	<3	Standing Water
	6/13/91	1056	0	<1	<1	<1	<3	Low Flow
Lift Station	6/10/91	1735	0	<1	<1	1	<3	Moderate Flow
	6/11/91	1412	0	<1	<1	<1	<3	Moderate Flow
	6/12/91	1932	0	<1	2	<1	<3	Moderate Flow
	6/13/91	0748	0	<1	<1	<1	<3	Moderate Flow
Car Wash Grit Chamber	6/10/91	1615	0	25	35	10	37	Discharge from line 2
	6/11/91	1327	0	15	18	5	12	Discharge from Line 1 Car Wash in Use
	6/12/91	1845	0	5	5	<1	<3	Discharge from Line 4 Car Wash in Use
	6/13/91	0840	0	30	31	15	34	Discharge from Line 2

LEL: Lower Explosive Limit
ug/l: micrograms per liter of air
*: System interferences and or contamination may have impacted the ability to detect concentrations of the indicated constituents at or slightly above the reported detection limit.

ATTACHMENT I

DAILY QUALITY CONTROL REPORTS

A-E Daily Quality Control Report
(A-E DQCR)

Date: 6/10/91

A. Weather (temperature, wind speed and direction, precipitation, etc.):
Cool mid 70s Morning & Early Afternoon Light Drizzle on & off from 10:30 to 3:30 Clearing Late Afternoon

B. Work Performed: Monitor Hoses with PID & Explosimeter Monitor all other locations with Explosimeter & GC

C. Sampling Performed (location/number, sample type, etc.):
Air Monitor ~~PIDEX~~ with GC MH89, MH90 MH91, MH 92, MH 93, MH 94, MH 95, MH-A, MH-B, MH-C, MH-D, Car Wash Grit Chamber, Lift Station Analyses Run in Field

D. Field Analyses Performed (including instrument checks, calibration, etc.):

HNu PI 101 Calibrated 58 PPM MX351 Explosimeter Calibrated 25% with Pentane, Photovac 10S50 Calibrated BTEX mix 16.709/L Each Analyte. Monitor all sampling locations above with Explosimeter Monitor Building 2149, 2151, 2176 & 2178 with HNu PI 101 & Explosimeter

E. Problems Encountered and Corrective Actions Taken (sampling problems, alternate methods/locations, etc.):

The HNu ~~PI~~ PI 101 READS NEGATIVE OFF SCALE WHEN MONITORING SEWER GAS. Sample all sewer locations with Photovac 10S50 Explosimeters are pressure diffusion instruments use CGM Dynamation in "Hold Mode" records peak value, lower it in manhole

F. Quality-Control Activities Initiated:
Photovac 10S50 Calibration Checks Recovery ~70% on Check #1: Recalibrate. Recovery ~90% to 120% Check #2.

Signature of Reporter: [signature]
Geraghty & Miller, Inc.

A-E Daily Quality Control Report
(A-E DQCR)

Date: 6/11/91

A. Weather (temperature, wind speed and direction, precipitation, etc.):
Cloudy & Cool in the morning. Progressively clearing & warmer throughout the day. Light Wind from the east

B. Work Performed: Monitor Houses with PID & Explosimeter
Monitor sewer points with GC & Explosimeter

C. Sampling Performed (location/number, sample type, etc.):
Air samples MH-89, MH-90, MH-91, MH-92, MH-93, MH-94
MH-95, MH-A, MH-B, MH-C, MH-D, Lift Station & Car Wash Grit Chamber

D. Field Analyses Performed (including instrument checks, calibration, etc.):

Calibrate HNu PI 101 @ 1515 Reads 60 ppm (58 ppm)
Monitor Houses with PID & Explosimeter
Calibrate Photovac 10S50 PTBX std 1ppm 49/l for each Analyte

E. Problems Encountered and Corrective Actions Taken (sampling problems, alternate methods/locations, etc.):

Continue monitoring all manholes with GC. & use CGM Explosimeter
MH-88 still inaccessible contact Molly McGrano will talk to the Plumbing shop

F. Quality-Control Activities Initiated:
Photovac 10S50 Calibration Checks 60-70 Recovery Recalibrate as needed. Field Duplicates ~60% RPD Between Syringes ~10-20% within a Syringe. Use only one syringe at a time

Signature of Reporter: [signature]
Geraghty & Miller, Inc.

A-E Daily Quality Control Report
(A-E DQCR)

Date: 6/12/91

A. Weather (temperature, wind speed and direction, precipitation, etc.):
WARM & SUNNY SOME HIGH THIN CLOUDS MODERATE BREEZE WITH GUSTS FROM THE SOUTH/SOUTHWEST

B. Work Performed: Monitor Houses 2149, 2151, 2175 & 2176 with HNu PID01 & ~~Photovac 10S50 GC~~ MX251 Explosimeter Monitor Source Points MH-89 through MH-95, MH-A through MH-D Lift Station & Car Wash Grit Chamber with Explosimeter & Photovac 10S50 GC

C. Sampling Performed (location/number, sample type, etc.):
Air Samples MH-89, MH-90, MH-91, MH-92, MH-93, MH-94 MH-95, MH-A, MH-B, MH-C, MH-D, Lift Station & Car Wash Grit Chamber for BTEX using the Photovac 10S50 GC

D. Field Analyses Performed (including instrument checks, calibration, etc.):
Field Analysis of Air Samples indicated above. ~~Three~~ Photovac calibrated twice. PID monitoring at the Houses Cal #1 59 ppm & Cal Check read 61 ppm Trace reading 58. MX251 Explosimeter calibrated read 23 and cal check read 24 Trace value 25

E. Problems Encountered and Corrective Actions Taken (sampling problems, alternate methods/locations, etc.):
MH-88 was still inaccessible. The battery problem with the MX251 was resolved and it was used on most of the monitoring today.

F. Quality-Control Activities Initiated: Photovac GC Check Standards read ~60% recovery and ~50% recovery the instrument was recalibrated after the first cal check. The second check was at end of the day run. Field ~~duplicates~~ duplicates had an RPD of ~90%

Signature of Reporter: [signature]
Geraghty & Miller, Inc.

A-E Daily Quality Control Report
(A-E DQCR)

Date: 6/13/91

A. Weather (temperature, wind speed and direction, precipitation, etc.):
Cool & Clear in early morning Some Clouds Hot & Sunny by Mid Day Light Winds Variable

B. Work Performed: Monitor Homes with PID in Early and Mid morning with PID & Explosimeter Monitor Sewer System locations with the GC & the Explosimeter

C. Sampling Performed (location/number, sample type, etc.):
Air Monitoring with GC MH-89, MH-90, MH-91, MH-92, MH-93, MH-94 MH-95, MH-A, MH-B, MH-C, MH-D, Coal Wash Cont Chamber, Lift Station Analyses run in Field

D. Field Analyses Performed (including instrument checks, calibration, etc.):
HNu PI 101 Calibrated 59 ppm Cal Check 57 ppm Trip value 58 ppm MX251 Explosimeter Calibrated 25% LEL with Pentane Rel 2% 21%, Photovac 10S50 mix 16 Trap Each Analyte BTEX. Check all sampling locations with Explosimeter and Monitor Homes 2109, 2151, 2176, & 2177 with Explosimeter & PID

E. Problems Encountered and Corrective Actions Taken (sampling problems, alternate methods/locations, etc.):
MH-88 was inaccessible Rapid loss of sensitivity on Photovac. Recalibrate often increase Gain to 20.

F. Quality-Control Activities Initiated: Photovac 10S50 Calibration Checks Recovery ~70% Cal Check 1 ~30 to 80% on Cal Check #2 Cal Check #3 ~30 to 90% Cal Check 4 ~10 to 120%

Signature of Reporter: [signature]
Geraghty & Miller, Inc.

ATTACHMENT II

DAILY LOGS

GERAGHTY & MILLER, INC.
Environmental Services

DAILY LOG

Well(s) _____ Project/No. TF48601 Page 2 of 3

Site Location Holloman AFB BX Service Station SS-17

Prepared By Francis L. Cooper

Date/Time	Description of Activities
6/10/91 6am	Begin instrument calibration Photovac Check RT using Headspace Run Blanks
7:30	Meet M McLean & Walk Hardt for Breakfast
8:30	Return to Room Prepare BTEX Std in Methanol 50ul of Neat BTEX in 10ml of Methanol ~ 4mg/ml
9:00	Head for store pickup supplies and leave for Base
9:30	Arrive on Base Check in through Security and go to CE Building 55. Meet Walk Hardt & Darvin St John of Entech Pickup Base HNU PID & Load Van Head to site
10:30	Arrive at Building 2149 Unload Vehicles Begins Raining Lightly. Still Checking Photovac keeps shutting down due to low internal battery. Check PID & Explosimeter for operation. Explosimeter is a Diffusion Type.
11:15	Tour Sites with Molly Talk About H&S issues Monitor 14 locations Sample Representative

GERAGHTY & MILLER, INC.
Environmental Services

DAILY LOG

Well(s) _____ Project/No. TF4861 Page 2 of 3

Site Location Holloman AFB SS-17

Prepared By Francis L. Corden

Date/Time	Description of Activities
6/10 12:00	Return to Building 2149
	Go Call Chris A & office
12:45	Calibrate Photovac 5 ml Std 4 mg/ml
	in 1.2 l Bag Run Blanks
13:15	Calibrate HNU 101 Span 0.28 Reads 56 PPM ok
	Explosimeter MX251 Reads 25% ok
13:30	Begin Monitoring Houses
14:00	Finish Checking Buildings, All low
14:05	Try to Monitor MH-92 HNU meter off scale
	negative. ~~Try~~ Repeat same result. Explosimeter
	low battery indicator on.
14:20	Meet Molly McGraw discuss PID problem.
	Use GC to monitor all manhole locations Neg Read
	Swap Explosimeter Dynamation GM
14:40	Resume sampling MH-92. Collect GC sample from Pump Station
14:50	Break for Lunch
15:15	Move to MH-A to see if PID reads
	negative on "upgradient" man hole
	same result though not as pronounced
	will return to sample this site
15:35	Prepare to sample all sewer points
	for GC Analysis Resume sampling &
	monitoring

GERAGHTY & MILLER, INC.
Environmental Services

DAILY LOG

Well(s) _____ Project/No. TF48601 Page 3 of 3

Site Location Hollman AFB BX Service Station SS-17

Prepared By Francis L. Cerden

Date/Time	Description of Activities
6/10 16:30	Grit Chamber sample is Hot (Discharging from Pipe #2 while sampling) Direct Sample/Pump not needed
	Run Blanks & Recalibrate
17:00	Switch to sampling MH in Residential Area
18:05	MH-88 is not accessible move to MH-85
1944	Finish sampling MH-D Check Instrument
	Calibration. Clean up & Pack up
2025	Off Site
2200	Work on Paper Work and Check Instrument
	Flows. The Flow meter is very
	sticky. Flows appear out of balance
	May be responsible for Poor Response. Charge Meters
2300	Lights Out

GERAGHTY & MILLER, INC.
Environmental Services

DAILY LOG

Well(s) _____ Project/No. TF48601 _____ Page 1 of 2

Site Location Hellman AFB BX Service Station SS-17

Prepared By Francis L. Carden

Date/Time	Description of Activities
6/11/91	
6:~~30~~	Call Holly for Messages Chat with Leslie
7:10	Call Phone Mail for Messages
~~7~~:25	Leave for site Cool somewhat Overcast
735 ~~7:30~~	Arrive on site Walk Haydel not here yet
	Work on yesterdays paper work
8:00	Walk Haydel on-site Unload Gear and Begin
	Instrument set-up.
	Slight trouble with Blank Hump (not a
	peak) occurs at ~ same RT as
	MP Xylene. Subtract it out of results
	Standards looks very good
9:40	Begin Monitoring ~~at~~ in Residential Man Holes
	Still Partly Cloudy. Somewhat Warmer
10:00	Weird Peaks in MH-95 Check Flows
	Problem with MH-94 A/30. Reset Flows
	Recalibrate. Resample MH-94 & MH-95
11:55	Collect Duplicate Sample at MH-91
	Reproducibility ~ 60% RPD ~~Collect Another one~~
	Different Syringes Collect Second one later
12:30	Retention Times Shifted Recalibrate
12:45	Resume Monitoring Move to Sites
	Across 1st Ave & BX Station

G&M Form 02 6-86 Southprint 89-1256

GERAGHTY & MILLER, INC.
Environmental Services

DAILY LOG

Well(s) _____ Project/No. JF48601 _____ Page 2 of 2

Site Location Hellenan AFB BX Service Station SS-17

Prepared By Francis L. Corden

Date/Time	Description of Activities
6/11 13:45	Break for Lunch
14:10	Resume Monitoring Across 1st Ave
15:10	Calibrate (PID) HNU PI 101 Reads 60 PPM (158)
15:15	Monitor Homes
15:35	Complete Monitoring of Homes
	Pack-up & Work on Paperwork
16:00	Off-Site

GERAGHTY & MILLER, INC.
Environmental Services

DAILY LOG

Well(s) _____ Project/No. TE4860/ Page 1 of _____

Site Location Holloman AFB BX Station SS-17

Prepared By Francis L. Cerda

Date/Time	Description of Activities
6/12/91 8:00	Call into Office
8:15	Review 2.4.3 Luke Base-wide Document
9:00	Call David discuss Meeting & Chetstanding
	Luke Items Put DEQS in QAPP not WP
10:00	Type 2.4.3 Corrections 1 Hour
11:15	Call corrections into David 30 minutes
11:45	Go To Post Office
12:00	Work on Holloman QC Paper Work & Pack up
13:30	Leave for site
14:00	Arrive at site STOPPED AT GATE FOR 15
	minutes
15:00	Photovac Blanked & Calibrated
15:05	Begin monitoring across 1st Ave with
	dynamation CGM & Photovac
15:35	Talk to Molly about explosimeter Switch back
	to Industrial Scientific MX251. Its very
	warm today High thin clouds & a moderate
	breeze from the south/southeast. Calibrate MX251 23/0 n 25
16:50	Neighbor from west side (woman) inquires about activities
	& indicates fumes in the evening are pretty bad.
	I explained I was monitoring the homes (vacant) and
	the sewer. If she had questions about the
	recovery system or the odors talk to Molly with
	Walk Hayden.

GERAGHTY & MILLER, INC.
Environmental Services

DAILY LOG

Well(s) _____ Project/No. TF4860) _____ Page 2 of _____

Site Location Holloman AFB BX Station SS-17

Prepared By Francis Corder

Date/Time	Description of Activities
6/12/91 1720	Little girl near MH-90 asking questions.
1820	Security Checks building 2141
1900	Calibrate the PID PI101 Panel Readings 60 ppm
1905	Begin Monitoring Houses
1925	Quit Checking Houses Leave for Lift Station
1945	Recalibrate MX251 Check reads 24% (25%)
	Cal Check PI101 reads 61 (58)
1955	Pack-up
2020	Off-site

G&M Form 02 6-86 Southprint 89-1256

GERAGHTY & MILLER, INC.
Environmental Services

DAILY LOG

Well(s) _____ Project/No. TF48601 Page 1 of 2

Site Location Hollaman AFB BX Service Station SS-27

Prepared By Francis L Carder

Date/Time	Description of Activities
6/12/91 05:15	On-site unload gear & START PHOTOVAC
5:45	Calibrate MX251 set zero Reads 21 set to 25
	Calibrate HNU PI 101 READS 59 OK
5:55	Begin Monitoring Homes
6:20	Finish 2178 Collect MH-95
6:00	Head for 2176 to Finish Monitoring Homes
6:30	Resume Man Hole Monitoring
6:45	Turn Draft on the Photovac Recalibrate
6:50	Resume Man Hole Monitoring
8:40	Head across street to get Gnt Chamber
	INSTRUMENT SENSITIVITY WAY DOWN
9:30	Recalibrate instrument at Gain 5 After Running
	MH-A
9:45	Monitor Homes second time today
10:05	Finish in the Homes Run Second Calibration
	at Gain 20
10:12	Cal Check on HNU Model PI 101 Reads 57
	don't adjust
10:20	Head across street to Finish man hole
	monitoring
11:00	Collect MH-D and Run it.
11:10	Cal Check on MX251 Reads 21%
	Turn instrument off.

G&M Form 02 6-86

Southprint 63-1150

GERAGHTY & MILLER, INC.
Environmental Services

DAILY LOG

Well(s) _____ Project/No. TF4860L _____ Page 2 of 2

Site Location Holloman AFB BX Service Station

Prepared By Francis L. Corden

Date/Time	Description of Activities
6/13 11:30	Begin Packing Up Car with Gear
11:45	Spend a few minutes observing Hawk Handle Collecting Soil Samples behind BX Service Station.
12:00	Break for Lunch Off-site to White Sands
2:00	Return to Hotel & Call Shipper to Handle Air Cylinder Get Directions
2:30	Drop off Cylinder & Get Manifests
3:00	Off the Clock Head for Bio Doso.

SM Form 02 6-86

END OF APPENDIX D

Southprint 89-1256

APPENDIX E

CORRESPONDENCE WITH NEW MEXICO ENVIRONMENT DEPARTMENT

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 833D COMBAT SUPPORT GROUP (TAC)
HOLLOMAN AIR FORCE BASE, NM 88330-5000

REPLY TO ATTN OF 833 CSG/DEV

02 APR 1991

SUBJECT Underground Storage Tanks (UST) as Pertains to Holloman Air Force Base (HAFB)

TO ATTN: Mr Glenn Schellinger
New Mexico Environmental Improvement Division
Underground Storage Tank Bureau
1190 St Francis Dr.
Santa Fe, NM 87503

1. Thank you for taking the time to speak with Ms Jane Fortier of Walk, Haydel, and Associates on 26 Feb 91 concerning the applicability of the New Mexico UST Regulations to sites under investigation at HAFB.

2. Under the Installation Restoration Program (IRP) initiated by the Department of Defense (DOD), Walk, Haydel, and Associates, Inc., under contract by the US Army Corps of Engineers, has investigated sites at HAFB where petroleum (mostly aviation fuel) and other materials have been handled, disposed, or released.

3. A Remedial Investigation (RI) report has been performed for several sites at HAFB. The report identifies two sites at HAFB that require a Feasibility Study (FS) for possible remediation. The purpose of the FS is to determine the best clean-up methods to be used at the sites, based upon overall protection of human health and environment, implementation, and cost.

4. The investigation of suspect sites at HAFB began under the IRP format (as initiated by the DOD). The DOD has now adopted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) protocol pertaining to its site investigations. CERCLA requires, for subtances left on-site at the conclusion of remedial action, that the action require a level or standard of control which at least attains applicable or relevant and appropriate Federal or State environmental or public health requirements (refer to EPA document CERCLA Compliance and Other Laws Manual, Interim Final, Aug 88).

5. One of the sites contains subsurface petroleum constituents which, from the remedial investigation, are believed to be the result of leaking underground storage tanks that were removed prior to the effective date of New Mexico's UST regulations. The source of contamination at the other site is still under investigation. Remediation of UST sites at HAFB shall comply with New Mexico UST Regulations. Specifically, Part XII, Corrective Action for Petroleum UST Systems would be applicable, relevant, and/or appropriate to UST sites at HAFB.

Readiness is our Profession

6. The Remedial Investigation report performed for the two sites under investigation (as well as for other sites for which an FS was not deemed necessary) contains information required for the "on-site investigation" and "hydrogeologic investigation" as discussed in Sections 1205 and 1210 of the New Mexico UST regulations. Using CERCLA format, the proposed FS report will contain information required by the "reclamation proposal" as stated in Section 1212 of the UST regulations.

7. Free product and possibly highly-contaminated soil exist at both sites to be included in the FS. The New Mexico UST regulations require removal of free product and excavation (to depths possible) of highly-contaminated soil. Ground water beneath HAFB contains Total Dissolved Solids (TDS) levels of 18,300 to 67,600 mg/l (as reported from field work associated with the RI). New Mexico Water Quality Control Commission groundwater quality standards WQCCR, Part III, are promulgated for groundwater with TDS values of 10,000 mg/l or less. Therefore, these standards are not applicable to sites at HAFB. Also, groundwater beneath HAFB is not a public or private water supply.

8. Therefore, it is our understanding that according to Section 1209 D of the New Mexico UST regulations:

a. Remediation of soil contamination will be considered complete when:

(1) Soil contamination has been reduced to a level which will not contaminate groundwater through percolation or as the water table rises and falls with seasonal fluctuations, and the soil is not a source of potentially explosive or potentially harmful vapors in utilities, basements, or other surface or subsurface structures.

(2) No highly-contaminated soils remain in the ground.

9. Also, according to Section 1219 of the New Mexico UST regulations:

a. Reclamation will be considered complete when all of the following criteria have been met:

(1) No floating product is present on the water table.

(2) Soil contamination has been reduced to a level which will not recontaminate groundwater through percolation or as the water table rises and falls with seasonal fluctuations and, where a soil treatment system was necessary under 1209 or 1212B (2), the soil remediation standards set out in 1209 have been met.

(3) Any other conditions which threatened health, public welfare or the environment have been remediated.

10. The New Mexico UST Division's written concurrence with the above interpretation is requested. Should you need to discuss this letter, please call Sharon Moore at 479-3931. Your assistance is greatly appreciated and we look forward to your response.

Howard E. Moffitt

HOWARD E. MOFFITT
Deputy Base Civil Engineer

cc: USACE, Omaha Dist.,
Larry Janis
Walk, Haydel, & Associates,
Ray Vacheon

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 833D COMBAT SUPPORT GROUP (TAC)
HOLLOMAN AIR FORCE BASE, NM 88330-5000

REPLY TO ATTN OF 833 CSG/DEV

10 APR 1991

SUBJECT Underground Storage Tanks (UST) as Pertains to Holloman Air Force Base (HAFB)

TO ATTN: Mr Glenn Schellonger
New Mexico Environmental Improvement Division
Underground Storage Tank Bureau
1190 St Francis Dr
Santa Fe, NM 87503

1. Thank you for taking the time to speak with Ms Jane Fortier of Walk, Haydel and Associates on 6 Mar 91 concerning further clarification and applicability of portions of the New Mexico Underground Storage Tank (UST) Regulations to sites under investigation at HAFB . This is the second correspondence with the Division concerning sites at HAFB; the first is dated 2 Apr 91.

2. The following portion of the New Mexico UST Regulations was discussed during the 6 Mar 91 telephone conversation:

a. 1209.D. "Remediation of soil contamination will be considered complete when:

(1) Soil contamination has been reduced to a level which will not contaminate groundwater through percolation or as the water table rises and falls with seasonal fluctuations, and the soil is not a source of potentially explosive or potentially harmful vapors in utilities, basements, or other surface or subsurface structures."

3. The Division stated that due to groundwater usage and quality (TDS level greater that 10,000 mg/l) beneath HAFB, that contaminated soil which may recontaminate groundwater due to seasonal fluctuations in the water table elevations need not be removed. This does not, however, pertain to "highly contaminated" soils or soils which are potentially explosive or are a source of potentially harmful vapors in utilities, basements, or other surface or subsurface structures.

4. The following day, 7 Mar 91, Jane Fortier attempted to contact Mr Glenn Schellinger again to clarify other portions of the regulations. He was not available, but another member of the Division discussed the following with Ms Fortier:

a. 1209.B. "Where highly contaminated soils remain beyond the depth or horizontal extent of practicable excavation, or when the owner or operator choose to treat contaminated soils in place, the owner or operator must design...."

5. The question was raised by Walk, Haydel as to whether highly contaminated soils which are within practicable depths or horizontal extent of excavation can be treated in place. The Division stated that all highly contaminated soils with practicable depths or horizontal extent of excavation must be excavated. Only highly contaminated soil beyond practicable depths or horizontal extent or contaminated soils can be treated in place. Therefore, in Section 1209.B., when "contaminated" soils are referred to, it does not infer "highly contaminated" soils.

6. Also discussed were acceptable constituent levels in soil after treatment (as described in Section 1209.A.1.). If highly contaminated soils are present, they must be excavated. Excavated soils can then be treated by thin spreading. The Division informed Walk, Haydel that if the total petroleum hydrocarbon (TPH) value of treated soil is less than 100 ppm using an appropriate laboratory test, that soils can be considered treated and may be backfilled into excavated areas.

7. The New Mexico UST Division's written concurrence with the above interpretation is now requested. Should you need to discuss the contents of this letter, please contact Sharon Moore at 479-3931. Your assistance is greatly appreciated and we look forward to your response.

Howard E. Moffitt

HOWARD E. MOFFITT
Deputy Base Civil Engineer

cc: USACE, Omaha Dist.,
Larry Janis
Walk, Haydel & Assoc,
Ray Vacheon

CR-5362.50-1

TELEPHONE RECORD

DATE: May 29, 1991

SUBJECT: New Mexico - UST Regulations for Soil Remediation

JOB NO.: 5362.50

CLIENT: Corps of Engineers
Holloman AFB, NM

PARTICIPANTS: For NM Health and Environmental Department - UST Bureau

Glen Schellinger

For Walk, Haydel & Associates, Inc. (WH&A):

Molly McGraw (5/29/91) &
Ray Vachon (6/5/91)

The following items were resolved:

1. There are no protocols or requirements for sampling the contents of USTs if the contents of the tanks is known.

2. The cement mat atop which USTs sit may be allowed to remain in the ground when the USTs are removed; however, a soil sample is still required from the center of the excavation. If the center of the excavation is beneath the mat, then a hole can be drilled through the mat to collect the sample or the mat can be removed to collect the sample. In any event a sample must be collected.

3. In the event that a soil sample has a PID or FID reading of >100 ppm and the soil is not highly contaminated (as defined in the NM - UST regs) and the groundwater beneath the site has a total dissolve solids (TDS) concentration of >10,000 ppm then the soil does not have to be remediated. Only highly contaminated soil must be remediated and floating product removed in areas where the groundwater has >10,000 ppm TDS. The dissolved phase in the groundwater does not need to be addressed. Must have data proving the groundwater has >10,000 ppm TDS.

4. If groundwater is encountered during the tank removal, then a sample of the groundwater plus four soil samples (one from each wall of the excavation above the groundwater table) will be collected for analysis. this is in lieu of No. 2 above.

MM/dh
T-625/W-58

State of New Mexico
ENVIRONMENT DEPARTMENT
Harold Runnels Building
1190 St. Francis Drive P.O. Box 26110
Santa Fe, New Mexico 87502
(505) 827-2850

BRUCE KING
GOVERNOR

JUDITH M. ESPINOSA
SECRETARY

ROB CURRY
DEPUTY SECRETARY

July 8, 1991

Mr. Roger Wilkson, IRP Program Coordinator
833rd CSG/DEV
Holloman Air Force Base, NM 88330

IRP Program Document Review
Site SS-17: BX Service Station - Chemical Data Acquisition Plan

Dear Mr. Wilkson:

The New Mexico Environment Department has reviewed the Chemical Data Acquisition Plan for Installation Restoration Program site SS-17, the BX service station, for adequacy under State environmental regulations.

Based on this review, the Department finds that the project organization, field procedures, and laboratory protocol described in the Plan are adequate in themselves. However, we are concerned at the lengthy remediation schedule that is implied by the Plan.

The Department is aware that the release at the BX Service Station predates the New Mexico Underground Storage Tank (UST) Regulations, and that groundwater beneath Holloman Air Force Base contains levels of dissolved minerals which render the groundwater cleanup standards contained in the Regulations inapplicable. Nevertheless, it has consistently been the Department's position, expressed both verbally and in correspondence prior to this letter, that Sections 1208 and 1209 of the UST Regulations do apply in this situation. Section 1208 requires the removal of all floating product in a way that minimizes its spread; Section 1209 requires the excavation of all highly contaminated soil to the greatest practicable depth and horizontal extent. Both Sections prescribe strict timetables. If removal of all highly contaminated soil is genuinely impracticable, some other appropriate soil treatment method may be acceptable if approved by the Department.

In short, the work described in the Chemical Data Acquisition plan is acceptable but is not sufficient to address the requirements of the New Mexico UST Regulations. Two areas concern us particularly: the first is paragraph 2.1 of the Scope of Work (page 1 of Appendix A) which limits excavation of highly contaminated soil to areas within ten feet of removed tanks; the second is the proposal in the Plan to collect soil samples from only three soil sampling boreholes, which will be inadequate either to define the extent of highly contaminated soil or to support an application for an alternative in-situ remediation system.

An additional concern is the possible buildup of explosive vapors in confined spaces. The sampling protocol proposed in the Plan for this appears to be adequate, but some sort of regular monitoring (such as that required by Section 1203.B of the UST Regulations) is essential to ensure that fire or explosions cannot occur. We trust that adequate provision has been made for this since gasoline vapor explosions are a major safety hazard, but we would appreciate being advised of the arrangements.

The Department recognizes that work described by the Plan is in progress and that it may be too late to modify the actual document. We do, however, feel strongly that the schedule of remediation for contamination from underground storage tanks at Holloman Air Force Base should more closely approach the timetable required in the New Mexico Underground Storage Tank Regulations. If modification of the Chemical Data Acquisition Plan per se is not the appropriate means to address the pace of remediation, we look forward to working with you as expeditiously as possible to find the appropriate means.

We appreciate that Holloman Air Force Base has been engaged in a good faith effort to remediate the BX fuel leak, and other UST contamination, using a process modelled after Federal Superfund procedures. Our reservations about this process have only to do with the dramatically faster schedule required by New Mexico UST Regulations. To the extent possible, we request that you pursue remediation of UST contamination using the format contained in Part XII of the UST Regulations (immediate initial abatement, a single on-site investigation, and reclamation proposal) rather than the lengthy Superfund-type procedure now in place. If the UST Regulation-mandated procedure is not possible under the Installation Restoration Program, we would very much like to work out with you an accelerated remediation schedule using some other format.

Sincerely,

David Morgan
Environmental Specialist - DSMOA Program
Toxic Sites Bureau

c: Mr. Glenn Schellinger, NMED UST Bureau

CONFERENCE RECORD

DATE:	August 12, 1991
SUBJECT:	Holloman AFB, Site SS-17, BX Service Station
LOCATION:	New Mexico Environmental Department, Santa Fe, NM
JOB NO.:	5362.55
PARTICIPANTS:	See Enclosure 1

PURPOSE

1. The primary purpose of this meeting was to brief the New Mexico State Environmental Department (NMED) on all past history relative to the gasoline spill and clean-up efforts at Site SS-17. In addition issues were discussed with emphasis on those related to the Underground Storage Tank (UST) Regulations. Attached as Enclosure 2 is a copy of the hand out that was provided to attendees at the meeting.

2. Holloman AFB through HQ TAC has obtained technical and project assistance from the U.S. Army Corps of Engineers (COE), Omaha District. In turn, Walk, Haydel and Associates (Walk, Haydel) is working as a contractor to the COE in the capacity of engineering consultant.

OTHER POINTS OF DISCUSSION

1. Requirements related to the New Mexico Underground Storage Tank Regulations were discussed. Other requirements under RCRA still need to be addressed separately. These could also impact the course of action to be taken in cleanup of Site SS-17.

2. Operating at the present rate, another 2.5 to 3 years could be required to remove all of the remaining recoverable product. Further investigation will be done to see if this can be accelerated. Eight consecutive quarters of detecting no free product in any well is the test to use to determine completion of groundwater cleanup. If after eight consecutive quarters no free product is detected in the monitoring wells, then the site is considered clean and no remediation of the soil is necessary.

3. Since the groundwater at Holloman AFB is not a source of potable water (total dissolved solids, TDS, are over 10,000 ppm), it will not be necessary to remediate soil classified as contaminated soil (soil containing more than 100 ppm of total petroleum hydrocarbons, TPH). Only highly contaminated soil would have to be remediated. Soil is classified as highly contaminated if one of the two conditions of the UST regulations is valid: a sample placed on filter paper reveals noticeable hydrocarbon or hydrocarbons are readily apparent in the soil by odor or by observation.

4. As part of the UST removal project under design now, a variance request should be presented to NMED, UST Bureau, to relieve the time table requirements of the UST regulations. This will mean all additional remediation is to be included in the Corrective Action Plan (CAP) for the total site, which the tank removal area is only a small part of. Paragraph 1222 should be cited in the variance request. No CAP is required for the removal of the underground tanks themselves. The CAP for the overall site needs to include a complete schedule.

5. The UST removal package shall require the tank-removal contractor to notify Nena Wells in the Las Cruces District Office of NMED before removing tanks to allow coordination of schedules. She will perform on-site inspection. Generally, as much highly contaminated soil would be removed as required by Nena and as practical during the removal of the tanks. Also the contractor will be required to take samples and fill out forms providing information as requested by the Base and/or his contract.

6. The base shall update the underground tank registration after removal is completed.

7. From the standpoint of NMED, UST Bureau, other structures could be built on the site as long as it does not hinder the remediation of the site.

8. Some discussion centered around clearing sewer lines of vapors. The typical solution elsewhere has been to install vent fans, one pushing and one pulling. However, alternate methods may be presented by the Base for review by the State as long as it can be shown to be effective. In particular, the base has been flushing with water whenever high vapor concentrations are detected. Further study is planned to evaluate the effectiveness of this method. Thirty percent lower explosion limit (LEL) is the required limit. Additionally, the air quality requirements need to be investigated since benzene, etc. are vented to the atmosphere.

DRAFT

September 24, 1991

Environmental Branch

Mr. John Pfeil
Environmental Improvement Division
1190 St. Francis Drive
Santa Fe, New Mexico 87503

Dear Mr. Pfeil:

Please reference our meeting held on August 12, 1991 regarding the remediation of the BX Service Station site at Holloman Air Force Base, New Mexico. I would first like to thank you and your staff for the generous block of time allocated to our group. As you recall, Mr. Ray Vachon of Walk-Haydel and Associates briefed your staff regarding the history of this site, present efforts to remove gasoline floating on the shallow water table and plans to complete site remediation. The purpose of this letter is to confirm my understanding of what constitutes a "clean" site according to your interpretation of New Mexico standards and also to present concerns regarding these standards.

It is my understanding that the following conditions must be fulfilled if this site is to be considered clean and safe:

- There must be no observable floating product in any of the monitoring wells associated with this site for a period of eight (8) consecutive quarters.

- Highly contaminated soils would normally be removed by excavation or treated in place in accordance with New Mexico standards; however, if the first condition stated above is fulfilled, it is assumed there would be no remaining highly contaminated soils on site.

- There is no requirement to treat the groundwater at this site since all groundwater under Holloman Air Force Base is considered to be a class III, non-potable aquifer. The class III designation is consistently supported by observations of total dissolved solids generally in excess of 10,000 milligrams per liter.

- Underground utilities and corridors must periodically be monitored for the presence of explosive vapors associated with site contamination. Explosive vapors must be maintained at a level no greater than 30 percent

of the lower explosive limit (LEL).

The above prerequisites for a clean and safe site appear to be reasonable; however, the first condition needs further clarification. Thin films of floating product may be observable to the eye, but yet not easily measurable. It would be reasonable to assume that such thin films might persist in our site monitoring wells long after our trench systems have ceased productive operation. Please provide further guidance regarding this standard and any variances that might be allowed.

I understand that new construction may take place at the BX Service Station provided such construction does not interfere with remediation efforts at the site. Please elaborate further regarding New Mexico Environmental Improvement Division regulations governing new construction at a site that is not totally remediated.

Cleanup goals at the BX Service Station site must be tailored to the most stringent requirements imposed by the State of New Mexico. Please confirm that the "clean and safe" criteria stated above are consistent with the requirements of both your Underground Storage Tank Bureau and your RCRA staff.

Your timely comments will be used to define more clearly our site remediation goals. Feel free to contact my assistant, Ms. Sharon Moore, if you should have questions regarding this important site. She may be contacted at telephone (505) 479-3931.

Sincerely,

Howard E. Moffitt
Deputy Base Civil Engineer

WALK, HAYDEL & ASSOCIATES, INC.

PROJECT MANAGERS - ENGINEERS - CONSTRUCTION MANAGERS

TELEPHONE 504-586-8111
TELEX 58-7302 (WALHAY NLN)
FAX 504-522-0554

MAIN OFFICES
600 CARONDELET STREET
NEW ORLEANS, LOUISIANA
70130-3587

February 18, 1992

Mr. John Pfeil
Environmental Improvement Division
1190 St. Francis Drive
Santa Fe, New Mexico 87503

L-18
Re: Holloman AFB
Clarification of UST Regulations
Job No. 5362.54-10.11

Dear Mr. Pfeil:

This letter is being sent to request clarification of UST Regulations and their applicability to Site SS-17, the BX Service Station at Holloman AFB. A meeting was held on August 12, 1991 at the New Mexico Environmental Department (NMED) office in Santa Fe with participants from the UST Bureau, Holloman AFB, the US Army Corps of Engineers, Walk, Haydel & Associates, Inc. and others. At this meeting the NMED was briefed on the site and UST Regulations applicable to Site SS-17 were discussed. A conference record of this meeting and follow-up letter is included as Enclosure 1.

Another meeting was held on February 11, 1992 at Holloman AFB to discuss the status of remediation of Site SS-17. Many of the same participants in the August 12, 1991 meeting were present. Representatives from the UST Bureau were invited to attend the meeting. Mr. Lincoln Adkins of the UST Bureau Prevention/ Inspection Section was present. UST Regulations were discussed and clarification of uncertainties requested of Mr. Adkins. Upon his request, questions were written for him so that he may bring them back to his office and collaborate with other members of the Department to determine answers. Issues conveyed to Mr. Adkins which need clarification are as follows:

1.) During the August 12, 1991 meeting it was stated by the NMED that if after eight consecutive quarters no free product is detected in any site monitoring wells, then the site is considered clean and no remediation of soil is necessary. Mr. Adkins did not believe this to be Department policy. Confirmation of the Department's position on this issue is requested.

2.) As stated in the follow - up letter to the August 12, 1991 meeting (see Enclosure 1), there is no requirement to treat the groundwater at Site SS-17 since all groundwater at Holloman AFB is considered to be a Class III, non- potable aquifer. The Class III designation was supported by analysis of TDS in excess of 10,000 ppm near the Main Base Landfill. Recently, TDS analysis was performed on groundwater samples from selected wells at Site SS-17 not containing free product. Some wells contained in excess of 10,000 ppm TDS and others contained below 10,000 ppm TDS. Since the aquifer is considered a Class III aquifer (in accordance with Guidelines for Ground- Water Classification under the EPA Ground- Water Protection Strategy, December 1986, does the presence of less than 10,000 ppm TDS in some wells change the applicability of regulations to Site SS-17? Would dissolved constituents in groundwater need to be remediated (even though the aquifer is a Class III aquifer) just because some wells contain less than 10,000 ppm TDS? If so, would then all contaminated soil (having greater than 100 ppm TPH when using a field instrument) need to be remediated? Clarification is requested from the NMED.

3.) As per the UST Bureau Soil Guidelines, there are two ways to determine if soil is highly contaminated: the filter paper method and observation of physical properties. During June 1991, borings were drilled in an

area at Site SS-17 believed to contain free product. Soil samples were placed on filter paper and hydrocarbons did not stain the paper. Some samples did contain a hydrocarbon odor, but due to the subjectiveness of what constitutes a "strong odor", it is unknown whether the soil would be considered highly contaminated. Attached as Enclosure 2 is the location, boring logs and analytical results of samples collected.

During the UST removal at the BX Service Station, Mr. Adkins, as well as representatives from the Base, were present. No filter paper testing was performed on soil within the excavation. Mr. Adkins believed the soil to be highly contaminated based upon black stains and odors. Base personnel did not believe the soil to be highly contaminated. A quantitative value is needed to term soil highly contaminated so that confirmation of highly contaminated soil can be made.

4.) Site SD-47, the POL Washrack Area, is also currently under investigation. It was believed that an UST was present at the site. During excavation, no UST could be found. Thus, UST Regulations became non-applicable to the site. The aquifer in this area (as well as the entire base) is considered a Class III aquifer. Would groundwater cleanup, other than removal of free product, be required? If so, would groundwater cleanup be required if an UST had been discovered?

We feel that we are nearing the end of removal of floating product from the groundwater at Site SS-17. We are now ready to address remediation of the soil and the site; however, until the aforementioned issues are clarified, it is not possible to delineate the areas requiring cleanup nor is it posible to develop cost estimates for remediation of the soil at Site SS-17.
Your timely response to the previously discussed issues would be greatly appreciated.

Very truly yours,

WALK, HAYDEL & ASSOCIATES, INC.

R. F. Vachon
Project Manager

Enclosures

cc: Ron Stirling, USACE, Omaha District
Sharon Moore, HAFB

RFV/JF/dh
L-863

State of New Mexico
ENVIRONMENT DEPARTMENT

JUDITH M. ESPINOSA
SECRETARY

RON CURRY
DEPUTY SECRETARY

BRUCE KING
GOVERNOR

March 25, 1992

Mr. R. F. Vachon, Project Manager
Walk, Haydel and Associates
600 Carondelet St.
New Orleans, LA 70130-3587

Dear Mr. Vachon:

I am in receipt of your letter of February 18th requesting clarification of the New Mexico Underground Storage Tank (UST) regulations. I will attempt to respond to your concerns in the same numerical format used in your letter; however, one key point should be made at the outset since it affects all the questions you have raised. The New Mexico Water Quality Control Commission Regulations (which contain the state groundwater regulations) make no use of the EPA class system; rather, all groundwater containing less than 10,000 mg/l total dissolved solids is to be protected from degradation beyond specified limits. Groundwater naturally containing more than 10,000 mg/l TDS is not so protected. NMED communication with you and with Holloman Air Force Base personnel has, to my knowledge, all been based on the assumption that groundwater beneath the base contained more than 10,000 mg/l TDS and thus was not protected. As you point out, this was apparently an erroneous assumption.

1.) The interpretation you mention, that absence of any free product for eight consecutive quarters would constitute evidence of adequate site remediation, was suggested assuming that no groundwater remediation would be required. In that case, the UST bureau has consistently stated that the site would be adequately remediated when no free product or "highly contaminated" soil remained. It is true that the regulatory definition of "highly contaminated" soil is qualitative and field-oriented rather than quantitative. If no floating product is found on the water table after eight quarters, it presumably could be argued that no product remains that is not sorbed onto the soil or retained by capillary forces, and therefore the highly contaminated soils would be remediated. There are other, perhaps preferrable, options available for confirming the absence of highly contaminated soil, as discussed further under number 3 below.

If the groundwater beneath the site is protected and must be remediated, the definition of highly contaminated soil becomes a

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moot point since soil must be remediated sufficiently that it will not continue to contaminate the groundwater. In addition, the requirement in Section 1209(D)3(a) of the New Mexico UST regulations that the most highly contaminated soil remaining on the remediated site contain no more than 100 ppm total aromatic hydrocarbons as measured by an appropriate field procedure (or no more than 50 ppm TAH/10 ppm benzene in laboratory analysis) would apply. These numerical standards do not apply unless the groundwater is protected.

2.) As mentioned above, NMED does not use EPA's classification system, and state regulations are promulgated by the New Mexico Water Quality Control Commission (WQCC). The UST regulations as they relate to groundwater are derived from the WQCC regulations, and, in brief, require groundwater remediation if the water underlying any particular site is below the 10,000 mg/l TDS standard.

Recent information from on-site wells and wells on other parts of Holloman Air Force Base indicate that water quality varies greatly and that concentrations fall both above and below the standard. Under the UST regulations those sites underlain by groundwater of less than 10,000 mg/l TDS would require remediation of the groundwater and soils in accordance with Section 1219 of the UST regulations; groundwater of greater than 10,000 mg/l TDS requires the removal of all floating product and highly contaminated soil.

NMED understands the potential confusion associated with sites that may be in close proximity but fall on opposite sides of the standard; or where the plume at one site affects water that is both over and under the standard. To my knowledge, this is the only place in the state where this situation has occurred. The most conservative approach to the regulations would be to provide for groundwater remediation at any site where any water has been found containing less than 10,000 mg/l TDS, regardless of the source or extent of the "fresh" water.

A regulatory decision that otherwise protected groundwater need not be remediated (for instance, because it was only marginally below 10,000 mg/l and surrounded by water considerably over the standard) would have to be made at a high level within NMED, or by the Water Quality Control Commission. If the Base would like to pursue this option (or other alternatives), a necessary first step will a written request to Kathleen M. Sisneros, Director of the Water and Waste Management Division of NMED, suggesting an alternative remedial approach. A brief but thorough synopsis of all the hydrological information available concerning groundwater flow,

mounding, recharge, and of course TDS level, under Holloman Air Force Base will also be needed. If this is to be done, it should be done immediately.

3.) In the event that ground water remediation is not required at the site (i.e. groundwater is greater than 10,000 mg/l TDS) and remediation of highly contaminated soil is the yardstick for cleaning up the site, some site-specific, agreed-upon standard for highly contaminated soil can be developed in concert with UST Bureau personnel. It is true that there is no quantitative definition of "highly contaminated soil" in the UST regulations, but on-site guidance will be provided if needed.

4.) If a leaking underground storage tank had been found at Site SD-47, the POL Washrack Area, the remediation requirements would of course be exactly the same as those outlined above. Since no UST has been found, the site needs to be addressed as a RCRA Solid Waste Management Unit under corrective action. Although RCRA corrective action authority in New Mexico still resides with EPA, the Hazardous and Radioactive Materials Bureau of the Environment Department has received permission from EPA to take the regulatory lead at the POL washrack site. They will therefore have the lead role in making groundwater remediation decisions at the site.

I hope this letter is responsive to the questions you have posed. If you have further questions, please contact me at (505) 827-2776 or David Morgan at 827-2754.

Sincerely,

John J Pfeil

John J. Pfeil
Environmental Specialist, DSMOA program
Ground Water Protection and Remediation Bureau

c: Roger Wilkson, HAFB
Ron Stirling, COE Omaha
Edward Horst, NMED HRMB
Bob Sweeney, NMED USTB

WALK, HAYDEL & ASSOCIATES, INC.

PROJECT MANAGERS - ENGINEERS - CONSTRUCTION MANAGERS

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600 CARONDELET STREET
NEW ORLEANS, LOUISIANA
70130-3587

May 11, 1992

State of New Mexico Environment Department (NMED)
1190 St. Francis Drive
Santa Fe, New Mexico 87502

Attention: Mr. John Pfeil

L-20

Re: 5362.54
Holloman AFB
Status of Sites SS-17 and SD-47
Our File No. 5362.54-10.11

Dear Mr. Pfeil:

I am in receipt of your letter of March 25, 1992 responding to clarification of the New Mexico Underground Storage Tank (UST) regulations. Thank you for your timely response.

A major issue addressed in your letter was whether or not groundwater at Holloman AFB (other than the removal of floating product atop groundwater) is required to be remediated. Based upon the April 28, 1992 meeting at Holloman AFB in which NMED and Holloman AFB representatives were in attendence, it is my understanding that groundwater (other than the removal of floating product) will not have to be remediated at Holloman AFB. Ms. Kathleen M. Sisneros, the Director of the Water and Waste Management Division of NMED, with whom you suggested a letter be written requesting exemption from groundwater cleanup, was present at the meeting. She agreed that cleanup would not be required. With the knowledge that groundwater will not have to be remediated, we are anticipating to begin soil remediation at Site SS-17, the BX Service Station, as soon as possible.

As stated in your March 25, 1992 letter under #3, "In the event that groundwater remediation is not required at the site (i.e., groundwater is greater than 10,000 mg/L TDS) and remediation of highly contaminated soil is the yardstick for cleaning up the site, some site-specific, agreed-upon standard for highly contaminated soil can be developed in concert with UST Bureau personnel."

A proposed approach in arriving at an agreeable clean-up standard for soil is as follows. We will be performing a soil gas survey of Site SS-17 during the next few months. In addition to the soil gas survey, soil borings in which soil samples are collected for analyses will be drilled. The intent of this work is to define the horizontal and vertical limits requiring remediation.

State of New Mexico Environment
Attention: Mr. John Pfeil

The results of the soil gas survey and soil analyses and locations of sampling will be forwarded to you. The areas (and depths) recommended for remediation by Holloman AFB and its contractors will be noted. These areas will be selected based upon hydrocarbon concentrations detected by the soil gas survey and soil analyses of boring samples. A clean-up level (i.e., not highly contaminated) to be used by field personnel will be recommended. Any comments you may have on this approach would be appreciated. Once a quantitative clean-up value is selected, remedial design can proceed.

As stated in your March 25, 1992 letter, Site SD-47, the POL Washrack Area, is now under the direction of the Hazardous and Radioactive Materials Bureau of the NMED. All correspondence regarding this site will be addressed to that office.

Should you have any questions or comments, please do not hesitate to contact me or Sharon Moore at (505) 479-5878.

Very truly yours,

Roger Wilkson
Remedial Project Manager

RFV/vb

L-3/L-269/W-56

END OF APPENDIX E

APPENDIX F

SURVEY RESULTS

BURKE & ASSOCIATES, P.C.

Consulting Engineers
Surveyors

June 25, 1991

Mr. Ray Vachon
Walk, Haydel & Associates, Inc.
600 Carondelet St.
New Orleans, Louisiana 70130-3587

RE: Agreement WH 5362-C-006

Dear Mr. Vachon,

Please find enclosed a copy of the site plan for Site 17 with the new borings shown, a copy of the field notes and a coordinate listing of the new borings.

If you have any questions please do not hesitate to call.

Sincerely,

BURKE & ASSOCIATES, P.C.

Klad Z

By: Klad Zimmerle
KZ/brs

Enclosures

1909 CUBA AVENUE, SUITE #5 ALAMOGORDO, NEW MEXICO 88310 (505) 437-7074

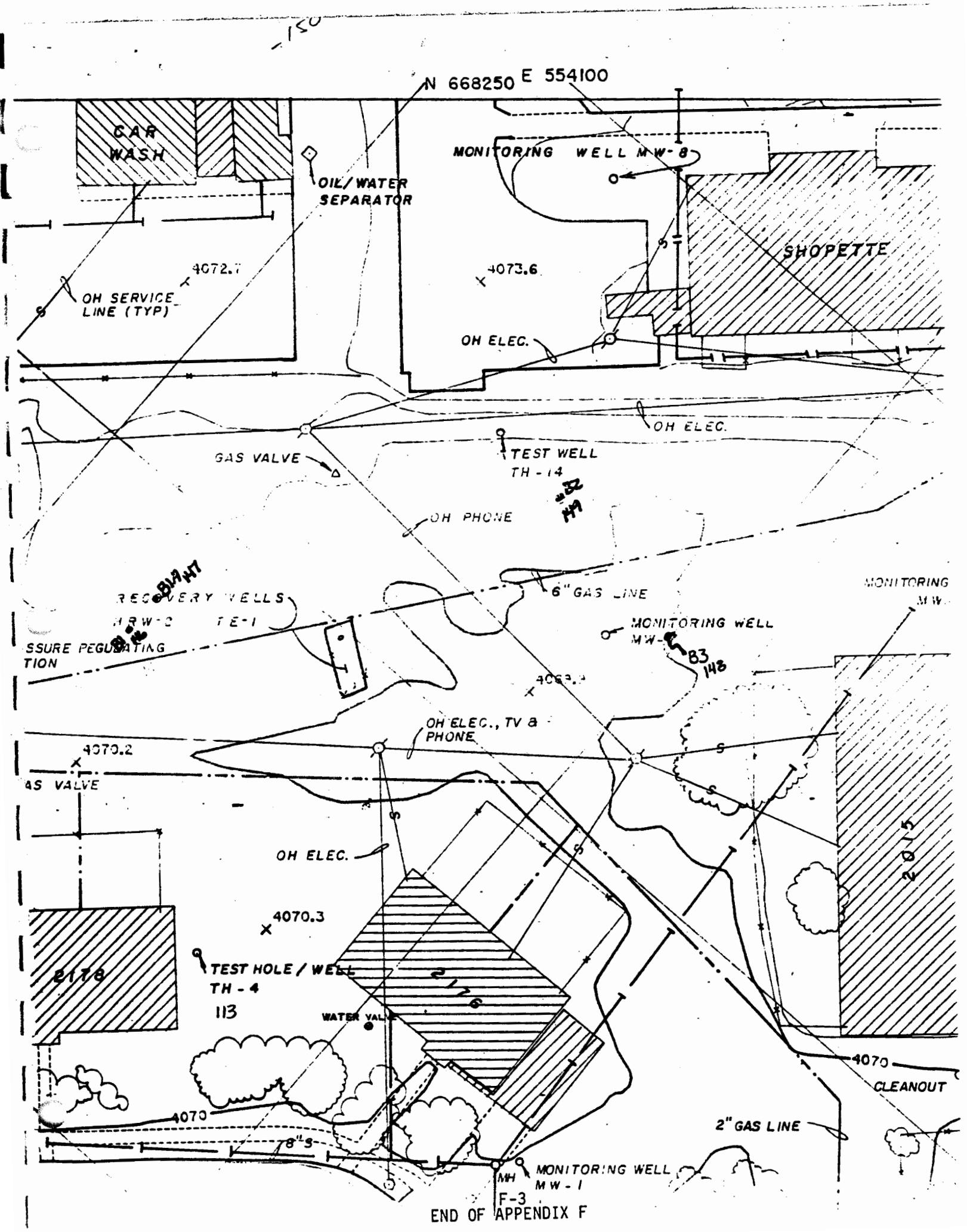
IST COORDINATES (146-149)

POINT	146	N	668211.9404,	E	553914.2295,	Z	4070.8000
POINT	147	N	668212.1133,	E	553924.6713,	Z	4070.8000
POINT	148	N	668101.4984,	E	554004.1517,	Z	4070.1000
POINT	149	N	668147.9040,	E	554017.3135,	Z	4070.6000

STA	BS	HI	FS	RR	Elev.
Top Casing TH-14	6.17	78.11			4071.94
B3				8.0	4070.1
B2				7.5	4070.6
B1A				7.3	4070.8
B1				7.3	4070.8
TBM			6.17		71.94

π 110 (TH-14) BS 144 (MW-6)

FS	H∠	H Dist	Remarks
146	349°25'46"	110.01	B1
147	351°41'45"	100.43	B1A
148	248°06'47"	71.40	B3
149	236°27'00"	23.90	B2



END OF APPENDIX F

APPENDIX G

COST CALCULATIONS

BY JCF DATE 9/24/91 SUBJECT SHEET NO. 1 of 62
CHKD. BY DATE JOB NO. 5362.54

OUTLINE

I. INTRODUCTION
   A. REFERENCES
   B. ASSUMPTIONS
II. ALTERNATIVE 2, LIMITED ACTION
III. ALTERNATIVE 3, EXCAVATION
IV. ALTERNATIVE 4, SOIL VENTING
V. ALTERNATIVE 5, SOIL FLUSHING
VI. PRESENT WORTH CALCULATIONS
VII. SUMMARY OF COSTS

BY: JANE C. FORTIER

CHECKED BY: MOLLY McGRAW
& JERRY HYMEL

BY JCF DATE 9/24/91 SUBJECT SHEET NO. 2 of 62
CHKD. BY DATE JOB NO. 5332.54

I. INTRODUCTION

A. REFERENCES

- COST ESTIMATES FOR THIS CAP WERE CALCULATED USING THE FOLLOWING REFERENCES:

  ~~1 TESORO FAX, 9/19/91~~
  ~~2 GROUNDWATER TECHNOLOGY FEE SCHEDULE (CALIF.)~~
  3 PROFESSIONAL JUDGMENT BASED ON WALK, HAYDEL EXPERIENCE
  4 BX SERVICE STATION UST REMOVAL COST ESTIMATE, WALK, HAYDEL (9/91)
  5 PSI PROPOSAL, CAP FIELD WORK
  6 EIRA FEE SCHEDULE
  7 PSI PROPOSAL, BERGSTROM AFB
  8 REMEDIAL ACTION COSTING PROCEDURES MANUAL (RACPM)

- THROUGHOUT THE ESTIMATE, THE ABOVE SUPERSCRIPTS ARE REFERENCED.

B. ASSUMPTIONS

- ESTIMATES BASED UPON PERCENTAGES OF DIRECT CAPITAL COSTS ARE IN ACCORDANCE WITH THE RACPM. IN THIS MANUAL, ACCEPTABLE RANGES OF PERCENTAGES ARE GIVEN. IN NEARLY ALL CASES, THE MAXIMUM PERCENTAGE WAS USED.

- A MANAGEMENT FEE OF 5% WAS ADDED TO DIRECT CAPITAL COSTS IN MOST CASES.[3]

- PRESENT WORTH COSTS ARE CALCULATED USING A DISCOUNT RATE OF 10% AS SUGGESTED IN THE RACPM.

- EACH ALTERNATIVE IS BROKEN INTO TASKS. EACH TASK IS COSTED OUT.

- THE NO ACTION ALTERNATIVE (ALTERNATIVE 1) HAS NO RELATED COSTS & WILL NOT BE FURTHER DISCUSSED.

BY GJF DATE 9/24/91 SUBJECT _____ SHEET NO. 3 of 62
CHKD. BY _____ DATE _____ JOB NO. 5362.54

II. ALTERNATIVE 2 - LIMITED ACTION

1. MONITOR SITE WELLS FOR FLOATING PRODUCT FOR 2 QUARTERS
2. PUMP WELLS FREE OF FLOATING PRODUCT AFTER 1st + 2nd QUARTERS
3. CONTINUE MONITORING FOR 8 QUARTERS

WH&A 1029

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE

BY GCF DATE 9/24/91 SUBJECT ALT. 2 SHEET NO. 4 of 62
CHKD. BY MM DATE 8/10/92 JOB NO. 5362.54

TASK ①

MONITOR SITE WELLS FOR FLOATING PRODUCT FOR 2 QUARTERS

DESCRIPTION:

MONITOR AVAILABLE WELLS FOR 2 QUARTERS TO DETERMINE IF FREE PRODUCT IS PRESENT. ASSUME PRODUCT IS PRESENT FOR BOTH QUARTERS. WELLS MONITORED ARE:

MW1 → MW-9

W-2, W-4, TH-3, TH-6, TH-11, 15, 20, 22 + EPT.

BEGIN MONITORING IN MID 1994.

CAPITAL COST

DIRECT

18 WELLS × 1 HR/WELL[3] = 18 HRS ≈ 2¼ DAYS

SAMPLER + EQUIPMENT ~$35/HR[6] × 18 HRS = $630

FOR 2nd QUARTER $630

$1260

5% MAN. FEE[3] 63

TOTAL D.C.C. $1323

INDIRECT

NONE

TOTAL CAPITAL COST $1323

BY JCF DATE 9/24/91 SUBJECT ALT. 2 SHEET NO. 5 of 62
CHKD. BY MJM DATE 8/10/92 JOB NO. 5362.54

TASK (2)

PUMP WELLS FREE OF FLOATING PRODUCT AFTER 1st + 2nd QUARTERS (TASK (1))

DESCRIPTION:

WELLS CAN BE HAND BAILED OR PUMPED FREE OF F.P.

CAPITAL COST

DIRECT

SAMPLER + BAILER (ASSUME ALL WELLS HAVE F.P.)

$\frac{18 \text{ WELLS}}{\text{QUARTER}} \times 2 \text{ QUARTERS} = 36 \text{ WELLS}$

$36 \text{ WELLS} \times \frac{2 \text{ HRS}}{\text{WELL}}$ [3] $= 72 \text{ HRS}$

$72 \text{ HRS} \times \$35/\text{HR}$ [6] $=$ $2520

INDIRECT

CONTINGENCY [8]

(.15) ($2520) $378

TOTAL CAPITAL COST $2898

BY JCF DATE 9/24/91 SUBJECT ALT. 2 SHEET NO. 6 of 62
CHKD. BY MJM DATE 3/10/92 JOB NO. 5362.54

TASK (3)

CONTINUE MONITORING FOR 8 QUARTERS

DESCRIPTION:

MONITOR SAME WELLS AS IN TASK (1) FOR 8 QUARTERS

CAPITAL COST:

$$\frac{\$1323}{2 \text{ QUARTERS}} = \frac{X}{8 \text{ QUARTERS}}$$

$X = \$5292$

BY JCF DATE 10/3/91 SUBJECT SHEET NO. 7 of 62
CHKD. BY DATE JOB NO. 5362.54

III ALTERNATIVE 3 - EXCAVATION

3A - OFF-SITE DISPOSAL	3B - ON-SITE TRMT.
① BORINGS TO DEFINE EXTENT OF H.C. SOILS →	① "
② IN SITU VENTING OF SOILS UNDER SHOPETTE →	② "
③ EXCAVATE H.C. SOILS & OTHER SOILS →	③ "
④ TRANSPORT H.C. SOILS TO NU MEX LANDFILL	④ TRANSPORT H.C. SOILS TO BASE LANDFILL
⑤ DISPOSAL COSTS	⑤ LANDFARMING OPERATION
⑥ BACKFILL "OTHER SOILS" & REPLACEMENT SOIL →	⑥ "

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE
WH&A 1029

BY GCF DATE 7/13/92 SUBJECT ALT. 3 SHEET NO. 8 of 62
CHKD. BY [illegible] DATE 8/10/92 JOB NO. 5362.54

TASK (1)

BORINGS TO DEFINE EXTENT OF HIGHLY CONTAMINATED SOILS.

DESCRIPTION

THE EXTENT OF HIGHLY CONTAMINATED SOIL MUST BE DETERMINED SO AS TO KNOW THE AREA TO BE EXCAVATED. IN THIS CAP, THE AREA IS ASSUMED TO BE WITHIN THE CONTOURS SHOWN ON THE FIGURE ON THE FOLLOWING PAGE. THIS AREA CONSISTS OF THE 5/91 AREA WITHIN THE 0.3' CONTOUR OF IN-SITU MOBILE PRODUCT & ALSO TRENCHES 3, 4 & A PORTION OF TRENCH 2 NORTH OF THE 0.3' CONTOUR. BEFORE EXCAVATION BEGINS, THE AREA SHOULD BE BETTER DEFINED BY FIELD CONFIRMATION. THIS WILL BE ASSUMED TO BE DONE BY DRILLING TEST BORINGS. FOUR BORINGS SHOULD INITIALLY BE DRILLED FOR EACH TRENCH (N, S, E & W OF TRENCH) TO 10' & SOIL SAMPLES COLLECTED & DEFINED AS "H.C." OR "NON H.C.". IT IS RECOMMENDED THAT FOR TRENCHES 1 & 2, 6 BORINGS (INSTEAD OF 4) BE DRILLED DUE TO THE LENGTH OF TRENCHES (SEE NEXT PAGE). IT IS RECOMMENDED THAT BORINGS BE DRILLED WITHIN 10' OF THE TRENCHES. IF H.C. SOILS ARE FOUND, DEPTHS SHOULD BE NOTED & ANOTHER BORING DRILLED AT A FURTHER DISTANCE FROM THE TRENCH UNTIL NO H.C. SOILS ARE ENCOUNTERED. IF NO H.C. SOILS ARE ENCOUNTERED, BORINGS SHOULD BE DRILLED NEARER TRENCHES TO FURTHER LIMIT THE AREA OF H.C. SOILS. FOR COSTING PURPOSES, ESTIMATE 40 BORINGS DRILLED TO 10'.

CAPITAL COSTS

REFER TO MARK UP OF 4/5/91 PSI PROPOSAL FOR WORK @ SS-17 DURING CAP FIELD MODIFICATIONS & 4/17/92 PROPOSAL FOR BREAK-UP OF CONCRETE $33,828

WH&A REPRESENTATIVE

11 d = 110 h x $40/hr[3] = $ 4,400

PER DIEM 11 d x $93/day[3] = $ 1078

AIRFARE + RENT-A-CAR[3] $ 1050

$ 40,306

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE

WH&A 1029

GCF 9/23/91 ALT. 3

5362.54

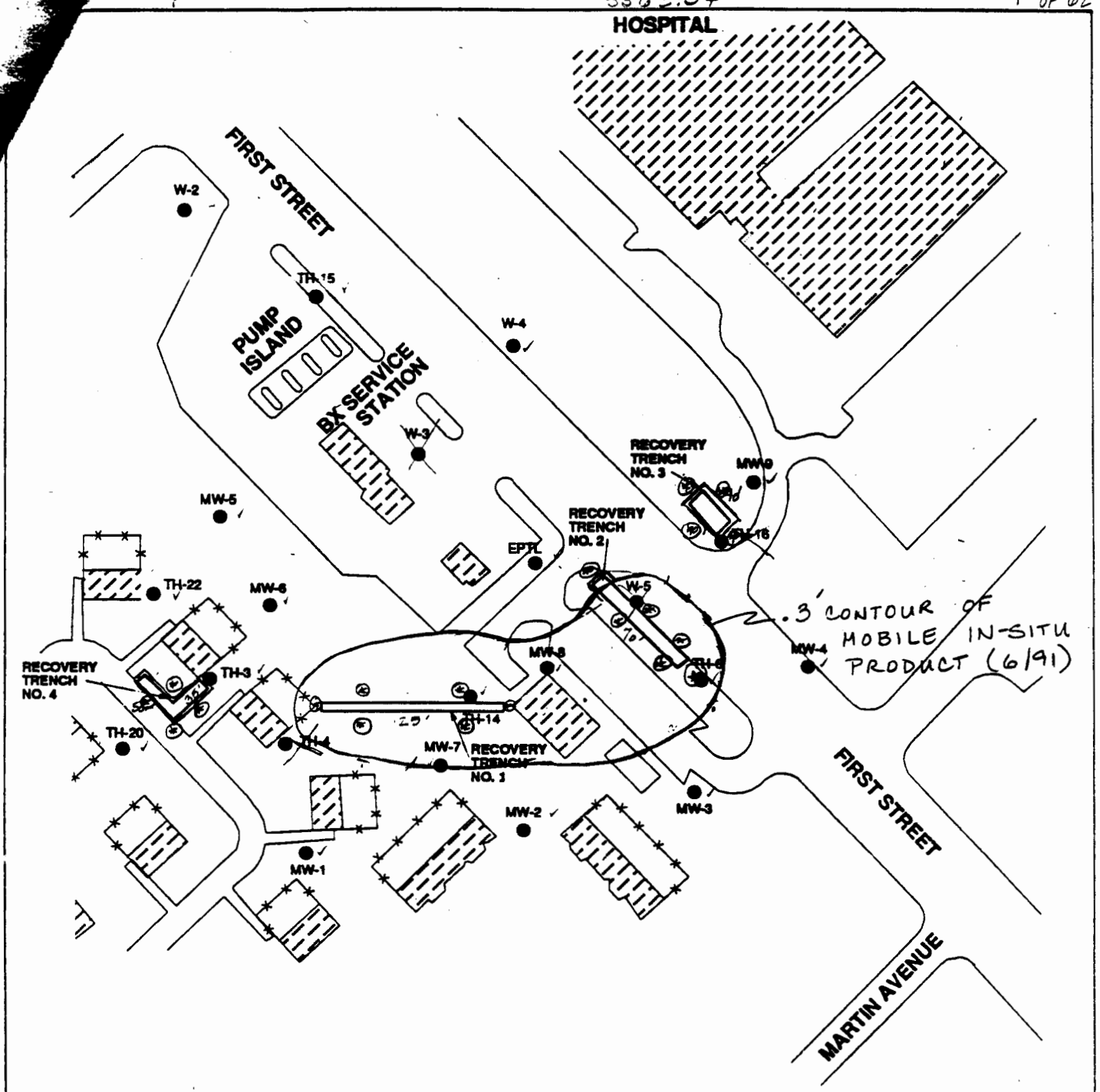


FIGURE 4.2-1 env-119

LEGEND:

● MONITORING WELL

(*) LOCATION OF TEST BORING TO DEFINE EXTENT OF H.C. SOILS

SCALE IN FEET: 1" = 125'

WALK, HAYDEL & ASSOCIATES, INC.

MONITORING WELL LOCATIONS

BX SERVICE STATION
HOLLOMAN AFB, NM

PCE 12-9-91 checked by [illegible]

Professional Service Industries, Inc.
PTL/National Soil Services Division

April 5, 1991
PSI Proposal No. 342-052B

PSI ESTIMATE FOR PERFORMING WORK
AT SITE SS-17, BX SERVICE STATION
HOLLOMAN AIR FORCE BASE, NEW MEXICO

PHASE I

Mobilization/demobilization,	1 @ $ 3,000.00 =	$ 3,000.00
Crew consisting of driller, helper and geologist/geotechnician to pickup passes coordinated by others, access site, take pictures, and set up, estimate 2 hours	2 @ $ 168.00 =	$ 336.00
Drill 3 borings each to a maximum depth of 10' below the ground surface and obtain split-spoon or Shelby tube samples continuously from 3' to 10', estimate 4 hours	4hrs / 3 borings = x hrs / 40 borings; 3x = 160; x ≅ 54 hours; 54 ~~4~~ @ $ 168.00 =	$ ~~672.00~~ 1072
Grout boreholes, estimate 2 hours	27 ~~2~~ @ $ 168.00 =	$ ~~336.00~~ 4536
Move drums to central location, spread cuttings if needed, and site restoration, estimate 2 hours	2hr / 3bor = x / 40bor; 3x = 80; x = 27 HR.; 27 ~~2~~ @ $ 168.00 =	$ ~~336.00~~ 4536

Total of 111 ~~46~~ hours (assume work 6 days per week @ 10 hours per day (111 ~~46~~/10) = 11 ~~5~~ days

Per diem per man-day	11 ~~6~~ @ $ 98.00 =	$ ~~588.00~~ 1078

PID provided by WH&A

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April 5, 1991
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Draeger tubes	~~1~~ 2 @ $ 35.00 =	~~$ 35.00~~ 70
Hot water high pressure washer on trailer, estimate ~~3~~ 11 days	~~3~~ 11 @ $ 100.00 =	~~$ 300.00~~ 1100
Stainless steel split-spoon catcher	~~1 @ $ 72.56 =~~	~~$ 72.56~~
DOT 55 gallon drums, estimate 2 assuming mixing of cuttings from borings $\frac{2}{3b} = \frac{x}{40b}$ $x \approx 27$	~~2~~ 27 @ $ 50.00 =	~~$ 100.00~~ 1350
DOT 55 gallon drums for use by WH&A for monitor well purge water, estimate 10	~~10 @ $ 50.00 =~~	~~$ 500.00~~
Personal protective equipment to include tyveks suits, rubber boots with steel toe & shank, rubber gloves (nitrile), safety glasses, hard hats, full face respirators with twin cartridges (on standby), estimate ~~3~~ 11 man days	~~3~~ 11 @ $ 25.00 =	~~$ 75.00~~ 275
Grout materials for bore holes, estimate $ 30.00 per hole	~~3~~ 40 @ $ 30.00 =	~~$ 90.00~~ 1200

PREPARATION OF REPORTS/SUPERVISION

Project Engineer

3 hours to prepare/review decontamination protocol and prepare input for the Site Safety and Health Plan, and project coordination

27 ~~2~~ hours to review report with boring logs. $\frac{2}{3} = \frac{x}{40}$

Engineer/Geologist

40 ~~3~~ hours to edit logs and prepare report.

20 ~~2~~ hours support of people in the field.

Draftsman

13 ~~1~~ hours to draft boring logs

Professional Service Industries

Walk, Haydel & Associates, Inc.
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Typing
30 ~~8~~ hours for boring logs and reports ~~and input for CDAP and SSHP~~

Project Engineer	30 ~~5~~ @ $ 65.00 =	$ ~~325.00~~	1950
Engineer/Geologist	60 5 @ $ 40.00 =	$ ~~200.00~~	2400
Draftsman	13 ~~1~~ @ $ 28.00 =	$ ~~28.00~~	364
Typing	80 ~~8~~ @ $ 20.00 =	$ ~~120.00~~	1600
Telephone, estimate ~~3~~ 11 calls	11 ~~3~~ @ $ 7.50 =	$ ~~22.50~~	83
Pictures	10 ~~1~~ @ $ 25.00 =	$ ~~25.00~~	250
		$ ~~720.50~~	6647
Report preparation/supervision, estimate 1	1 @ $ ~~720.50~~ 6647 =	$ ~~720.50~~ 6647	
	TOTAL =	$7,~~161.06~~	
		$ 33,200	

Professional Service Industries, Inc.

April 17, 1992

Mr. Ray Vachon
Walk, Haydel & Associates, Inc.
600 Carondelet Street
New Orleans, Louisiana 70130

Re: Coring Asphaltic Concrete and
Portland Cement Concrete Pavements
Bergstrom Air Force Base

Dear Mr. Vachon:

As we discussed, Professional Service Industries, Inc. (PSI) would be pleased to provide pavement coring services. The work would be performed on a unit price basis and the unit rates are shown below:

Technician for coring, hole plugging, standby, etc. portal to portal from our Austin, Texas office	$ 26.00/hour
Generator and core drill	$ 150.00/day
Bit charge for 4" diameter bit	$ 4.00/inch depth
Bit charge for 6" diameter bit	$ 6.00/inch depth
Concrete or asphalt cold patch to fill holes	$ 3.00/hole

The above unit rates are applicable for work performed Monday through Friday between 8:00 a.m. and 5:00 p.m. An overtime multiplier of 1.5 is applicable to work performed outside of the time outlined above, over 8 hours per day and on Saturdays, Sundays and holidays. We have assumed that base permits, utility clearance, etc. would be obtained and/or provided by WH&A.

It is understood that hazardous materials are not anticipated at the coring locations within the core depths. As a result, OSHA hazardous materials training is not required for this work.

For your planning purposes, we have typically found that we can core through a 4 to 6 inch thick pavement in approximately 30 minutes after the equipment is set up on each

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location. The time to set up depends on the distance between holes, access, etc. and could be as little as 10 minutes or in excess of ½ hour per hole.

If you have any questions please contact me.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Koi Z. Woodson, P. E.
Vice President

KZW/tc

cc: PSI - Austin
Attention: Mr. John Flores

FROM ABOVE ESTIMATE, ASSUMING 10 OF THE 40 BORINGS MUST BE DRILLED THROUGH CONCRETE,

$ 26/hr
$ 150/day
4" ϕ BIT $ 4/in depth (ASSUME 6") = $ 24/HOLE
$ 3/hole

10 HOLES x ~ 45 min/hole = 450 min ≅ 8 hrs.

$ 26/hr x 8 hr = $208
$ 150/day x 1 day = $150
$ 24/hole x 10 hole = $240
$ 3/hole x 10 hole = $30
$628

BY CCF DATE 7/20/92 SUBJECT ALT. 3 SHEET NO. 10 of 62
CHKD. BY DJH DATE 8/10/92 JOB NO. 5362.54

CONTINGENCY @ (.20)($40,306) $ 8061

$ 48,367

BY JCF DATE 10/3/91 SUBJECT ALT. 3 SHEET NO. 11 of 62
CHKD. BY DJF DATE 7/16/92 JOB NO. 5332.54

TASK (2)

IN SITU VENTING OF SOILS UNDER SHOPETTE

DESCRIPTION:

SOIL VENTING WILL BE USED TO REMOVE HYDROCARBON VAPORS FROM BENEATH THE SHOPETTE. GROUNDWATER WILL BE DEPRESSED BY TRENCHES 1 + 2 & VENTING WELLS INSTALLED. DESIGN OF THE NUMBER & PLACEMENT OF WELLS WILL DEPEND UPON THE VAPOR FLOW, K. OFTEN THIS PARAMETER IS ESTIMATED USING A HYDRAULIC CONDUCTIVITY VALUE MEASURED FROM GW WELL PUMP TESTS. HOWEVER, PROPERTIES OF THE WATER SATURATED ZONE ARE OFTEN DIFFERENT FROM THOSE OF THE VADOSE ZONE. VADOSE ZONE AIR PUMP TESTS, WHICH ARE THE VAPOR FLOW EQUIVALENT OF GW PUMP TESTS, ARE THE MOST PRACTICAL METHOD OF DETERMINING K. AIR WILL BE INJECTED ON THE WEST SIDE OF THE SHOPETTE & COLLECTED ON THE EAST SIDE. (SEE NEXT PG.)

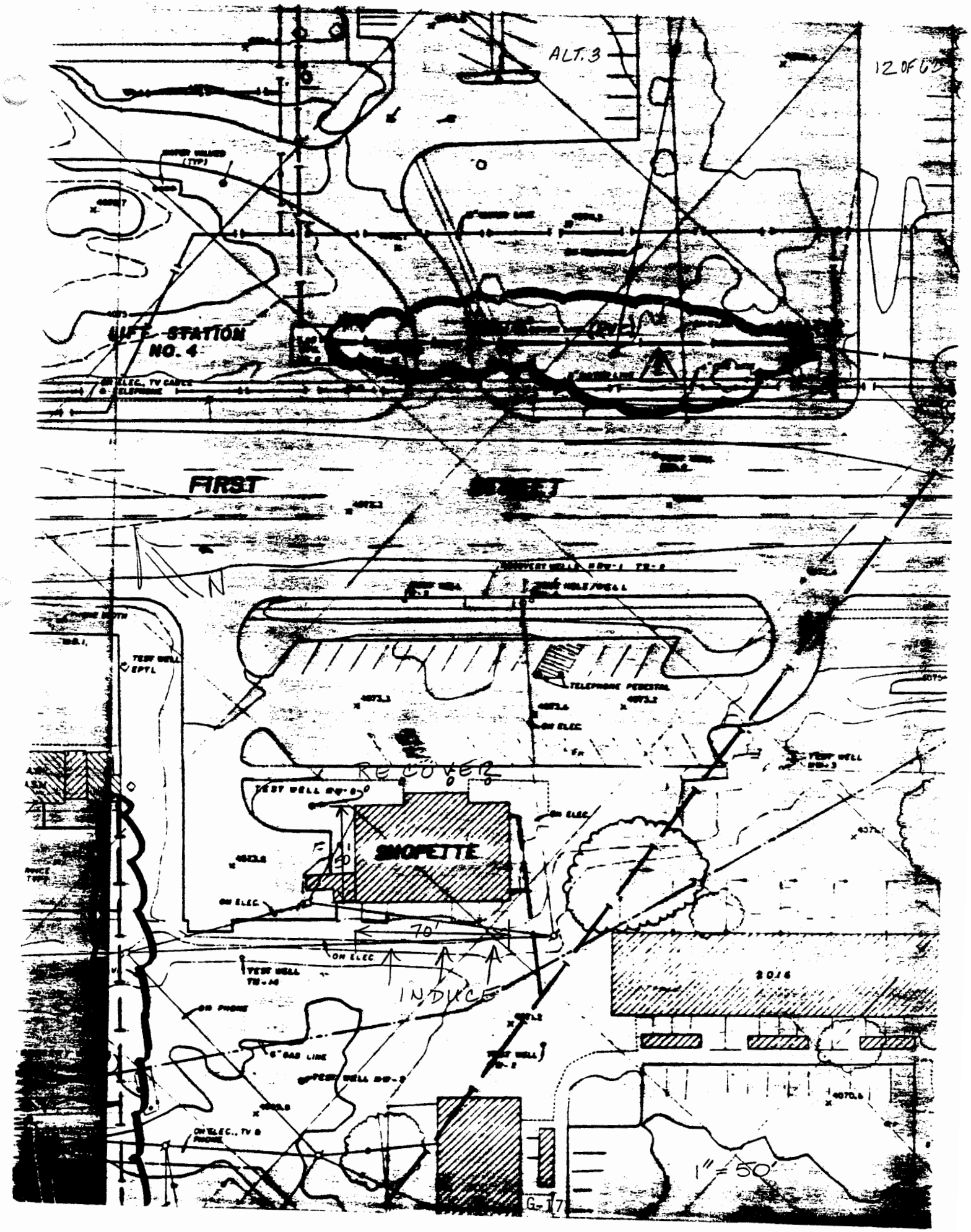
CAPITAL COSTS:

FROM THE HAZARDOUS WASTE CONSULTANT, PG. 1-10, MAY/JUNE 1988, FOR A SITE 130' x 130' (16,900 FT²), FOR 1,000 GAL. OF FUEL SPILLED WITH CONTAMINATION EXTENDING 10' BELOW THE SURFACE + NO OFF-GAS TREATMENT NECESSARY, COSTS ASSOCIATED WITH A TYPICAL SOIL VENTING SYSTEM ARE:

COSTS ASSOCIATED WITH A TYPICAL SOIL VENTING SYSTEM

Soil vapor survey	$ 5,000
Engineering	10,000
Risk assessment for air discharge permit	5,000
Construction (including all materials, inspection, and startup)	27,600
Operating costs (including periodic monitoring, soil and water sampling)	23,000
Total cost	$70,600

Source: R.E. Hinchee et al.


ALT. 3
12 OF 65
LIFT STATION
NO. 4
FIRST
N
TEST WELL
EPTL
TELEPHONE PEDESTAL
ON ELEC.
RECOVER
TEST WELL
SHOPETTE
70'
INDUCE
2016
1" = 50'

BY JCF DATE 10/3/91 SUBJECT ALT. 3 SHEET NO. 13 of 62
CHKD. BY DAF DATE 7/16/91 JOB NO. 5362.51

THE AREA TO BE VENTED AT SS-17 WILL BE ASSUMED TO BE THE SAME AS THE EXAMPLE. THEREFORE, COST IS ESTIMATED TO BE $ 70,600 (IN 1988)
ASSUME 10% MORE COST FOR 1991 DOLLARS.

$ 70,600 x 1.1 = $ 77,660

ADD COST FOR CARBON ADSORPTION CANISTERS TO TREAT RECOVERED VAPORS:

CARBITROL, MODEL SVX, 105 scfm FLOW, FOR 2 MONTHS, $ 1540/MO x 2 = $3080 (PEDERSEN + CURTIS, 1991, pg. 111)

$77,660 + $3080 = $80,740

WH&A 1029

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE

BY JCF DATE 9/23/91 SUBJECT ALT. 3 SHEET NO. 14 of 62
CHKD. BY MM DATE 8/10/92 JOB NO. 5362.54

TASK (3)

EXCAVATE H.C. & OTHER SOILS

DESCRIPTION:

ONCE THE EXTENT OF H.C. SOILS IS DETERMINED IN TASK (1), CAN BEGIN EXCAVATION. FOR THIS ESTIMATE IT IS ASSUMED THAT H.C. SOILS EXIST AS DESCRIBED IN TASK (3) OF ALTERNATIVE 4. CALCULATIONS WHICH FOLLOW ESTIMATE THE FOLLOWING:

7897 CY OF H.C. SOIL
7920 CY OF OTHER SOIL

NOTE, THAT ASSUMED PLUME OF H.C. SOILS INCLUDES THE SHOPETTE BUILDING. EXCAVATION CANNOT TAKE PLACE UNDER THE SHOPETTE WITHOUT DISTURBING THE STRUCTURAL INTEGRITY OF THE BUILDING. WILL INSTITUTE SOIL VENTING SYSTEM TO REMEDIATE SOIL UNDER SHOPETTE. ESTIMATE 90' x 70' WILL BE TREATED BY SOIL VENTING & NOT NEED TO BE EXCAVATED.

∴ 90' x 70' x 5' = 31,500 FT³ = 1167 CY LESS OF H.C. & OTHER SOIL TO BE EXCAVATED.

∴ TOTAL TO BE EXCAVATED:

H.C. SOILS 7897 − 1167 = 6730 CY ≅ 6750 CY
OTHER SOIL 7920 − 1167 = 6753 CY ≅ 6750 CY

CAPITAL COSTS:

DIRECT

• BREAK UP SURFACE, ~ 7656 SF

CREW OF 1-FRONT END LOADER WITH OPERATOR, 2 LABORERS + JACKHAMMER WITH AIR COMPRESSOR

7656 SF / 70 SF/HR ≅ 109 HRS

EQUIPMENT 109 HRS x 55.00/HR.[4] = $ 5995
LABOR 109 HRS x 48.50/HR.[4] = $ 5287

• LOAD + DISPOSE OF RUBBLE
CREW OF 1-FRONT END LOADER WITH OPER.
WILL LOAD INTO TRUCKS + BRING TO SITE 1, 2.5 MI. AWAY

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NEW ORLEANS MOBILE BATON ROUGE

BY CCF DATE 7/23/91 SUBJECT ALT. 3 SHEET NO. 15 of 62
CHKD. BY MJM DATE 8/10/92 JOB NO. [illegible]

7656 SF / 90 SF/HR[4] ≅ 85 HR.

EQUIPMENT 85 HR × 62.00/HR[4] = $5270

LABOR 85 HR × 36.68/HR[4] = $3118

- EXCAVATE
  CREW OF 1-BACKHOE WITH OPERATOR + 3-LABORERS WILL EXCAVATE SOIL. LINED TRUCKS ON-SITE FOR H.C. SOILS WHICH WILL BE TRANSPORTED EITHER TO SITE 1 OR OFF-BASE.
  (675.0 × 2) CY / 17 CY/HR[4] = 794 HRS.

  EQUIPMENT 794 HR × 25.00/HR[4] = $19,850

  LABOR 794 HR × 35.42/HR[4] = $27,941

SUBTOTAL $67,461

5% MANAGEMENT FEE[3] $3,373

TOTAL D.C.C. $70,834

INDIRECT

ENGINEERING
15% OF TOTAL D.C.C.[8]
(.15) ($70,834) $10,625

SUBTOTAL I.C.C. $10,625

CONTINGENCY
25% OF TOTAL D.C.C + SUBTOTAL I.C.C.[8]
(.25) (70,834 + 10,625) $20,365

MOB./DEMOB.
20% OF TOTAL D.C.C. + SUBTOTAL I.C.C.[8]
(.20) (70,834 + 10,625) $16,292

TOTAL I.C.C. $47,282

TOTAL CAPITAL COST (DIRECT + INDIRECT) $118,116

BY J.L.F DATE 9/17/91 SUBJECT ALT. 3 SHEET NO. 16 of 62
CHKD. BY MLM DATE 8/10/92 JOB NO. 5362.54

CALCULATIONS TO DETERMINE VOLUME OF H.C. SOILS

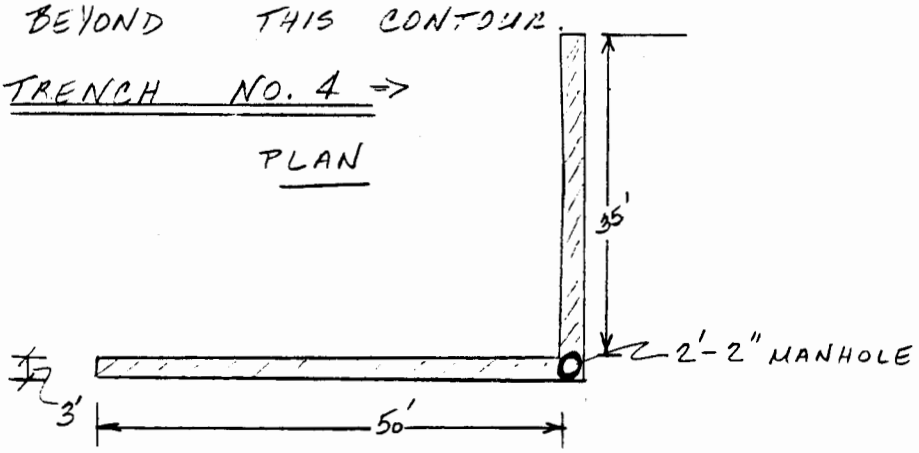
AFTER TRENCH OPERATIONS CEASE, "HIGHLY CONTAMINATED" SOIL MUST BE REMOVED. ASSUME:

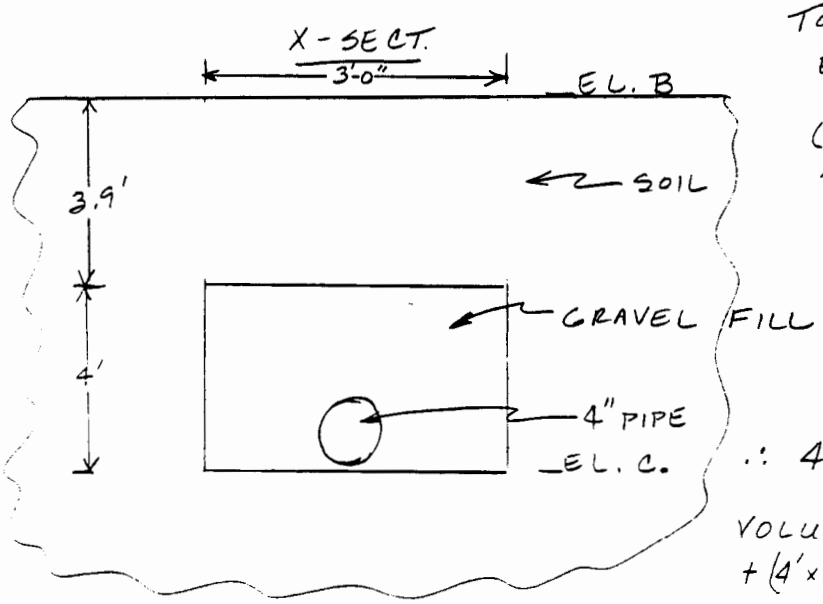
1. ACTUAL TRENCHES EXCAVATED
2. ALL SOIL WITHIN 0.3' CONTOUR MUST BE EXCAVATED. (CONSERVATIVE.)

1 & 2 WILL BE ASSUMED TO BE "HIGHLY CONTAMINATED" SOIL. BEFORE EXCAVATION, TEST BORINGS OUTSIDE OF THIS CONTOUR SHOULD BE MADE TO DETERMINE IF "HIGHLY CONTAMINATED" SOIL EXTENDS BEYOND THIS CONTOUR.

TRENCH NO. 4 =>

PLAN





TO BE EXCAVATED =>

EL. B - EL. C =

4070.0 - 4062.11 = 7.9'
(FROM AS-BUILT AF 932-10-01, 2/15/91)

~3.9' IS SOIL & 4' IS GRAVEL TRENCH FILL

WILL ASSUME THAT ALL GRAVEL WILL BE "HIGHLY CONTAMINATED".

$\therefore 4' \times 3' - \left[\pi \left(\frac{2''}{12''/'}\right)^2\right] = 11.9 \text{ FT.}^2$

VOLUME $= 11.9 \text{ FT}^2 \times (50' - 3.5') + (4' \times 3')\, 3' - \pi \left(\frac{13''}{12''/'}\right)^2 (4') = 40.36 \text{ FT}^3 \cong 3.3 \text{ CY}$

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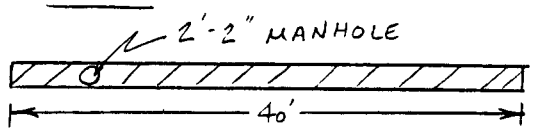
OTHER SOIL (ATOP) = $3.9' \times 3' \times (50' - 55') + 3.9' \times 3' \times 3' - \pi \left(\frac{13''}{12''/'}\right)^2 (3.9') = 1015\ FT^3 \cong 38\ CY$

SUMMARY OF TRENCH NO. 4 =>

TOTAL TO BE EXCAVATED = 38 + 38 = 76 CY
VOLUME OF "HIGHLY CONT." = 38 CY
VOLUME OF OTHER SOIL = 38 CY

TRENCH NO. 3 =>

PLAN



X-SECT

4' GRAVEL TRENCH FILL
EL. B - EL. C = 4073.8 - 4063.72 = 9.88'
ASSUME ALL GRAVEL IS HIGHLY CONTAMINATED

$4' \times 3' \times 40' - \pi \left(\frac{13''}{12''/'}\right)^2 (4') = 465\ FT^3 \cong 17\ CY$

OTHER SOIL (ATOP) = $(9.88 - 4)' \times 3' \times 40' - \pi \left(\frac{13''}{12''/'}\right)^2 (5.9') = 684\ FT^3 \cong 25\ CY$

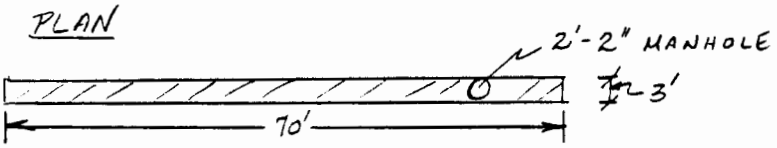
SUMMARY OF TRENCH NO. 3 =>

TOTAL TO BE EXCAVATED = 17 + 25 = 42 CY
VOLUME OF "HIGHLY CONT." = 17 CY
VOLUME OF OTHER SOIL = 25 CY

BY GCF DATE 4/17/91 SUBJECT ALT. 3 SHEET NO. 18 of 62
CHKD. BY MJM DATE 3/10/92 JOB NO. 5362.54

TRENCH NO. 2 ⇒

PLAN



X-SECT.

6' GRAVEL TRENCH FILL

EL. B − EL. C = 4072.6 − 4060.51 = 12.1'

ASSUME ALL GRAVEL IS HIGHLY CONTAMINATED

$6' \times 3' \times 70' - \pi \left(\frac{13''}{12''/'}\right)^2 (6') = 1238 \text{ FT}^3 \cong 46 \text{ CY}$

OTHER SOIL (ATOP) $= (12.1' - 6')(3')(70') - \pi \left(\frac{13}{12}\right)^2 (6.1')$

$= 1259 \text{ FT}^3 \cong 47 \text{ CY}$

SUMMARY OF TRENCH NO. 2 ⇒

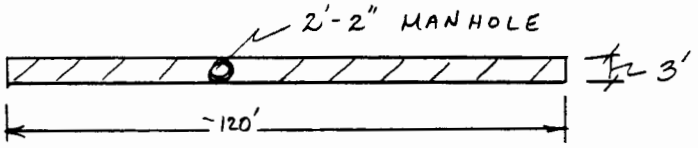
TOTAL TO BE EXCAVATED = 46 + 47 = 93 CY

VOLUME OF "HIGHLY CONT." = 46 CY

VOLUME OF OTHER SOIL = 47 CY

TRENCH NO. 1 ⇒

PLAN



X-SECT.

4' GRAVEL TRENCH FILL

EL. B − EL. C = 4070.5 − 4061.46 = 9.04'

ASSUME ALL GRAVEL IS HIGHLY CONTAMINATED.

$4' \times 3' \times 120' - \pi \left(\frac{13''}{12''/'}\right)^2 (4') = 1425 \text{ FT}^3 \cong 53 \text{ CY}$

OTHER SOIL (ATOP) $= (9.04' - 4')(3')(120') - \pi \left(\frac{13''}{12''/'}\right)^2 (5.04')$

$= 1796 \text{ FT}^3 \cong 67 \text{ CY}$

SUMMARY OF TRENCH NO. 1 ⇒

TOTAL TO BE EXCAVATED = 53 + 67 = 120 CY

VOLUME OF "HIGHLY CONT." = 53 CY

VOLUME OF OTHER SOIL = 67 CY

BY JCF DATE 3/17/91 SUBJECT ALT. 3 SHEET NO. 19 of 62
CHKD. BY MLH DATE 8/10/92 JOB NO. 5362.54

REFERRING TO THE FIGURE ON THE NEXT PAGE, THE AREA WITHIN THE 0.3' CONTOUR CAN BE ESTIMATED TO BE THE LARGE RECTANGLE MINUS AREAS ① → ⑦

$$\therefore (375')(175') - \overset{①}{[(187.5')(62.5')]} - \overset{②}{[\tfrac{1}{2}(87.5')(62.5')]} - \overset{③}{[\tfrac{1}{2}(62.5')^2]}$$

$$- \overset{④}{[\tfrac{1}{2}(21.9')(15.6')]} - \overset{⑤}{[\tfrac{1}{2}(200')(43.8')]} - \overset{⑥}{[\tfrac{1}{2}(75')(43.3')]}$$

$$- \overset{⑦}{[\tfrac{1}{2}(37.5')(34.4')]} = 65,625 - \overset{①}{(11,719)} - \overset{②}{(2,734)} - \overset{③}{(1953)}$$

$$- \overset{④}{(171)} - \overset{⑤}{(4380)} - \overset{⑥}{(1643)} - \overset{⑦}{(615)}$$

$$= 42,380 \text{ FT}^2$$

ALSO, SUBTRACT AREA OF TRENCH NOS. 1 + 2

$\therefore$ $42,380 \text{ FT}^2 - (120' \times 3') - (70' \times 3') = 41,810 \text{ FT}^2$

WILL CONSERVATIVELY ASSUME THAT HIGHLY CONTAMINATED SOIL EXISTS IN GROUNDWATER TABLE FLUCTUATION RANGE, 5' TO 10' BELOW GROUND SURFACE.

$\therefore$ VOLUME OF H.C. SOIL $= 41,810 \text{ FT}^2 (5') = 209,050 \text{ FT}^3 = 7743 \text{ CY}$

MUST EXCAVATE 5' OF OTHER SOIL IN ORDER TO GET TO HIGHLY CONTAMINATED SOIL.

$\therefore$ VOLUME OF OTHER SOIL $= 41,810 \text{ FT}^2 (5') = 209,050 \text{ FT}^3 = 7743 \text{ CY}$

VOLUME WITHIN 0.3' CONTOUR => (CY)

		TRENCH 1	TRENCH 2
H.C. SOILS	7743 CY	53	46
OTHER SOILS	7743 CY	67	47

VOLUME OF TRENCHES

	3	4
H.C. SOILS	17	32
OTHER SOILS	25	32

TOTAL H.C. SOILS = 7897 CY

OTHER SOILS = 7920 CY

WH&A 1029

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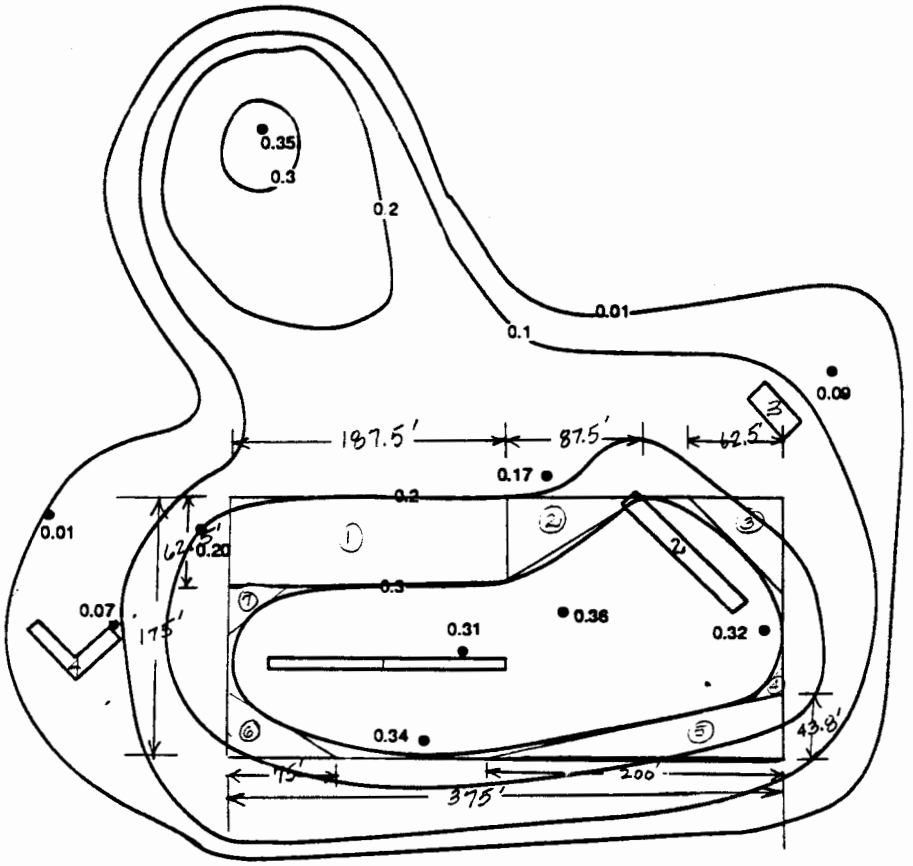
NEW ORLEANS MOBILE BATON ROUGE

ALT. 3



June 1991 di

env-276

created by:

Gerry Tyrrell

IN-SITU MOBILE PRODUCT THICKNESS CONTOUR (IN FEET)

1" = 25'

BY JLF DATE 9/17/91 SUBJECT ALT. 3 SHEET NO. 21 of 60
CHKD. BY MJM DATE 8/10/92 JOB NO. 5332.51

WITH THE EXCAVATION ALTERNATIVE,

MUST EXCAVATE TOTAL OF 15,817 CY;
OF THIS 15,817 CY, 7897 CY MAY BE HIGHLY CONTAMINATED.

& 7920 CY IS LIKELY NOT HIGHLY CONTAMINATED.

BY JCF DATE 9/23/91 SUBJECT ALTERNATIVE 3A SHEET NO. 22 of 62
CHKD. BY MLM DATE 9/10/91 JOB NO. 5362.51

TASK (A)

TRANSPORT OF H.C. SOILS TO NU MEX LANDFILL

DESCRIPTION:

6750 CY OF H.C. SOILS WILL BE PLACED INTO LINED TRUCKS & TRANSPORTED TO NU MEX LANDFILL[4] ~150 MI. AWAY FROM HOLLOMAN.

CAPITAL COST

DIRECT

6750 CY × 1.3 FLUFF FACTOR[3] = 8775 CY

USING 20 CY TRUCKS @ 6 HR/ROUNDTRIP + .7 HRS/EA. LOAD[4] = 2940 HRS

TRUCKS	2940 HR × $60[4]/HR =	$176,400
DRIVERS	2940 HR. × 18.27[4]/HR =	$53,714
	SUBTOTAL D.C.C.	$230,114
	5% MANAGEMENT FEE[3]	$11,506
	TOTAL D.C.C.	$241,620

INDIRECT

MOB./DEMOB. (DEMURRAGE)[8]

20% OF TOTAL D.C.C.

(.20) ($241,620) $48,324

CONTINGENCY[8]

25% OF TOTAL D.C.C.

(.25) ($241,620) $60,405

TOTAL I.C.C. $108,729

TOTAL CAPITAL COST (DIRECT + INDIRECT) $350,349

BY JCF DATE 9/24/91 SUBJECT ALTERNATIVE 3A SHEET NO. 23 of 62
CHKD. BY MM DATE 8/20/92 JOB NO. 5362.54

TASK (5)

DISPOSAL OF H.C. SOILS

DESCRIPTION:

DISPOSAL AT NM MEX LANDFILL

CAPITAL COST

DIRECT

TCLP TEST[4] $ 1433

6750 CY × 1.3 FLUFF = 8775 CY × $6/CY[4] $ 52,650

INDIRECT

NONE

TOTAL CAPITAL COST = $ 54,083

BY GOF DATE 10/4/91 SUBJECT ALTERNATIVE 33 SHEET NO. 24 of 62
CHKD. BY MM DATE 2/10/92 JOB NO. 5366.54

TASK (4)

TRANSPORT H.C. SOILS TO BASE LANDFILL

DESCRIPTION:

H.C. SOILS WILL BE TRANSPORTED IN LINED TRUCKS TO MAIN BASE LANDFILL WHERE A LANDFARMING OPERATION WILL BE ESTABLISHED. SOILS EXCAVATED ARE TO BE PLACED DIRECTLY INTO LINED TRUCKS.

CAPITAL COSTS:

DIRECT

6750 CY x 1.3 FLUFF[3] = 8775 CY

~ 2.5 MI. FROM SS-17 TO MAIN BASE LANDFILL

8775 CY ÷ 20 CY/TRUCK ≅ 439 TRUCKS

ASSUME 20 MI/HR + .5 HR DUMP + 1 HR DEMURRAGE

$\frac{5 \text{ MI}}{20 \text{ MI/HR}}$ = .25 HR

TOTAL ROUND TRIP = .25 + .5 + 1 = 1.75 HRS.

439 TRUCKS x 1.75 HRS = 768 HRS.

TRUCKS, $60.00/HR[4] x 768 HRS. = $46,080

TRUCK DRIVER, $18.27/HR[4] x 768 HRS. = $14,031

SUBTOTAL D.C.C = $60,111

5% MAN. FEE = $3,006

TOTAL D.C.C = $63,117

INDIRECT

MOB. / DEMOB.

20% OF TOTAL D.C.C.[8]

.20 ($63,117) $12,623

CONTINGENCY

25% ($63,117)[8] $15,779

TOTAL I.C.C. $28,402

TOTAL CAPITAL COSTS (TOTAL D.C.C. + I.C.C) = $91,519

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE
WH&A 1029

BY JCF DATE 12/2/91 SUBJECT SHEET NO. 25 of 62
CHKD. BY DATE 12/4/91 JOB NO. 5362.54

ALTERNATIVE 3B

TASK (5)

LAND FARM OPERATION (SET-UP + TREATMENT)

DESCRIPTION:

H.C. SOILS (6750 CY x 1.3 FLUFF = 8775 CY) SPREAD IN 6" LIFTS + TILLED. BASED UPON INFO SUPPLIED BY SHARON MOORE OF HAFB, HAVE 2 ~ 50'x70' LINED + BERMED AREAS. ASSUME HAVE TO SET UP NEW AREAS TO BE OPERATED BY CONTRACTOR.

IF SPREAD IN ONE 6" LIFT (APPROXIMATELY),

8775 CY = 236,925 FT^3

$$\frac{236,925\ FT^3}{.5\ FT} = 473,850\ FT^2 = 688' \times 688'$$

ASSUME NO SOIL IS STOCKPILED. COST TO SET UP STOCKPILE AREA IS PROHIBITIVE SINCE IT ALSO MUST BE LINED + BERMED.

ASSUME TILL ONCE EVERY 2 WEEKS FOR 3 MO.
ASSUME 2 DAYS OF TILLING PER CYCLE.

GEOMEMBRANE LINER SCENARIO

CAPITAL COSTS:

DIRECT

- BERM 688' x 688' AREA, ASSUME 12 DAYS[3]
  - F.E. LOADER 8 h/d x 12 d x \$30.22/HR[1] — \$2880
  - LABOR 8 h/d x 12 d x \$18.76/HR[4] — \$1801
- 688' x 688' SHEETING + SEAMING
  - \$.90/SF + 20d TO SEAM @ \$600/DAY — \$438,010
  - (MPC CONTAINMENT SYSTEMS, 1-800-621-0146, DENNIS O'BRAIN)
- 6' OF SAND LAID ATOP GEOMEMBRANE LINER
- 6" OF GRAVEL LAID ATOP SAND
  - ASSUME SAND CAN COME FROM BASE BORROW PIT
  - GRAVEL, FROM TOM BLANKENSHIP OR TOMMY J. GRAVEL + TOPSOIL, LA LUZ, (505) 437-5[illegible]
    - \$6.25/CY x 8766 CY — \$54,788
    - (INCLUDES TRANSPORTATION)
- LABOR + EQUIPMENT TO SPREAD SAND + GRAVEL

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BY JCF DATE 12/2/91 SUBJECT SHEET NO. 26 of 62
CHKD. BY DATE 12/4/91 JOB NO. 5362.54

ALTERNATIVE 3B

DOZER (8766 x 2) CY / 20CY/HR = 877 HR
877 HR x $25.00/HR[4] (USING BACKHOE COST) $21,925
OPERATOR, 877 HR x $20.68/HR[4] $18,136

• SPREAD H.C. SOILS TO 6" LIFT
8766 CY / 20CY/HR = 438 HR
DOZER, 438 HR x $25.00/HR[4] (USING BACKHOE COST) $10,950
OPERATOR, 438 HR x $20.68/HR[4] $9,057

• TILLER, $60.00/HR x 13 DAYS x 8 HR/DAY $6240
• OPERATOR, $18.27/HR x 13 DAYS x 8 HR/DAY $1900

• ASSUME 4 TPH SAMPLES PER 2 WK.
∴ 4 TPH x 7 EVENTS (OVER 3 MO) = 28
28 SAMPLES x $140.6/SAMPLE $3920

SUBTOTAL D.C.C. $569,608
5% MAN. FEE[3] $28,480
TOTAL D.C.C. $598,088

INDIRECT
ENGINEERING (TREATABILITY STUDY), ASSUME[3] $25,000
ENGINEERING (REVIEW OF ANALYTICAL DATA)[3] $10,000
$35,000

CONTINGENCY
25% OF TOTAL D.C.C. + SUBTOTAL I.C.C.[8]
(.25) ($598,088 + $35,000) $158,272

LICENSE/PERMIT COSTS
ASSUME 5% OF TOTAL D.C.C.
(.05) ($598,088) $29,904

MOB./DEMOB.
20% OF TOTAL D.C.C. + SUBTOTAL I.C.C.[8]
(.20) ($598,088 + $35,000) $126,618

TOTAL I.C.C. $349,794

TOTAL CAPITAL COSTS $947,882

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ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE

WH&A 1029

BY JCF DATE 12/2/91 SUBJECT SHEET NO. 26A of 62
CHKD. BY DJF DATE 12/4/91 JOB NO. 5352.54

ALTERNATIVE 3B

CLAY LINER SCENARIO

CAPITAL COSTS:

DIRECT

- BERM 688' x 688' AREA, ASSUME 12 DAYS[3]
  - F.E. LOADER $ 2880
  - LABOR $ 1801
- 1' OF CLAY WITH PERMEABILITY $<10^{-7}$ cm/sec. FROM TOM BLANKENSHIP OR TOMMI J. GRAVEL + TOP SOIL, LA LUZ, (505) 437-5989, $ 4.50/CY x 8766 CY x 2 $ 78,894
  (INCLUDES TRANSPORTATION)
- LABOR + EQUIPMENT TO SPREAD CLAY; SHOULD BE PLACED IN 6" LIFTS + PERMEABILITY TESTS EACH LIFT.
  - BACKHOE $ 21,925
  - OPERATOR $ 12,136
  - PERM TESTS, ~$100/TEST x 1 TEST/400SF = 1184 SAMPLES x 2 LIFTS = 2368 SAMPLES x $100/SAMPLE $ 236,800
- SPREAD H.C. SOILS TO 6" LIFT
  8766 CY / 20CY / HR = 438 HR.
  - BACKHOE, $ 10,950
  - OPERATOR, $ 9,058
- TILLER $ 6240
- OPERATOR $ 1900
- TPH SAMPLES $ 3920

SUBTOTAL D.C.C. $ 392,504
5% MAN. FEE[3] $ 19,625
TOTAL D.C.C. $ 412,129

INDIRECT

ENGINEERING (TREATABILITY STUDY), ASSUME[3] $ 25,000
ENGINEERING (REVIEW OF ANALYTICAL DATA[3] $ 10,000
$ 35,000

CONTINGENCY
25% OF TOTAL D.C.C. + SUBTOTAL I.C.C.
(.25) ($412,129 + 35,000) $ 111,782

BY QCF DATE 12/2/91 SUBJECT
CHKD. BY DATE 12/4/91

SHEET NO. 26B (OF 26B) of 62
JOB NO. 5362.54

ALTERNATIVE 3B

LICENSE / PERMIT COSTS
ASSUME 5% OF TOTAL D.C.C.
(.05) ($412,129) $ 20,606

MOB. / DEMOB.
20% OF TOTAL D.C.C. + SUBTOTAL I.C.C.
(.20) ($412,129 + 35,000) $ 89,426

TOTAL I.C.C. $ 256,814

TOTAL CAPITAL COSTS $ 668,943

- EVALUATING BOTH THE GEOTEXTILE + CLAY LINER SCENARIOS, THE CLAY LINER SCENARIO IS LESS EXPENSIVE + ITS COST WILL BE INCLUDED FOR TASK (5) OF ALTERNATIVE 3B.

BY QCF DATE 9/24/91 SUBJECT ALT. 3 SHEET NO. 27 of 62
CHKD. BY MJA DATE 9/10/92 JOB NO. 5362.51

TASK (6)

BACKFILL OTHER SOILS & REPLACEMENT SOIL

DESCRIPTION

"OTHER SOILS" & REPLACEMENT SOIL (TO REPLACE H.C. SOILS TREATED OR DISPOSED) ARE BACKFILLED INTO EXCAVATED AREAS. REPLACEMENT SOIL CAN BE TAKEN FROM BASE BORROW PIT.

CAPITAL COST

DIRECT

BACKFILL 6750 CY × 1.3 FLUFF[3] OF "OTHER SOIL"

AQUIRE & BACKFILL 6750 × 1.3 CY OF REPLACEMENT SOIL

CREW OF 1-FRONT END LOADER WITH OPERATOR WILL BACKFILL.

[(6750)(1.3) + (6750)(1.3)] / 17CY/HR[4] ≈ 1032HR.

EQUIPMENT 1032HR × 30$/HR[4] = $30,960

LABOR 1032HR × 12$/HR[4] = $12,360

TRANSPORT OF REPLACEMENT SOIL FROM BORROW PIT ~ 2.5 MI AWAY

TOTAL CYCLE TIME[4] = 45 MIN

6750 × 1.3 CY / 20CY/TRUCK[3] = 437 TRUCK LOADS

437 TRUCKLOADS × 45MIN/LOAD = 19,755 MIN ≈ 330 HRS

EQUIPMENT (20CY TRUCK) 330HR × 60$/HR[4] = $19,800

LABOR 330HR × 18$/HR[4] = $6034

SUBTOTAL D.C.C. $76,149

5% MANAGEMENT FEE[3] $3,807

TOTAL D.C.C. $79,956

INDIRECT

MOB./DEMOB (DEMURRAGE)[8]

20% TOTAL D.C.C.

(.20)($79,956) $15,991

CONTINGENCY

.25 ($79,956)[8] $19,989

TOTAL I.C.C. $35,980

TOTAL CAPITAL COST (DIRECT + INDIRECT) $115,936

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WALK, HAYDEL & ASSOCIATES, INC.
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NEW ORLEANS MOBILE BATON ROUGE

BY SCF DATE 7/9/92 SUBJECT SHEET NO. 28 of 62
CHKD. BY DATE JOB NO. 5362.54

II ALTERNATIVE 4- SOIL VENTING

1. BORINGS TO DEFINE EXTENT OF H.C. SOILS (SOME ANALYSES)
2. FIELD VAPOR PERMEABILITY TEST (PILOT TEST)
3. ENGINEERING DESIGN OF VENTING SYSTEM
4. INSTALLATION & OPERATION OF SYSTEM
5. DRILL CONFIRMATION BORINGS

BY GCF DATE 7/9/92 SUBJECT ALT. 4 SHEET NO. 23A of 62
CHKD. BY DJ DATE 8/10/92 JOB NO. 5362.54

TASK ①

BORINGS TO DEFINE EXTENT OF HIGHLY CONTAMINATED SOILS.

DESCRIPTION:

SEE ALT. 3, TASK ①

TOTAL CAPITAL COST = $ 48,367 (SEE PG. 10 OF CALCS)

ADD ENUMERATION STUDIES & SOIL GAS (CO_2 + O_2)

SAMPLING COST:

FROM GW TECH INC, POPULATION ENUMERATION FOR VOLATILE HYDROCARBON UTILIZERS, $75.00/EA (1993), ASSUME $125

ASSUME $125 FOR O_2 & CO_2

ASSUME 10 SAMPLES

∴ 10 × $ 250 = $ 2500

∴ $ 48,367 + $ 2500 = $ 50,867

BY CCF DATE 7/13/92 SUBJECT ALT. 4 SHEET NO. 29 of 62
CHKD. BY RJL DATE 7/16/92 JOB NO. 5362.51

TASK (2)

FIELD VAPOR PERMEABILITY TEST

DESCRIPTION:

DRILL 5 WELLS & 1 TRENCH. 2 WELLS WILL MEASURE INFLUENCE OF AN EXTRACTION WELL & 2 OTHER WELLS WILL MEASURE INFLUENCE OF TRENCH. THE 5TH WELL IS THE EXTRACTION WELL. TEST TIME ALLOTTED IS 1 MONTH.

CAPITAL COST:

DIRECT

ENVIRONMENTAL RESTORATIONS PILOT VENTING SYSTEM (713) 496-2323

1 MO. RENTAL (DAVE CUMMINGS)	$1600
FREIGHT (ALLOW)	$300
KNOCK OUT POT	$100
DRILL 5 BORINGS TO 10' BELOW GROUND (NO SAMPLING)	
8 HR[3] x $168/HR[5]	$1344
SET 2" ϕ WELL	
5 WELLS x 3 HR/WELL[7] x $168/HR[5]	$2520
MATERIALS[7] ~$400/WELL x 5 WELL	$2000
EXCAVATE & SET TRENCH	
2 HR[3] x $168/HR[3]	$336
MATERIALS[3]	$400
FIELD ENGINEER	
24 DAYS x 10 HR/DAY x $40/HR[3]	$9600
PER DIEM, $98/DAY x 24 DAYS	$2352
1 CARBON CANISTER 1 MO x $1540/MO. (PEDERSEN + CURTIS, PG. 111)	$1540
SAMPLING[3] (ALLOW)	$1500
SUBTOTAL D.C.C.	$23,592
5% MAN. FEE	$1,180
TOTAL D.C.C.	$24,772

BY CLF DATE 7/13/92 SUBJECT ALT. 4 SHEET NO. 29A of 62
CHKD. BY [illegible] DATE 7/16/92 JOB NO. 5302.51

INDIRECT

MOB./DEMOB.

20% OF TOTAL D.C.C.

(.20) ($ 24,772) $ 4954

CONTINGENCY

25% OF TOTAL D.C.C.

(.25) ($ 24,772) $ 6,193

TOTAL I.C.C. $ 11,147

TOTAL CAPITAL COST (D.C.C. + I.C.C.) $ 35,919

BY JCF DATE 10/10/91 SUBJECT ALT. 4 SHEET NO. 30 of 62
CHKD. BY MJM DATE 8/10/92 JOB NO. 5362.54

TASK (3)

ENGINEERING DESIGN OF VENTING SYSTEM

DESCRIPTION:

AFTER INFORMATION IS GATHERED FROM FIELD VAPOR PERMEABILITY TEST, DESIGN OF VENTING SYSTEM CAN BE PERFORMED BY ENGINEERING FIRM.

CAPITAL COST

DIRECT

NONE

INDIRECT

ACCORDING TO MAY/JUNE 1988 EDITION OF THE HAZARDOUS WASTE CONSULTANT, SOIL VENTING SYSTEM FOR A 130' x 130', 1000 GAL. FUEL SPILL WITH CONTAMINANTS EXTENDING 10' BELOW THE SURFACE + NO OFF-GAS TREATMENT WAS ESTIMATED TO BE

COSTS ASSOCIATED WITH
A TYPICAL SOIL VENTING SYSTEM

Soil vapor survey	$ 5,000
Engineering	10,000
Risk assessment for air discharge permit	5,000
Construction (including all materials, inspection, and startup)	27,600
Operating costs (including periodic monitoring, soil and water sampling)	23,000
Total cost	$70,600

Source: R.E. Hinchee et al.

ENGINEERING CONSISTED OF $10,000

THE AREA ASSUMED TO BE REMEDIATED (FIG 7-1) IS ~ 42,380 FT^2 + TRENCH 3 + 4.

ALLOW 90' x 53' TO BE TREATED AT TRENCH 3 + 100' x 22' AT TRENCH 4.

∴ TOTAL AREA = 42,380 + 4770 + 8800 = 55,950 FT^2

BY JCF DATE 10/9/91 SUBJECT ALT. 4 SHEET NO. 31 of 62
CHKD. BY MM DATE 11/10/92 JOB NO. 5362.54

55,950 FT² ÷ (130' x 130') = 3.3

∴ ASSUME 3.3 ($10,000) + 10% (INFLATION) FOR ENGINEERING COST. = $36,300

BY GJF DATE 10/9/91 SUBJECT ALT. 4 SHEET NO. 32 of 62
CHKD. BY [illegible] DATE 1/16/92 JOB NO. 5362.54

TASK (4)

INSTALLATION + OPERATION OF SYSTEM

DESCRIPTION:

ENGINEERING DESIGN WILL DETERMINE THE NUMBER OF WELLS, LOCATION, DEPTH, NUMBER OF PUMPS, PUMP SIZES, ETC. UNTIL DESIGN IS MADE, COST ESTIMATE IS VERY ROUGH.

CAPITAL COST

FROM TASK (2), RISK ASSESSMENT FOR AIR DISCHARGE, CONSTRUCTION (INCLUDING ALL MATERIALS, INSPECTION + STARTUP) & OPERATING COSTS (INCLUDING PERIODIC MONITORING, SOIL + WATER SAMPLING) IS $55,600. IF THIS IS FOR A 130'x130' AREA & THE AREA TO BE REMEDIATED AT SS-17 IS ~ 3.3 TIMES AS LARGE,

~ COST IS $55,600 (3.3) + 10% (INFLATION) = $201,828

REFER TO P6. 11

ASSUME $\frac{32,600}{55,600}$ ($201,828) IS CONST. = $118,338

$\frac{23,000}{55,600}$ ($201,828) IS OPER. = $83,490

ADDITIONAL COSTS FOR CAP (IF REQUIRED), TREATMENT (CARBON ADSORPTION) OF RECOVERED VAPORS + ADDITIONAL WELLS (IF REQUIRED) TO LOWER GROUNDWATER TABLE.

CAP (SURFACE SEAL) ⇒ FROM PEDERSEN + CURTIS, P6. 105,
2" ASPHALT LAYER = $9.24 / YD²
ASSUME 41,810 FT² TO BE PAVED

∴ 41,810 FT² $\frac{(YD)^2}{(3\ FT)^2}$ = 1,549 YD² P6. 19 OF CALCS

$9.24/YD² × 1,549 YD² = $14,313

CARBON ADSORPTION ⇒ FROM PEDERSEN & CURTIS, P6. 111,
CARBITROL, SYX MODEL, 105 SCFM, $1540/MO.
ASSUME 4 CANISTERS FOR 6 MO.
4 X 6 MO X $1540/MO = $36,960

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ENGINEERS
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BY JCF DATE 7/9/92 SUBJECT ALT. 4 SHEET NO. 32A of 62
CHKD. BY DJS DATE 7/16/92 JOB NO. 5362.54

ADDITIONAL WELLS TO LOWER GW TABLE

ASSUME 4 EXTRA WELLS.

INSTALLATION, ASSUME $3000 (PEDERSON & CURTIS, PG. 104)

MATERIALS, PVC, 2", $3/FT x 30' = $90
SCREEN, 2", $4/FT x 10' = $40
SAND, GRAVEL, $20/CF x .65 = $13
$\pi(\frac{1}{12})^2(30') = .65$ CF
(PEDERSON & CURTIS, PG. 106)

CONTINGENCY = $100

$243

∴ 4 WELLS x $3243/WELL = $12,972

∴ TOTAL COST = $201,828 + $14,313 + $36,960 + $12,972
= $266,073

OF $266,073, ASSUME 118,338 + 14,313 + 36,960 + 12,972
= $182,583 IS FOR CONST.

$266,073 − $182,583 = $83,490 IS FOR OPER.

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NEW ORLEANS MOBILE BATON ROUGE

BY JCF DATE 9/23/91 SUBJECT ALT. 4 SHEET NO. 33 of 62
CHKD. BY [illegible] DATE 8/10/92 JOB NO. 5362.54

TASK (5)

DRILL CONFIRMATION BORINGS

DESCRIPTION:

AFTER GW FROM TRENCHES SHOWS A DECREASE IN BTEX & TPH LEVELS THOUGHT TO BE INDICATIVE OF REDUCING H.C. SOILS TO NON H.C. SOILS, BORINGS SHOULD BE DRILLED IN AREAS DEFINED TO CONTAIN H.C. SOILS PRIOR TO REMEDIATION & CONFIRMED AS NOT H.C. WILL ASSUME THAT 12 BORINGS TO 10' ARE DRILLED.

CAPITAL COST:

REFER TO ALT. 3, TASK (1)

PSI $\left(\frac{40\ bor}{\$33,828} = \frac{12\ bor}{x}\right)$ $10,148

WH+A $\left(\frac{40\ bor}{\$6478} = \frac{12\ bor}{x}\right)$ $1,943

$12,091

(.20 x $12,091) = CONTINGENCY @ $2418

TOTAL COST $14,509

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BY GCF DATE 10/9/91 SUBJECT SHEET NO. 34 of 62
CHKD. BY DATE JOB NO. 5362.54

V. ALTERNATIVE 5 - SOIL FLUSHING

1. BORINGS TO DEFINE EXTENT OF H.C. SOILS
2. PILOT & LAB STUDY
3. ENGINEERING DESIGN OF INFILTRATION GALLERY + WELLS
4. INSTALLATION + OPERATION OF SYSTEM
5. CONFIRMATION BORINGS

BY JCF DATE 7/9/92 SUBJECT ALT. 5 SHEET NO. 34A of 62 (OF 34A)
CHKD. BY [illegible] DATE 8/10/92 JOB NO. 5362.54

TASK ①

BORINGS TO DEFINE EXTENT OF HIGHLY CONTAMINATED SOILS.

DESCRIPTION:

SEE ALT. 3, TASK ①

TOTAL CAPITAL COST = $ 48,367 (SEE PG. 10 OF CALCS)

BY JCF DATE 9/24/91 SUBJECT ALT. 5 SHEET NO. 35 of 62
CHKD. BY MJM DATE 3/10/92 JOB NO. 5362.54
ΔCHKD. BY [illegible] 2/12/92

TASK (2)

PILOT + LAB STUDY

DESCRIPTION:

LABORATORY TESTS WOULD BE VERY BENEFICIAL TO DETERMINE THE AMOUNT OF SURFACTANT + WHAT TYPE OF SURFACTANT WOULD PROVE THE MOST EFFECTIVE IN FLUSHING "HIGHLY CONTAMINATED" SOILS TO A STATE WHICH WOULD DEEM THEM NOT "H.C." ALSO, PERFORM PILOT TEST WITH ONE WELL + TEST SURROUNDING SOILS TO DETERMINE TIME NEEDED FOR WASHING + EFFECTIVENESS

CAPITAL COST

DIRECT

SOIL SAMPLES WOULD NEED TO BE COLLECTED.

ASSUME 1 BACKHOE + OPER. FOR 1 DAY[3]

BACKHOE 8 HR × $25.00/HR[4] = $ 200

OPERATOR 8 HR × $20.62/HR[4] = $ 165

MOB./DEMOB., DECON 4 HR[3] × $45.62/HR[4] $ 183

TRANSPORT & DRUM OF SOIL[3] $ 200

SURFACTANT (TYPE & QUANTITY) STUDY[3] $ 10,000 Δ

DRILL 1 BORING TO 10

~ 1 HR × $ 168 / HR[5] $ 168

SET WELL

3 HR/WELL × $168/HR[7] $ 504

PUMP WATER + SURFACTANT FOR

~ 2 WKS INTO WELL[3]

EQUIPMENT + MATERIALS[3] $ 2000

FIELD ENG.

120 HR. × $ 40/HR[3] $ 4800

PER DIEM, $ 98/DAY × 10 DAY[3] $ 980

CONFIRMATION BORING NEXT TO WELL $ 168

SUBTOTAL D.C.C. $17360

5% MAN. FEE[3] $ 968

TOTAL D.C.C. $ 20,336 Δ

INDIRECT

MOB./DEMOB (20% TOTAL D.C.C.)

.20 ($ 20,336) $ 4067

CONTINGENCY (25% TOTAL D.C.C.)

(.25) ($ 20,336) $ 5084

TOTAL I.C.C. $ 9151 Δ

TOTAL CAPITAL COST = $ 29,487

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BY JCF DATE 10/9/91 SUBJECT ALT. 5 SHEET NO. 36 of 62
CHKD. BY [illegible] DATE 8/12/92 JOB NO. 5362.54

TASK (3)

ENGINEERING DESIGN OF INFILTRATION GALLERY + WELLS

DESCRIPTION:

LOCATION, SIZE, DEPTH + NUMBER OF PIPES TO BE INCORPORATED INTO AN INFILTRATION GALLERY MUST BE DESIGNED. ALSO, SPACING OF WELLS AROUND SHOPETTE & NEAR 1ST STREET WOULD NEED TO BE DESIGNED. DESIGN CAN BE MADE ONCE TASK (1) & (2) IS COMPLETE.

CAPITAL COST

DESIGN WOULD BE MORE COMPLEX THAN SOIL VENTING SYSTEM DUE TO REQUIREMENT THAT ALL INTRODUCED WATER BE RECAPTURED.

ASSUMED $36,300 FOR DESIGN OF ALT. 4.

ALLOW $50,000 FOR DESIGN OF ALT. 5

(REFER TO THE HAZARDOUS WASTE CONSULTANT, MAY/JUNE 1988)

ALLOW FOR GROUND WATER INJECTION PERMIT - $10,000

TOTAL : $60,000

BY JCF DATE 10/9/91 SUBJECT ALT. 5 SHEET NO. 37 of 62
CHKD. BY [illegible] DATE 7/15/92 JOB NO. 5362.54

TASK (4)

INSTALLATION + OPERATION OF SYSTEM

DESCRIPTION:

WATER WITH SURFACTANTS IS INJECTED IN WELLS SCREENED IN THE VADOSE ZONE + DISTRIBUTED THROUGH INFILTRATION GALLERY TO PERCOLATE INTO SOIL. RATE OF INJECTION + DISTRIBUTION DETERMINED IN TASK (2). ALLOW 6 MO. FOR OPERATION (NOT NECESSARILY CONSECUTIVE MONTHS)

CAPITAL COST

DIRECT

HAVE ~7900 CY OF H.C. SOILS (REFER TO TASK 3 OF ALT. 3). ASSUMING POROSITY OF 10% (LAB RESULT BY EL PASO TESTING LABORATORIES, 1981, AS REPORTED IN PHASE II REPORT), HAVE (.10)(7900 CY) ≅ 790 CY OF VOLUME FOR WATER

$$790\ CY\left(\frac{27\ FT^3}{CY}\right)\left(\frac{7.481\ gal.}{FT^3}\right) = 159,570\ gal.$$

ASSUME 4 FLUSHES OVER 6 MO.

4 (159,570 gal) = 638,280 gal.

5¢/gal[4] × 638,280 gal — $31,914

ASSUME 4 PUMPS FOR INJECTION

4 EA. × $4000[3]/EA — $16,000

4 TANKS (FOR SURFACTANT) × $800[3]/EA. — $3,200

SURFACTANT, ASSUME[3] — $3,000

ANALYSIS OF GW FOR BETX; ASSUME 2 PER WK FOR 6 MO. ∴ 52 TESTS

52 TESTS × $107[4]/TEST — $5564

ASSUME INSTALLATION OF 4 WELLS NEAR TRENCH 2[3] + 24[3] AROUND SHOPETE

DRILL 28 WELLS × 1 HR/WELL × $168/HR[5] — $4704

SET 28 WELLS

3 HR/WELL × 28 WELLS × $163/HR[7] — $14,112

INFILTRATION GALLERY

HAVE ~41,210 FT² OF AREA TO REMEDIATE (SEE TASK 3 OF ALT. 3)

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BY JCF DATE 10/9/91 SUBJECT ALT. 5 SHEET NO. 38 of 62
CHKD. BY [illegible] DATE 8/12/92 JOB NO. 5362.54

ASSUME 2" PIPE FOR EVERY 5'

$\sqrt{41,810\ FT^2} \cong 204' \times 204'$

204' ÷ 5' = 41, ∴ 41 2" PIPE OF LENGTH 205'

204' × 41 = 8364 LF

10' OF SLOTTED PVC = $40[3]

8364 LF ÷ 10' ≅ 836

836 × $40 — $ 33,456

EXCAVATION OF 2' OVER 41,810 FT²
TO INSTALL INFILTRATION GALLERY

41,810 FT² × 2' = 83,620 FT³ = 3097 CY

CREW OF 1 BACKHOE WITH OPERATOR + 3 LABORERS WILL EXCAVATE SOIL.

3097 CY / 17 CY/HR[4] = 182 HR.

EQUIPMENT 182 HR × $25/HR[4] — $ 4550

LABOR 182 HR × $35[2]/HR — $ 6405

BACKFILL SOIL (ASSUME SAME COST AS TO EXCAVATE) $4550 + 6405 = — $ 10,955

BREAK CONCRETE PRIOR TO EXCAVATING (SEE TASK ③ UNDER ALT. 3)

$5995 + 5287 — $ 11,282

LOAD + DISPOSE OF RUBBLE (SEE TASK ③ UNDER ALT. 3)

$5270 + 3118 — $ 8388

PRETREAT RECOVERED H_2O BEFORE SENDING TO WWTP. USE AIR STRIPPER, 26 WK × $750/WK — $ 19,500

ENV. RESTORATION, MOD. 2631, SUBTOTAL D.C.C. $ 173,030

DAVE CUMMINGS (713) 496-2323 5% MAN. FEE[3] $ 8,652

TOTAL D.C.C. $ 181,682

BY GCF DATE 10/9/91 SUBJECT ALT. 5 SHEET NO. 39 of 62
CHKD. BY [illegible] DATE 8/12/92 JOB NO. 5362.52

INDIRECT

ENGINEERING (OPERATION)

15% OF TOTAL D.C.C.[3]

(.15) ($181,682) $27,252

SUBTOTAL I.C.C. $27,252

MOB./DEMOB

15% OF TOTAL D.C.C. + SUBTOTAL I.C.C.

(.15) ($181,682 + 27,252) $31,340

CONTINGENCY

25% OF TOTAL D.C.C. + SUBTOTAL I.C.C.

(.25) ($181,682 + 27,252) $52,234

TOTAL I.C.C. $110,826

TOTAL CAPITAL COST (DIRECT + INDIRECT) = $292,503

ASSUME WATER COSTS (31,914) + ENG. (27,252) = OPERATION COST
= 59,166

BY JCF DATE 9/24/91 SUBJECT ALT. 5 SHEET NO. 40 of 62
CHKD. BY [illegible] DATE 8/10/92 JOB NO. 5362.54

TASK 5

CONFIRMATION BORINGS

DESCRIPTION:

REFER TO TASK 5 OF ALT. 4

CAPITAL COSTS

$ 14,509

BY JCF DATE 9/25/91 SUBJECT SHEET NO. 41 of 62
CHKD. BY DATE JOB NO. 5353.54

VI PRESENT WORTH CALCULATIONS

WH&A 1029

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE

ALTERNATIVE 2 TASK 1

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 1992	92	93	94	95	96										
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs				1323												
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)				1323												
4. Discount Factors Annual Discount Rate = 10%	1.00	.909	.826	.751	.683	.621										
5. Present Worth (Product of Lines 3 and 4)				994												

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ~~($1000)~~
4. Discount Factor Annual Discount Rate = __%																
5. Present Worth (Product of Lines 3 and 4)																$994

GCF 10/11/91
WLM 8/10/92

42 OF 62

ALTERNATIVE 2, TASK (2)

(ASSUME 1ST QUARTER MID 74
" 2ND " SEPT. 74)

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 1992 92 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs				2898												
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)				2898												
4. Discount Factors Annual Discount Rate = 10%				.751												
5. Present Worth (Product of Lines 3 and 4)				2176												

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ($1000)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$2176

GCF 10/11/91
MTW 11/10/92

43 OF 62

ALTERNATIVE 2, TASK (3)
(ASSUME 1ST CLEAN QUARTER IN 12/94)
(" 2-5 QUARTERS IN 1995
" 6-8 " " 1996)

8 QUARTERS = $5292
1 QUARTER = $662

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 1992 92 93 94 95 96															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs				662	2648	1986										
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)				662	2648	1986										
4. Discount Factors Annual Discount Rate = 10%				.751	.683	.621										
5. Present Worth (Product of Lines 3 and 4)				497	1809	1233										

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ~~($1000)~~
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$3539

QCF 10/11/91
MLM 8/10/92

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ALTERNATIVE 3 - TASK ①

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 1992 92 93 94 95 96															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs				48,367												
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)				48,367												
4. Discount Factors Annual Discount Rate = 10 %				.751												
5. Present Worth (Product of Lines 3 and 4)				36,324												

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ~~($1000)~~
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																36,324

Checked by [illegible] 3/10/92

CCE 10/11/91

ALTERNATIVE 3, TASK 2

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 1992 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs					80,740											
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)					80,740											
4. Discount Factors Annual Discount Rate = 10 %					.683											
5. Present Worth (Product of Lines 3 and 4)					55,145											

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth (~~$1000~~)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$55,145

QCF 10/11/91 46 OF 62
Checked CJH 7/17/92

ALTERNATIVE 3, TASK (3)

EXCAVATE

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (Thousands of Dollars) 1992 92 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs					118,116											
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)					118,116											
4. Discount Factors Annual Discount Rate = 10 %					.683											
5. Present Worth (Product of Lines 3 and 4)					80,673											

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ($1000)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$80,673

CCF 10/11/91

CK. MLM 2/10/92

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ALTERNATIVE 3A, TASK (4)

DISPOSAL OFF-BASE

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 199: 1: 13 1, 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs					350,349											
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)					350,349											
4. Discount Factors Annual Discount Rate = __ %					.683											
5. Present Worth (Product of Lines 3 and 4)					239,28[illegible]											

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ($~~1000~~)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$239,28[illegible]

CF 10/11/91

CY. MM 8/10/92

48 OF 62

ALTERNATIVE 3A, TASK (5)

DISPOSAL OFF-BASE

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (Thousands of Dollars) 1992 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs					54,083											
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)					54,083											
4. Discount Factors Annual Discount Rate = __ %					.683											
5. Present Worth (Product of Lines 3 and 4)					36,939											

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ($1000)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$36,939

QCF 10/11/91
CK: MM 2/12/92

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ALTERNATIVE 3B, TASK (4)

TRANSPORT TO BASE LANDFILL

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (Thousands of Dollars) 1992 92 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs					91,519											
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)					91,519											
4. Discount Factors Annual Discount Rate = 10 %					.683											
5. Present Worth (Product of Lines 3 and 4)					62,507											

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ($1000)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$62,507

JCF 10/11/91
CK. MLH 8/10/92

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ALTERNATIVE 3B, TASK (5)

LANDFARM (CLAY LINER SCENARIO)

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 1992 93 94 95 96															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs					668,943											
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)					668,943											
4. Discount Factors Annual Discount Rate = 10 %					.683											
5. Present Worth (Product of Lines 3 and 4)					456,888											

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ~~($1000)~~
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$ 456,888

QCF 10/11/91 51 OF 52
Checked 8/12/92

ALTERNATIVE 3, TASK 6

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 1997 92 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs					115,936											
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)					115,936											
4. Discount Factors Annual Discount Rate = __ %					.683											
5. Present Worth (Product of Lines 3 and 4)					79,184											

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth (~~$1000~~)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$79,184

QCF 10/11/91 52 OF 62
CK: MSM 8/10/92

ALTERNATIVE 4, TASK 1

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (Thousands of Dollars) 1992 92 93 94 95 96															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs				59,867												
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)				50,867												
4. Discount Factors Annual Discount Rate = __%				.751												
5. Present Worth (Product of Lines 3 and 4)				38,201												

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth (~~$1000~~)
4. Discount Factor Annual Discount Rate = __%																
5. Present Worth (Product of Lines 3 and 4)																38,201

JCF 7/20/92
Checked by SAH 8/10/92

52A OF 62
(JF52A)

ALTERNATIVE 4, TASK ②

CAN BE DONE NOW

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 1992 92 93 94 95 96															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs	35,919															
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)	35,919															
4. Discount Factors Annual Discount Rate = 10 %	1.00															
5. Present Worth (Product of Lines 3 and 4)	35,919															

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ~~(¢1000)~~
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$35,919

Checked by [illegible] 10/11/91

QF 53 OF 62

ALTERNATIVE 4, TASK (3)
(CAN BE DONE DURING '92)

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 1992 92 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs		36,300														
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)		36,300														
4. Discount Factors Annual Discount Rate = __ %		.909														
5. Present Worth (Product of Lines 3 and 4)		32,997														

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth (~~$1000~~)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$32,917

QF 10/11/91
Checked 2/10/92

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ALTERNATIVE 4, TASK (4)
INSTALLATION + OPERATION

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (Thousands of Dollars) 1992 92 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs		182,583														
2. O&M Costs			41,745	41,745												
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)		182,583	41,745	41,745												
4. Discount Factors Annual Discount Rate = __ %	1.00	.909	.826	.751												
5. Present Worth (Product of Lines 3 and 4)		165,968	34,481	31,350												

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ~~($1000)~~
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$231,799

QCF 10/11/91 55 OF 62
Checked [illegible] 7/17/92

ALTERNATIVE 4, TASK (5)

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (Thousands of Dollars) 1992 93 94 95 96															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs					14,509											
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)					14,509											
4. Discount Factors Annual Discount Rate = 10 %					.683											
5. Present Worth (Product of Lines 3 and 4)					9910											

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ($1000)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																#9910

QCF 10/11/91 56 OF 62
Reviewed by [illegible] 2/10/92

ALTERNATIVE 5 - TASK ①

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (Thousands of Dollars) 1992 93 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs				48,367												
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)				48,367												
4. Discount Factors Annual Discount Rate = __%				.751												
5. Present Worth (Product of Lines 3 and 4)				36,324												

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ($1000)
4. Discount Factor Annual Discount Rate = __%																
5. Present Worth (Product of Lines 3 and 4)																36,324

JGF 7/16/92
Checked DJV 8/10/92

56A OF 62 (OF 56A)

ALTERNATIVE 5, TASK (2)
(COULD BE DONE NOW)

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (Thousands of Dollars) 1992 93 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs	29,487															
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)	29,487															
4. Discount Factors Annual Discount Rate = 10 %	1.00															
5. Present Worth (Product of Lines 3 and 4)	29,487															

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ($1000)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$ 27,487

QCF 10/11/91
Checked RJF 2/5/92

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ALTERNATIVE 5, TASK (3)

(CAN BE DONE DURING '92)

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (Thousands of Dollars) 1992 92															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs		60,000														
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)		60,000														
4. Discount Factors Annual Discount Rate = __ %		.909														
5. Present Worth (Product of Lines 3 and 4)		54,540														

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ($1000)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																$54,540

JCF 10/11/91

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ALTERNATIVE 5, TASK 4

INSTALLATION & OPERATION

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands~~ of Dollars) 1992 92 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs		233,342														
2. O&M Costs			29,583	29,583												
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)		233,342	29,583	29,583												
4. Discount Factors Annual Discount Rate = __ %		.909	.826	.751												
5. Present Worth (Product of Lines 3 and 4)		212,105	24,432	22,217												

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ($1000)
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																#258,761

JCF 10/11/91 59 0:52

Checked 8/12/92

ALTERNATIVE 5, TASK 5
(SAME AS ALT. 4, TASK 5)

FIGURE 3-6. WORKSHEET 4: COST ANALYSIS WORKSHEET

Cost Component	Cost/Year Cost Occurs (~~Thousands of~~ Dollars) 1992 92 93 94 95															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Capital Costs					14,509											
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)					14,509											
4. Discount Factors Annual Discount Rate = 10 %					.683											
5. Present Worth (Product of Lines 3 and 4)					9910											

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Capital Costs																
2. O&M Costs																
3. Annual Expenditures, x_t (Sum of Lines 1 and 2)																Total Present Worth ~~($1000)~~
4. Discount Factor Annual Discount Rate = __ %																
5. Present Worth (Product of Lines 3 and 4)																#9910

QCF 10/11/91 60 OF 62
Checked by [illegible]

BY JCF DATE 9/25/91 SUBJECT SHEET NO. 61 of 32
CHKD. BY DATE JOB NO. 5332.54

VII. SUMMARY OF COSTS

BY CCF DATE 9/25/91 SUBJECT
CHKD. BY [illegible] DATE 11/9/92
SHEET NO. 62 of 65
JOB NO. 5332.54

PRESENT WORTH COSTS

TASK	ALTERNATIVE 2- LIMITED ACTION	ALTERNATIVE 3 - EXCAVATION 3A-DISPOSAL	3B-LANDFARM	ALTERNATIVE 4- SOIL VENTING	ALTERNATIVE 5- SOIL FLUSHING
1	994	36,324	36,324	38,201	36,324
2	2176	55,145	55,145	35,919	29,487
3	3539	80,673	80,673	32,997	54,540
4		239,288	62,507	231,749	258,761
5		36,939	456,888	9910	9910
6		79,184	79,184		
	$6709	$527,553	$770,721	$348,826	$389,022
ROUNDED -> TO NEAREST 5000 (EXCEPT FOR ALT. 2)	$7000	$530,000	$770,000	$350,000	$390,000

END OF APPENDIX G

WH&A 1029
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ENGINEERS
NEW ORLEANS MOBILE BATON ROUGE

APPENDIX H

FIELD BAIL-OUT PROCEDURES

4.3 Bail-Down Tests

4.3.1 *General* Under certain circumstances, the true thickness of the mobile hydrocarbon layer in the formation can be determined by using a simple bail-down technique. The test may be used in areas whether the hydrocarbon/water interface is above the potentiometric surface, and the recharge rate of hydrocarbon into the well is slow.

The elevation data generated by the test are plotted against time and interpretations made based on the characteristics of the recharge curve. Figure 4-6 shows the "type curves" for three possible situations. If the base of the hydrocarbon in the formation is above the potentiometric surface, the well will recharge at a constant rate to that level, and then begin to recharge at at steadily decreasing rates as the well continues to fill. This is similar to what happens in a recharge test. Recall that in a recharge test the inflection point "Y" between the straight line (constant rate) and the curved (decreasing rate) portions of the plot, represented by the elevation of the buoyancy surface in the mobile hydrocarbon layer. That is because the well had been pumped sufficiently long to allow a draw-down cone to form in the hydrocarbon pool, and to allow the hydrocarbon/water interface to rebound in response to the removal of the hydrocarbon (i.e. until steady-state conditions had been reached. In a bail-down test, however, the only hydrocarbon that is removed is essentially what existed in the well. A draw-down cone is not formed in the hydrocarbon pool, consequently, the hydrocarbon/water interface does not rebound toward the buoyancy surface. The shape of the mobile hydrocarbon zone in the formation, therefore, remains as shown in figure 4-6a. Given these conditions, the inflection point "Y" represents not the elevation of the buoyancy surface, but rather the base of the mobile hydrocarbon layer in the formation. The thickness of the mobile hydrocarbon layer (Tf) is then the distance from "Y" to the top of the hydrocarbon in the well under static conditions, and may be scaled directly off the plot. This interpretation is based on the assumption that the thickness of hydrocarbon in the formation does not change during the test.

From the discussion in the previous paragraph,if the level of the hydrocarbon in the formation is below the potentiometric surface, the recharge curve produced from the bail-down test will show a steadily decreasing rate of flow into the well from the very beginning (Figure 4.6b). Given these conditions, the bail-down test will not yield any information that can be used to calculate the true mobile hydrocarbon thickness. A recharge test will yield useable results regardless of whether the hydrocarbon/water interface is located above or below the potentiometric surface. Consideration should,

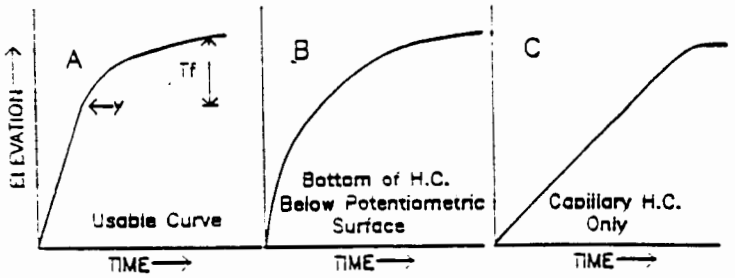

Figure 4—6. Type recharge curves for bail—down tests.

therefore, be given to conducting a recharge test at locations where the bail-down test yields the type of curve shown in Figure 4.6b.

The third type of curve that may be generated from a bail-down test (Figure 4.6c) shows a constant rate of recharge from the beginning of the test until the top static hydrocarbon level in the well is reached (i.e. during the entire test). Again based on our previous discussions, this would seem to indicate that the "head" driving the hydrocarbon into the well remained the same throughout the test. In other words, the recharging hydrocarbon surface in the well apparently reached the top of the mobile hydrocarbon zone before it reached the base of the mobile hydrocarbon zone. The solution to this apparent dilemma would seem to be that a zone of mobile hydrocarbon simply does not exist in the formation. This type of recharge could result if the filter pack around the well is allowing hydrocarbon at less than atmospheric pressure, to accumulate and enter the well (see section 2.3.2)

4.3.2 *Bail-Down Test Procedure* The bail-down test consists of the following steps:

Step 1 : Gauge the well and calculate the potentiometric surface.

Step 2 : Bail the hydrocarbon from the well rapidly.

Step 3 : Gauge the well again, and if the thickness of the hydrocarbon is acceptable (0.1 to 1.0 feet), calculate the potentiometric surface. It should be within approximately 0.05 feet of the first value, before beginning to record the recharging hydrocarbon elevations in the well

Step 4 : Record the top of the hydrocarbon surface in the well as it recharges. Continue until the well is fully recharged.

Source: Hughes, J.P., Sullivan, C.R. and Zinner, R.E., 1988. "Two Techniques for Determining the True Hydrocarbon Thickness in an Unconfined Sandy Aquifer", proceedings of the NWWA/API Conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection and Restoration.

TEST PROCEDURE

The test procedure is similar in performance to a rising head slug test. The equipment necessary to perform the test is listed in Table 2.

Table 2
Testing Equipment

- oil/water interface probe
- bailer
- bucket(s)
- clock
- log book
- pencil

The following steps outline the test procedure:

1. Measure and record the stabilized water/product levels.

2. Bail product/water from well. Bailing should continue until all the product is removed from well bore or until it reaches a constant thickness in bailer after numerous bailer volumes are removed.

3. Record the rising water/product interface levels with time while retrieving the probe. Then record the top of product level. Be consistant with recording the levels, that is, always take top of product reading first then take water/product interface. Timing begins upon taking the first reading. Table 3 lists suggested measuring chronology:

Table 3
Suggesting Reading Frequency

Test Interval (minutes)	Reading Frequency (minutes)
0 - 5	30 sec.
5 - 10	1
10 - 30	2
30 - 60	5
60 - 180	10
180+	As necessary to define slope

4. Graph water/product levels vs. time.

5. Observe the slope of water/product interface line and determine inflection point.

6. Determine water level in test well using water levels from monitor wells without any product accumulationor correct elevation by accounting for difference in specific gravity.

7. Measure difference between product line and water/product interface line at inflection point. This is the actual product thickness.

8. Determine the difference between water/product interface level at time of inflection and the stabilized top of product level. This is the sum of the actual product thickness and capillary fringe.

9. Subtract the measurement in 8 from measurement in 7 to obtain height of capillary fringe.

Source: Gruszczenski, T.S., 1987. "Determination of a Realistic Estimate of the Actual Formation Product Thickness Using Monitor Wells: A Field Bailout Test," Proceedings of the NWWA/API conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection and Restoration.

END OF APPENDIX H

APPENDIX I

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