ENVIRONMENTAL INVESTIGATION - BALLFIELDS
CHEVRON REFINERY
PHILADELPHIA, PENNSYLVANIA

MAY 24, 1991

DAMES & MOORE

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May 24, 1991

Chevron U.S.A. Incorporated
30th Street and Penrose Avenue
Philadelphia, Pennsylvania

Attention: Mr. Mike Manigly
Environmental Specialist

Re: Environmental Investigation
Ballfields Area
Chevron Refinery
Philadelphia, Pennsylvania

Dear Mr. Manigly:

Dames & Moore is pleased to present the enclosed report of the results of our environmental investigation performed at the Ballfields Area at Chevron's Philadelphia, Pennsylvania refinery. This investigation was performed by Dames & Moore personnel in accordance to our proposal dated July 16, 1990. The scope of work was further developed per our letter of September 17, 1990.

If you have any questions, please do not hesitate to call.

Very truly yours,

DAMES & MOORE
A Professional Limited Partnership

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RTG:pas
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1.0 INTRODUCTION

This report presents the results of our environmental investigation conducted on the "Ballfields" area of the Chevron refinery in Philadelphia, Pennsylvania. The Ballfields lies east of the northern portion of the refinery area, as shown on Figure 1. The purpose of the investigation was to further evaluate environmental conditions and to obtain information necessary for the potential remediation of soil and/or ground water at the site. This investigation directly addresses three concerns associated with the Ballfields:

- A 6- to 12-foot high mound of soil and waste, referred to as "Area B," covering approximately 110,000 square feet immediately east of the contractors' parking area.

- An area of approximately 50,000 square feet, referred to as the "Soil Gas Anomaly Area," where elevated concentrations of volatile organic compounds (VOCs) have been detected in soil gas and areas of buried oily material have been encountered.

- The impact to ground water from Area B and the Soil Gas Anomaly Area.

From the 1940s to the 1970s, the Ballfields was owned by the Union Tank Car Company and contained nearly 100 sidings where tank cars were cleaned. The property was sold to Philadelphia Electric and then to Arco Oil Company, which traded property with Gulf Oil Company. In the mid-1980s, Chevron Oil Company purchased the entire refinery from the Gulf Oil Company, including the Ballfields.

Several investigations of soil and ground water have been conducted by Dames & Moore in the Ballfields since 1987. The results of these investigations are presented in reports entitled:

- "Site Assessment Investigation, Chevron-Gulf Refinery, Philadelphia, Pennsylvania," dated May 18, 1987

- "Investigation of Area A, Ballfields, Chevron Refinery, Philadelphia, Pennsylvania," dated June 10, 1988

- "Investigation of Area B, Ballfields, Chevron Refinery, Philadelphia, Pennsylvania," dated August 30, 1988

- "Pilot Geophysical Study, Ballfields, Chevron Refinery, Philadelphia, Pennsylvania," dated July 8, 1988

- "Soil Gas Survey, Ballfields, Chevron Refinery, Philadelphia, Pennsylvania," dated July 28, 1989

- "Results of Ground Water Sampling and Analyses, Chevron Refinery, Philadelphia, Pennsylvania," dated March 21, 1991

The remainder of this section reviews background information for Area B and the Soil Gas Anomaly Area and discusses RCRA Corrective Action Permit requirements regarding the Ballfields. Section 2.0 reviews the project objectives and tasks performed to achieve the objectives. The findings of our expanded historical review are presented in Section 3.0. The procedures and results of the soil investigation are described in Section 4.0. Section 5.0 discusses the methodologies and results of the ground water quality and hydrogeologic investigation. The results of our data validation program are summarized in Section 6.0. Section 7.0 discusses the initiation of an interim corrective measures study. Our conclusions are presented in Section 8.0.

1.1 BACKGROUND INFORMATION

1.1.1 Area B

Dames & Moore has reviewed historical aerial photographs from 1959, 1965, 1970, 1973, 1975, 1979, 1980, and 1985 to evaluate the history of the Area B soils. The 1959 to 1970 photographs show that a railroad yard existed at the Ballfields, with a relatively large building at Area B. In the 1973 photograph, the railroad yard and the large building were being dismantled. The 1975 photograph shows that the Ballfields had been cleared of most of the railroad yard debris, except for a concrete pad where the large building existed. The approximate location of the concrete pad is shown on Figure 2.

The mound of Area B soils is not present in the 1975 photograph, but is present on the 1979 photograph. Apparently, the mound was deposited on top of the concrete pad some time between 1975 and 1979. Also visible on the 1979 photograph are four areas of ponded liquid on the northern half of the mound (Figure 2). These features are not present in the 1980 and 1985 photographs.

In 1988, Area B was investigated by Dames & Moore. Soil samples were collected and analyzed. In summary, the pile was found to consist primarily of silty soils containing volatile organic compounds (VOCs), base/neutral extractable compounds (B/Ns), and metals. A copy of the 1988 Dames & Moore report is included as Appendix A.

1.1.2 Soil Gas Anomaly Area

To identify the presence and approximate the extent of soil containing VOCs in the Ballfields, a soil gas survey was performed by Dames & Moore in May 1989. In summary, an area of elevated VOCs in soil gas was detected in the northeast corner of

Task 3 - Monitoring Well Installation

Task 4 - Ground Water Sampling and Analyses

Task 5 - Hydrogeologic Regime Investigation

The results of the expanded historical investigation (Task 1) are presented in Section 3.0. The soils investigation (Task 2) is described in Section 4.0. Section 5.0 discusses the procedures and results of the ground water quality and hydrogeologic investigation (Tasks 3, 4, and 5).

3.0 EXPANDED HISTORICAL REVIEW

Dames & Moore attempted to obtain additional pertinent historical information with regard to the Ballfields. Various organizations, including Drexel, Temple and the Pennsylvania State Universities, the University of Pennsylvania, the Philadelphia Naval Base, the City of Philadelphia Department of Records, Philadelphia International Airport, the Northeast Philadelphia Airport, and commercial aerial photograph sources were contacted in an effort to obtain additional aerial photographs of the referenced site.

Dames & Moore was able to obtain additional aerial photographs for the years 1940, 1944, and 1951 from Aero Service of Houston, Texas, a commercial aerial photographer. Similar to the aerial photographs for the years 1959, 1965, and 1970 (see discussion in Section 1.1), these photographs show that a railroad yard existed at the site, with a large building at Area B. These photographs did not provide any additional information with regard to the nature and extent of Area B and Soil Gas Anomaly Area wastes.

4.0 BALLFIELD SOILS INVESTIGATION

On August 27 and 28, 1990, Dames & Moore collected soil and mounded material from three locations in Area B and from four locations in the Soil Gas Anomaly Area. Samples collected from Area B were obtained from test pits excavated using a backhoe. Samples obtained from the Soil Gas Anomaly Area were collected by split spoon from borings conducted with a hollow-stem auger. Figure 2 shows the approximate sample locations. Dames & Moore field personnel were on-site to coordinate sampling activities and to log the test pits and boreholes. Samples were selected based on visual observations and photoionization detector (PID) measurements. Borehole/test pit logs, which include the results of PID measurements, are presented as Appendix B.

A complete description of soil sampling procedures is presented in Appendix C, Section 1.0. Soil sampling procedures were performed in accordance with the Sampling Plan, Health and Safety Plan, and Data Quality Assurance Plan contained in Dames & Moore's RFI Work Plan for the Chevron Philadelphia Refinery, dated April 16, 1990. Analytical testing was performed using United States Environmental Protection Agency methods when one existed. All samples were delivered to ETC labs of Edison, New Jersey, via carrier service for analyses.

Section 4.1 discusses the results of the soil investigation in Area B. The soil investigation in the Soil Gas Anomaly Area is presented in Section 4.2.

4.1 AREA B

4.1.1 Soil Sampling and Analyses

On August 27 and 28, 1990, samples SSS-1, SSS-2, and SSS-3, were collected from soil and mounded material in Area B. The depths of these samples are shown on the test pit logs in Appendix C. Samples were analyzed for: RCRA Appendix IX pesticides and PCBs; total organic carbon (TOC); specific conductance; pH; the RCRA characteristics of: H_2S and HCN reactivity, corrosivity, and ignitability; ammonia; nitrates; percent solids; phosphorous; total sulfide; water content; British Thermal Unit (BTU) value; specific gravity; Toxicity Characteristic Leaching Procedure (TCLP): volatiles, semivolatiles, pesticides, and metals; RCRA herbicides and hexavalent chromium. Note that these samples were not analyzed for total VOCs or B/Ns. Area B was sufficiently characterized with respect to these parameters by previous investigations (see Appendix A). A field blank was collected for Quality Assurance/Quality Control (QA/QC) assessment and analyzed for the above mentioned parameters where applicable. A trip blank sample was analyzed for Appendix IX volatile compounds. In addition, samples were analyzed to establish toxicity and treatment rate ranges for the potential bioremediation of the material. The biological testing methodology and results are discussed in Section 7.0 and presented in detail in Appendix D.

4.1.2 Volume Determination

A topographic survey of the mounded soils in Area B (Figure 3) was conducted by Pennoni Associates of Haddon Heights, New Jersey, on December 11, 1990. The volume was determined to be 15,103 cubic yards. A copy of the topographic survey map is included as Figure 3.

5.3 GROUND WATER SAMPLING, ANALYSES, AND RESULTS

Two sets of ground water samples were collected from wells in and adjacent to the Ballfields during September and December 1990. The analytical parameters, a brief description of Quality Assurance and Quality Control (QA/QC) measures, and problematic situations encountered during sample collection are discussed in this section.

The sampling procedures followed those specified in the Sampling Plan, Data Quality Assurance Plan, and the Health and Safety Plan contained in the RFI Work Plan for the Chevron Philadelphia Refinery dated April 16, 1990. Sample collection and QA/QC procedures are discussed in Appendix B, Section 5.0. Pertinent data including depth to static water measurements, total well depth measurements, and purge volumes were collected and entered on Dames & Moore ground water field sampling logs, provided as Appendix E. Samples were analyzed by ETC Laboratories of Edison, New Jersey.

5.3.1 First Quarter

5.3.1.1 Sampling and Analyses

Ground water samples were collected by Dames & Moore field personnel from September 20 to 26, 1990. Ground water from shallow wells BF88, BF90, BF99, BF100, BF104, BF105, BF106, BF107, and C95, and deep wells B48D and C50D was sampled and analyzed for RCRA Appendix IX constituents and hexavalent chromium less dioxins and furans. In addition, the samples were also analyzed for RCRA herbicides and pesticides. For QA/QC, a field blank was collected and analyzed for the above-mentioned parameters. Further QA/QC measures included the collection and analyses of a duplicate sample (collected from BF99), and the analysis of a trip blank for Appendix IX volatiles.

Dames & Moore originally planned to also collect ground water samples from wells BF-101, 102, and 103. However, BF-103 could not be sampled because it was essentially dry. Samples were not collected from BF101 and BF102 as these wells could not be located by Dames & Moore field personnel due to heavy vegetation in the area that obscured the wells. Wells BF-101 and BF-102 have since been located and clearly marked so that they have become part of the Ballfields ground water monitoring program. Ground water samples from BF101 and BF102 were collected during the second round as discussed in subsection 5.3.2.

5.3.1.2 Analytical Results

Laboratory analyses did not detect the presence of Appendix IX pesticides or PCBs; nor did they detect the presence of RCRA herbicides or hexavalent chromium in any of the samples.

Various Appendix IX metals, VOCs, and semivolatiles were detected, as indicated on Table 3. Of the metal compounds detected, arsenic at a maximum concentration of 0.120 mg/l (BF90) and chromium at concentrations of 0.23 mg/l (BF104) and 0.12 mg/l (BF105) slightly exceed current federal maximum contaminant levels (MCLs). Lead concentrations were equal to or greater than the MCL for all well samples analyzed.

The VOC benzene was detected in samples BF90, BF99, BF106, and BF107. The maximum concentration detected was 29,700 ug/l (BF106). In each of these samples, the MCL of 5 ug/l was exceeded. Ethylbenzene and xylenes were also detected in wells BF90, BF99, and BF167. However, these detections did not exceed MCLs.

Several SVOCs were also detected in ground water samples. The only detected SVOCs that have MCLs are 1,3-dichlorobenzene and 1,2-dichlorobenzene. No detected concentration exceeded these MCLs. Sampling locations, detected compounds, and reported concentrations are presented on Table 3.

5.3.2 Second Quarter

5.3.2.1 Sampling and Analyses

Ground water samples were collected by Dames & Moore field personnel on December 11, 12, and 13, 1990. Ground water from shallow wells BF88, BF90, BF99, BF100, BF104, BF105, BF106, BF107, C95, and deep wells B48D and C50D was sampled and analyzed for RCRA Appendix IX constituents less dioxins, furans, herbicides, pesticides, and PCBs. In addition, ground water from shallow wells BF101 and BF102 was sampled and analyzed for RCRA Appendix IX constituents and hexavalent chromium less dioxins and furans. These two wells were not sampled during the first ground water sampling event in September. A field blank was collected and analyzed for the same parameters as those of wells BF101 and BF102. For additional QA/QC, a duplicate sample (from BF101), and a trip blank were also collected and analyzed for Appendix IX volatiles.

Monitoring well BF103 was again not sampled because that well was found to be nearly dry as during first sampling event. To obtain a consistent evaluation of ground water quality in this area, BF103 should be properly closed and a deeper well installed at that location.

5.3.2.2 Analytical Results

Ground water samples were analyzed for the full suite of RCRA Appendix IX constituents less dioxins and furans. The samples were not analyzed for hexavalent chromium, RCRA herbicides and pesticides, or PCBs as none have been detected in soils or ground water at the Ballfields.

Various Appendix IX metals, VOCs, and semivolatiles were detected, as indicated on Table 3. Of the compounds detected, arsenic at a concentration of 0.065 mg/l (C50D) and chromium at a concentration of 0.12 mg/l (BF105) exceeded MCLs. Lead concentrations were equal to or greater than the MCL for all well samples.

The VOC benzene was detected in samples BF90, BF106, and BF107. The maximum concentration detected was 30,700 ug/l (BF106). Each of these sample results exceed the MCL of 5 ug/l. Ethylbenzene was detected in BF90 and BF107. Toluene was detected in BF90. However, the MCLs for toluene and xylenes were not exceeded.

Several SVOCs were also detected in ground water samples. The only detected SVOCs that have MCLs are 1,3-dichlorobenzene and 1,2-dichlorobenzene. No detected concentration exceeded these MCLs. Sampling locations, detected compounds, and reported concentrations are presented on Table 3.

5.4 FREE PHASE HYDROCARBON CHARACTERIZATION

On December 19, 1990, three samples designated MA3682, MA3683, and MA3684, were collected from wells BF107, BF106, and BF99, respectively. They were submitted to Caleb-Bret Laboratory of Houston, Texas for characterization of any free-phase hydrocarbons present. Coleb-Bret performed two analyses on the samples: Hydrocarbon characterization of "organic component" by Simulated Distillation American Society for Testing Materials (ASTM) method D-2887 and BTEX Determination by Gas Chromatograph. The purpose of these analyses was to obtain information regarding the product composition. As such, this sampling and analyses were not conducted in accordance with USEPA protocol.

The results of the hydrocarbon characterization indicated that the hydrocarbons consisted of various components.

Samples MA-3862 (BF107) and MA-3864 (BF99) both had organic layers. BTEXs were detected in both samples. The simulated distillation results for samples MA3682 and MA3684 differed slightly. Both samples are a mixture of crude oil fractions.

Sample MA-3862 (BF107) contained hydrocarbons in the heavy straight-run gasoline (naphtha) boiling range based on initial boiling point and gas chromatographic peak profile. In addition, the sample contained hydrocarbon components in the light/heavy gas oil ranges as based on the boiling point distributions end-point and gas chromatographic peak profiles. Typical hydrocarbon products within these petroleum fractions can include: gasolines, kerosene, diesel fuels, and some lubricating oils.

Sample MA-3864 (BF99) did not contain any gasoline products, as based on initial boiling point and gas chromatographic peak profiles. The sample consists of compounds characteristic of diesel fuel and heavier hydrocarbons, i.e., diesel fuels and lubricants.

BTEXs were not detected at concentrations greater than 5 mg/kg in sample MA-3863 (BF106). A simulated distillation was run on sample MA-3863 and no hydrocarbon fraction was observed. Two factors appear to have caused these results. First, sampling techniques appear to have resulted in an exclusion of the thin (0.04") floating free-phase hydrocarbon layer from the sample. Second, these samples were submitted to Caleb-Bret in ordinary amber-colored glass jars without a teflon septum. This probably resulted in a loss of BTEX from the sample.

Several petroleum fractions are indicated in samples from BF107 and BF99. These samples appear to be a mixture of several petroleum products. A copy of the Caleb-Bret laboratory report is included as Appendix G.

5.5 HYDROGEOLOGIC CONDITIONS

Two aquifers exist beneath most of the Ballfields area: the Upper Unconsolidated Aquifer and the Lower Unconsolidated Aquifer. As discussed in Dames & Moore's Phase I and Phase II Site Assessment Investigation dated May 18, 1987, the aquifers are similar to and hydraulically connected to those below the Main Plant. The intervening silty clay unit that is present beneath the two aquifers at the Main Plant is from 10 to 15 feet thick in the western portion of the Ballfields and is thin to absent beneath the remaining portion. Figure 8 shows a generalized cross-section along line A-A' (located as shown on Figure 8A). A silty unit acts as an aquitard beneath most of the Ballfields, but is absent in much of the northern portion of the site, where a gravel unit replaces it.

Depth to water measurements were taken in the newly installed wells and in the existing wells in and adjacent to the Ballfields on October 4 and December 11, 1990. An Oil Recovery System (ORS) interphase probe capable of detecting both floating hydrocarbons and water was used for this task. From these data,

presented on Tables 4 and 4A, ground water contour maps were generated showing ground water flow direction in both the Upper and Lower Aquifers. Floating product (BF99) was detected in wells BF99, BF106, and BF107 on both dates. The maximum thickness was 0.12 feet in BF99 on October 4, 1990.

Based on the ground water contours for the upper aquifer (Figures 9 and 9A), ground water generally flows from all directions toward the north-central portion of the site. This flow regime is consistent with the absence of a relatively impermeable silt unit in the north-central portion of the site. As the schematic flow arrows on the cross-section (Figure 8) illustrates, ground water flowing along the top of the silt unit enters the lower aquifer where the gravel unit is present and then flows southwestward toward the Schuylkill River. Figures 10 and 10A are lower aquifer ground water flow maps for October 4 and December 11, 1990, respectively.

6.0 DATA VALIDATION

All laboratory analyses were subjected to data validation procedures. The detailed reports for the data validation are included as Appendix F. The conclusions and qualifications resulting from this process were used to formulate the tabulated data for results tables and the discussion below. The original laboratory reports will be submitted under separate cover.

In general, the quality of laboratory data was good. The data validation noted correctable deficiencies in all data packages but in no case was data unusable. However, aspects of the data did require qualification. As noted in Appendix F, qualifiers have been added to the data presented in this report. Specific qualifications and limitations of the data are discussed therein.

7.0 INITIATION OF INTERIM CORRECTIVE MEASURES STUDY

Soil samples from Area B and the Soil Gas Anomaly were analyzed for miscellaneous parameters and subjected to preliminary biological treatability testing to facilitate the review of remedial options. Subsection 7.1 briefly discusses the miscellaneous analyses and subsection 7.2 discusses the Phase I bioremediation treatability testing.

7.1 MISCELLANEOUS ANALYSES

The miscellaneous analyses results are listed under the heading Wet Chemistry on Tables 1 and 2 for Areas B and the Soil Gas Anomaly, respectively. All soil samples were subject to analyses for the following parameters.

- Total Organic Carbon (TOC)
- Specific Conductance (SC)
- Ammonia as Nitrogen
- Nitrates as Nitrogen
- BTU/Pound
- Total Solids
- Phosphorus
- Specific Gravity
- Water Content
- Cyanide
- Sulfide

The analyses indicated that TOC ranged from 134,396 mg/kg to 519,604 mg/kg in Area B and from 6,278.7 mg/kg to 63,038.2 mg/kg in the Soil Gas Anomaly. The range of specific conductance for Area B (1,030 micro mhos/centimeter [um/cm] to 1,570 um/cm) was higher than that in the Soil Gas Anomaly (152 um/cm to 396 um/cm). Area B samples generally had lower total solids contents (68.6%, 58.6%, and 73.6% for samples SSS-1, SSS-2, and SSS-3, respectively), than the Soil Gas Anomaly samples (range from 74.9% to 93.4%).

Area B samples also had higher water content (range from 21.93% to 24.13%) than the Soil Gas Anomaly samples (range from 8.90% to 18.10%). Specific Gravity for both areas was similar with an overall range of 1.3.83 grams per cubic centimeter (gm/cc) to 1.978 gm/cc). Only one sample, SSS-1, was found to have a BTU value (2,428 BTU/lb).

Ammonia concentrations in both areas were similar with an observed range of 6 mg/kg to 470 mg/kg. Nitrates in both areas were also similar with a observed range of 7 mg/kg to 370 mg/kg. Cyanide was not detected in soil samples from either area. Sulfide concentrations in both areas were roughly equivalent with a range from 11 mg/kg to 170 mg/kg in Area B and a range from 8 mg/kg to 130 mg/kg in the Soil Gas Anomaly. However, phosphorus concentrations in Area B (5,800 mg/kg to 6,800 mg/kg) were significantly higher than those for the Soil Gas Anomaly (1.96 mg/kg to 1,700 mg/kg).

These data presented above are to be used for analysis of interim corrective measures for the site. They were used in the biological treatability testing discussed in Subsection 7.2.

7.2 PHASE I - BIOLOGICAL TREATABILITY ANALYSES

The detailed report on this testing is presented in Appendix G. No fatal flaws eliminating biological remediation were identified during Phase I testing. The testing indicated that the

samples all contained populations of hydrocarbon degrading bacteria, that toxicity due to metal and organic compounds should not limit biodegradation, and that levels of nitrogen and phosphorus must be elevated to accelerate bioremediation.

Physical characteristics of the material in Area B, high oil content and tendency to aggregate, will necessitate mixing to assure proper nutrient and oxygen circulation. Therefore, Phase II testing, focusing on land treatment, is recommended to establish a feasible end point for any bioremediation. The details of the recommended Phase II testing are presented in Appendix G.

8.0 CONCLUSIONS

Results of the laboratory analysis on soil samples indicate that concentrations of total VOCs, total semi-volatile compounds, and total metals are present in Area B and the Soil Gas Anomaly Area at the Ballfields. Selected VOCs and metals are impacting the shallow ground water beneath these areas.

Comparison of the compounds detected in soil samples with those detected in the upper aquifer ground water reveals that:

- The elevated hydrocarbon concentrations (see Appendix A-1) detected in soil samples from Area B do not appear to be affecting ground water at that location.

- The elevated metals concentration in Area B, particularly chromium and lead, appear to be affecting ground water in the area of BF-105.

- The elevated concentrations of aromatic hydrocarbons in soil samples from the Soil Gas Anomaly Area, particularly benzene, ethylbenzene, and xylenes, are affecting ground water in that area.

- The elevated metals concentrations in soil samples from the Soil Gas Anomaly Area, particularly chromium and lead, are affecting ground water in the area.

Remediation of the source areas, Area B and the Soil Gas Anomaly, is recommended to minimize further migration of VOC and metal compounds to the upper aquifer ground water. The absence of the clay layer separating the upper aquifer from the lower aquifer presents a pathway for the migration of potential contaminants, although the analysis of water from wells screened in the lower aquifer did not detect any constituents of concern. The ongoing interim corrective measure study is addressing the two source areas.

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TABLE 1
PHASE I - BALLFIELDS REMEDIAL EVALUATION
DETECTED COMPOUNDS
SOIL SAMPLES - AREA B
CHEVRON OIL REFINERY
PHILADELPHIA, PENNSYLVANIA

Dames & Moore Sample Number Laboratory Sample Number	Detection Limit (1)	SSS-1 HA2966/2957	SSS-2 HA2967/2958	SSS-3 HA2968/2959	FB HA2975	TB HA2977	TCLP Limits (2)	Hazardous Waste Thresholds
Analytical Parameters (Units)								
TCLP METALS (mg/l)								
Arsenic	0.01	0.031	0.011	0.12	ND	NA	5.0	NA
Barium	0.02	0.81	1.2	0.84	ND	NA	100.0	NA
Chromium	0.01	0.037	0.12	0.01	ND	NA	5.0	NA
Silver	0.01	ND	BMDL	0.057	ND	NA	5.0	NA
MISCELLANEOUS METALS (ug/kg)								
Chromium 6+	200	BMDL	300	200	BMDL	NA	NA	NA
TCLP ORGANIC COMPOUNDS (ug/l)								
Benzene	4.4	121 D	7.78 D	33 D	ND	ND	500	NA
RCRA CHARACTERISTICS								
Ignitibility	NA	ND	ND	ND	NA	NA	NA	(3)
Corrosivity [pH (std)]	NA	6.45	6.74	6.55	6.5	NA	NA	2>pH>12
Reactive Cyanide (mg/kg)	.7	BMDL	BMDL	ND	NA	NA	NA	250 (4)
Reactive Sulfide (mg/kg)	2	47	270	11	NA	NA	NA	500 (4)
WET CHEMISTRY								
Total Organic Carbon (mg/kg)	100	519,604	259,549	134,396	1.1	NA	NA	NA
Ammonia (N) (mg/kg)	6	470	140	350	BMDL	NA	NA	NA
Nitrates (mg/kg)	7	73	38	36	0.06	NA	NA	NA
Phosphorus (mg/kg)	150	5,800	6,800	6,800	0.08	NA	NA	NA
Sulfide (S) (mg/kg)	2	11	170	52	BMDL	NA	NA	NA
Btu/Lb	NA	2,428	ND	ND	ND	NA	NA	NA
Total Solids (%)	.1	68.6	58.6	73.6	ND	NA	NA	NA
Water Content (%)	NA	24.13	21.93	22.22	<0.05	NA	NA	NA
Specific Conductance (um/cm)	10	1,570	1,030	1,110	ND	NA	NA	NA
Specific Gravity (gm/cc)	NA	1.383	1.622	1.602	NA	NA	NA	NA

Explanation:

ND - Compound was not detected
BMDL - Below Method Detection Limit
D - Dilution required to detect compound
NA - Not Applicable
NS - No Standard Available
FB - Field Blank
TB - Trip Blank

Notes:

1. Standard detection limits shown only; detection limit may vary for individual compounds. Actual detection limits are located in the complete laboratory analytical reports.

2. Represents maximum concentration of contaminants for Toxicity Characteristic.

3. Samples do not exhibit the characteristics of ignitability, which include: flash point <60C; spontaneous ignition to exposure to air or water; vigorous persistent burning; or act as a strong oxident.

4. Interim threshold value for toxic gas generation reactivity based on recent USEPA (April 1990) memo.

TABLE 2
PHASE I - BALLFIELDS REMEDIAL EVALUATION
DETECTED COMPOUNDS
SOIL SAMPLES - SOIL GAS ANOMALY AREA
CHEVRON OIL REFINERY
PHILADELPHIA, PENNSYLVANIA

Dames & Moore Sample Number Laboratory Sample Number	Detection Limit (1)	SSS-4D HA2965/2974	SSS-4S HA2961/2970	SSS-5 HA2963/2972	SSS-6 HA2964/2973	SSS-7D HA2962/2971	SSS-7S HA2960/2969	FB HA2975	TB HA2977	Background Guidelines (2)	TCLP Limit (3)	Hazardous Waste Thresholds
Analytical Parameters (Units)												
METALS												
APPENDIX IX (mg/kg)												
Arsenic	1.2	6.8	13	8.2	ND	BMDL	BMDL	ND	NA	5.4	NA	NA
Barium	2.3	60 D	70 D	432 D	83 D	43 D	26 D	ND	NA	15-1000	NA	NA
Beryllium	.12	0.75	0.62	0.5	0.6	0.5	0.3	ND	NA	<1-7	NA	NA
Cadmium	.23	0.81	0.77	1.4	2.6	1.3	BMDL	ND	NA	<1-1	NA	NA
Chromium	1.2	22 D	27 D	710 D	489 D	28 D	14	ND	NA	1-100	NA	NA
Cobalt	2.3	7.9	8.7	59 D	24	6.7	4.3	ND	NA	<3-70	NA	NA
Copper	1.2	170 D	43 D	505 D	166 D	14	8.4	ND	NA	<1-150	NA	NA
Lead	8.7	440 D	230 D	200 D	110 D	23 D	33 D	BMDL	NA	<7-300	NA	NA
Mercury	.09	8.1	11.7	7.3	2	ND	0.11	ND	NA	0.1-3.4	NA	NA
Nickel	2.3	12	13	48 D	110 D	13	8.3	ND	NA	<3-700	NA	NA
Tin	5.8	9	12	17	19	12	6.1	ND	NA	NA	NA	NA
Vanadium	2.3	31 D	36 D	55 D	85 D	42 D	21 D	ND	NA	<5-300	NA	NA
Zinc	2.3	64 D	61 D	533 D	294 D	40 D	25 D	BMDL	NA	<5-400	NA	NA
TCLP (mg/l)												
Arsenic	0.01	0.01	0.12	0.019	BMDL	ND	ND	NA	NA	NA	5.0	NA
Barium	0.02	0.3	0.66	ND	0.28	0.066	0.38	NA	NA	NA	100	NA
Cadmium	0.002	0.002	0.004	ND	BMDL	0.004	BMDL	NA	NA	NA	1.0	NA
Chromium	0.01	0.033	BMDL	ND	0.56	0.064	BMDL	NA	NA	NA	5.0	NA
Lead	0.075	0.13	0.83	ND	0.11	0.079	0.27	NA	NA	NA	5.0	NA
Silver	0.01	ND	ND	ND	ND	BMDL	ND	NA	NA	NA	5.0	NA
MISCELLANEOUS												
Chromium 6+ (ug/kg)	200	BMDL	BMDL	BMDL	BMDL	600	300	BMDL	NA	60000	NA	NA
VOLATILE ORGANIC COMPOUNDS (ug/kg)												
APPENDIX IX												
Methylene Chloride	5.0	3.61 J	5.79 J	1470 D	ND	7.41 J	4.61 J	ND	ND	NA	NA	NA
1,1,1-Trichloroethane	5.0	ND	ND	ND	ND	ND	ND	4.71	ND	NA	NA	NA
Benzene	5.0	5.46	33.3	78200 D	ND	ND	ND	ND	ND	NA	NA	NA
Ethylbenzene	5.0	26.3	25.6 J	75400 D	BMDL	ND	ND	ND	ND	NA	NA	NA
Xylenes (total)	5.0	31.4	80.8 J	293000 D	ND	ND	ND	ND	ND	NA	NA	NA
Methyl Ethyl Ketone	10.0	ND	35.8	ND	ND	ND	ND	ND	ND	NA	NA	NA
TOTAL APPENDIX IX VOCs		66.17	181.29	450070	BMDL	7.41 J	4.61 J	4.71	ND	NA	NA	NA
TCLP (ug/l)												
Benzene	4.4	ND	6.14 D	BMDL	18.3 D	BMDL	BMDL	NA	NA	NA	500	NA
SEMI-VOLATILE ORGANIC COMPOUNDS												
APPENDIX IX (ug/kg)												
Napthalene	190	ND	446	152000 D	9190 D	ND	1560 D	ND	NA	NA	NA	NA
2-Methylnapthalene	1200	BMDL	BMDL	434000 D	40500 D	ND	BMDL	ND	NA	NA	NA	NA
Dibenzofuran	1200	ND	BMDL	BMDL	1460 D	ND	BMDL	ND	NA	NA	NA	NA
Fluorene	230	ND	ND	1110000 D	10500 D	ND	346 D	ND	NA	NA	NA	NA
Phenanthrene	640	BMDL	2260 D	336000 D	23700 D	ND	936 D	ND	NA	NA	NA	NA
Anthracene	230	ND	BMDL	39500 D	1830 D	ND	8230 D	ND	NA	NA	NA	NA
Fluoranthene	260	ND	288 D	4730 D	BMDL	ND	620 D	ND	NA	NA	NA	NA
Pyrene	300	BMDL	908 D	20100	2010 D	ND	502 D	ND	NA	NA	NA	NA
Chrysene	300	ND	766 D	19100	1660 D	ND	532 D	ND	NA	NA	NA	NA
Benzo(a)pyrene	300	ND	BMDL	BMDL	347 D	ND	BMDL	ND	NA	NA	NA	NA
TCLP (ug/l)												
o-Cresol	10.0	ND	ND	24.9 J	BMDL	ND	ND	NA	NA	NA	2.0E5	NA
e,p-Cresol	10.0	ND	ND	ND	11.8	ND	ND	NA	NA	NA	2.0E5	NA
RCRA CHARACTERISTICS												
Ignitibility	NA	None	None	None	None	None	None	None	NA	NA	NA	(3)
Corrosivity (pH (std))	NA	5.41	5.42	8.93	6.49	4.17	6.49	6.5	NA	NA	NA	2>pH>12
Reactive Cyanide (mg/kg)	0.2	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	NA	NA	NA	NA	250 (4)
Reactive Sulfide (mg/kg)	1.0	2.0	2.0	80	BMDL	2.0	6.0	NA	NA	NA	NA	500 (4)
WET CHEMISTRY												
TOC (mg/kg)	100	13889.8	83036.2	97018	14431.6	6278.7	7320.3	1.2	NA	NA	NA	NA
Specific Conductance (um/cm)	10	312	396	349	347	152	256	ND	NA	NA	NA	NA
Ammonia (N) (mg/kg)	6	13	170	39	6	33	10	BMDL	NA	NA	NA	NA
Nitrates (N) (mg/kg)	7	250	220	7	370	230	190	0.06	135000	NA	NA	NA
BTU/LB	NA	NA	0	0	0	NA	0	NA	NA	NA	NS	NS
Total Solids (%)	1	88.6	82.4	74.9	78.5	84.0	93.4	ND	NA	NA	NA	NA
Phosphorus (mg/kg)	150	450	1100	1700	920	610	700	0.08	2.69	NA	NA	NA
Specific Gravity (gm/cc)	NA	1.96	1.90	1.782	1.707	1.411	1.978	NA	NA	NA	NA	NA
Water Content (%)	NA	10.70	12.11	15.22	18.10	15.78	8.90	<0.05	NA	NA	NA	NA
Cyanide (mg/kg)	0.01	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	NA	NA	NA	NA
Sulfide (S) (mg/kg)	2	8	10	120	10	9	8	BMDL	NA	NA	NA	NA

Explanation:

ND - Not Detected
BMDL - Below Method Detection Limit
D - Dilution required to detect compound
J - Quantitation is approximate due to limitations identified during the quality control review (data validation)
NS - No Standard
NA - Not Applicable
FB - Field Blank
TB - Trip Blank

Notes:

1. Standard detection limits shown only; detection limit may vary for individual compounds. Actual detection limits are located in the complete laboratory analytical reports.
2. Elemental Abundances in Uncultivated Soils in Eastern US "B" Horizon Soils. Source: USEPA National Environmental Investigations Center, Denver, Colorado.
3. Represents the maximum concentration of contaminants for Toxicity Characteristic.
4. Samples do not exhibit the characteristics of ignitability, which include: flash point < 60C; spontaneous ignition on exposure to air or water; vigorous persistent burning; or act as a strong oxidant.
5. Interim threshold value for toxic gas generation reactivity based on a recent USEPA (April 1990) memo.

AAW012F5

TABLE 3
PHASE I - BALLFIELDS REMEDIAL EVALUATION
DETECTED COMPOUNDS
GROUND WATER SAMPLES
CHEVRON OIL REFINERY
PHILADELPHIA, PENNSYLVANIA

Dames & Moore Sample Number	Detection	848D	848D	C60D	C60D	BF88	BF88	BF90	BF90	C96	C96	Regulatory Limits/Guidelines			
Laboratory Sample Number	Limit[1]	HA3052	HA3618	HA3058	HA3617	HA3059	HA3616	HA3056	HA3621	HA3054	HA3623				
Sample Date		9/90	12/90	9/90	12/90	9/90	12/90	9/90	12/90	9/90	12/90	NIPDWR	MCLG	MCL	SMCL
Analytical Parameters (Units)															
APPENDIX IX METALS (mg/l)															
Antimony	0.060	ND	BMDL UJ	ND	UJ	ND	ND	ND	BMDL J	ND	BMDL J	0.05	0	NS	NS
Arsenic	0.01	BMDL	BMDL	0.110 D	0.085 D	BMDL	0.014	0.120 D	0.063	0.086 D	0.042	0.06	0	0.05	NS
Barium	0.020	0.500	0.47	0.280	0.200	BMDL	0.087	0.08	0.077	0.290	0.44	1	5*	1	NS
Beryllium	0.001	ND	.0018 B	ND	BMDL B	ND	0.002	ND	BMDL B	ND	0.0086	NS	0	NS	NS
Cadmium	0.002	BMDL	BMDL	0.0061	BMDL	ND	0.006	ND	BMDL	0.0022	0.0029	0.01	0.005*	0.05	NS
Chromium	0.01	BMDL	0.061 J	0.028	0.032 J	BMDL	0.051	BMDL	BMDL B	0.012	0.097 J	0.05	0.1	0.1	NS
Cobalt	0.02	ND	BMDL B	BMDL	BMDL B	0.027	0.089	ND	BMDL B	ND	0.037 J	NS	NS	NS	NS
Copper	0.01	BMDL	0.1 J	0.024 B	0.020 J	BMDL	0.053	BMDL	BMDL	0.026 B	0.47 J	NS	1.3	1.3	NS
Lead	0.005	BMDL	0.044 D	0.032	0.038 D	BMDL	0.019	0.013	0.006	0.1 D	1.4	NS	0	0.05	NS
Mercury	0.0002	ND	ND	BMDL	ND	ND	BMDL	ND	ND	ND	0.00027	0.002	0.002	0.002	NS
Nickel	0.02	ND	0.031	BMDL	BMDL	BMDL	0.065	BMDL	BMDL	BMDL	0.094	NS	0.1	0.1	NS
Tin	0.05	BMDL	BMDL BR	BMDL	BMDL BR	0.054	0.46 J	0.063	.075 J	BMDL	0.058 J	NS	NS	NS	NS
Vanadium	0.02	BMDL	0.065	0.044	0.033	BMDL	0.065	BMDL	BMDL B	0.021	0.088	NS	NS	NS	NS
Zinc	0.02	0.034 B	0.15 J	0.091 B	0.083 J	0.19	0.52	0.038	0.041	0.360	4.01 J	NS	NS	NS	NS
APPENDIX IX VOLATILE ORGANIC COMPOUNDS (ug/l)															
Acetone	10.0	ND	ND	BMDL B	ND	ND	ND	ND	ND	25.9	ND	NS	NS	NS	NS
Benzene	4.4	ND	ND	ND	ND	ND	ND	16	11.4	BMDL	ND	NS	0	5	NS
Ethylbenzene	7.2	ND	ND	ND	ND	ND	ND	ND	36.2	ND	ND	NS	700	700	30
Methylene Chloride	2.8	4.02 B	UJ	ND	UJ	ND	ND	3.4 B	ND	3.92 B	UJ	NS	0	5	NS
Toluene	6.0	ND	ND	ND	ND	ND	ND	BMDL	6.10 B	BMDL	ND	NS	2000	2000	40
Xylenes (total)	10.0	ND	ND	ND	ND	ND	ND	330	ND	BMDL	ND	NS	10000	10000	NS
TOTAL VOLATILE ORGANIC COMPOUNDS		ND	ND	BMDL B	ND	ND	ND	346	46.6	25.9	ND				
APPENDIX IX SEMI-VOLATILE ORGANIC COMPOUNDS (ug/l)															
Acenaphthene	2.2	3.06	2.06	UJ	ND	UJ	ND	UJ	ND	ND	ND	NS	NS	NS	NS
Anthracene	2.2	UJ	ND	UJ	ND	UJ	ND	UJ	ND	ND	UJ	NS	NS	NS	NS
bis(2-Ethylhexyl)phthalate	12	ND	12.2	ND	ND	UJ	ND	UJ	ND	ND	ND	NS	NS	NS	NS
o-Cresol	12	R	R	R	ND	ND	ND	11.7	BMDL	R	ND	NS	NS	NS	NS
1,3-Dichlorobenzene	2.2	ND	ND	ND	ND	ND	ND	3.78 J	3.54	ND	ND	NS	75	75	NS
1,2-Dichlorobenzene	2.2	ND	ND	ND	ND	ND	ND	21.1 J	21.7	ND	ND	NS	75	75	NS
2,4-Dimethylphenol	3.1	R	ND	R	ND	UJ	ND	16.5 J	4.31	R	ND	NS	NS	NS	NS
Fluorene	2.2	BMDL	ND	UJ	ND	UJ	ND	UJ	BMDL	ND	ND	NS	NS	NS	NS
2-Methylnaphthalene	12	ND	ND	UJ	ND	UJ	ND	UJ	ND	ND	ND	NS	NS	NS	NS
Naphthalene	1.8	ND	ND	UJ	ND	UJ	ND	6.64 J	11.9	ND	ND	NS	NS	NS	NS
Phenol	1.7	R	R	R	ND	ND	ND	UJ	ND	R	ND	NS	NS	NS	NS
Phenanthrene	6.2	UJ	ND	UJ	ND	UJ	ND	UJ	ND	ND	ND	NS	NS	NS	NS
WET CHEMISTRY															
Cyanide (total) (mg/l)	.026	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	0.0172	0.0239	BMDL	BMDL	NS	0.2	0.2	NS
Sulfide (as S) (mg/l)	.05	BMDL	BMDL	BMDL	BMDL	0.16	0.37 J	0.39	0.13 J	0.11	0.34	NS	NS	NS	250
Specific Conductance (um/cm)[2]		633	891	776	1116	224	327	400	683	1140	1375	NS	NS	NS	-
pH (std)[2]		6.27	4.77	6.60	4.82	6.15	4.86	6.69	6.47	6.61	5.05	NS	NS	NS	6.5-8

Explanation:

ND - Compound was not detected
- Compound is quantitatively suspect; compound was detected in the field and/or laboratory blank at a similar level
BMDL - Below Method Detection Limit
- Dilution required to determine concentration
ND - Indeterminate; standard and/or spike could not be detected at current method levels
- Quantitation is approximate due to limitations identified in the QA review
NA - Not Applicable/Not Analyzed
NS - No standard available
- Unreliable result; analyte may or may not be present in this sample
UJ - Analyte was not detected, but the quantitation limit is probably higher due to a bias identified during the QA review
- Proposed

Notes:

. Standard detection limits shown only; detection limit may vary for individual compounds. Actual detection limits are located in the complete laboratory analytical reports.
. Specific conductance and pH measured in the laboratory (ETC) for first round sampling only (September 1990); all others measured in the field by Dames & Moore field personnel.

Regulatory Limits/Guidelines:

NIPDWR - National Interim Primary Drinking Water Standard in mg/l
MCLG - Maximum Contaminant Level Goal in mg/l
MCL - Maximum Contaminant Level in mg/l
SMCL - Secondary Contaminant Level Goal in mg/l

TABLE 3
PHASE I - BALLFIELDS REMEDIAL EVALUATION
DETECTED COMPOUNDS
GROUND WATER SAMPLES
CHEVRON OIL REFINERY
PHILADELPHIA, PENNSYLVANIA

Dames & Moore Sample Number Laboratory Sample Number Sample Date	Detection Limit[1]	BF99 HA3062 9/90	BF99 DUP HA3064 9/90	BF99 HA3624 12/90	BF100 HA3063 9/90	BF100 HA3619 12/90	BF101 NA 9/90	BF101 HA3629 12/90	BF101 DUP HA3628 12/90	BF102 NA 9/90	BF102 HA3627 12/90	BF104 HA3061 9/90	BF104 HA3620 12/90	Regulatory Limits/Guidelines			
														NIPDWR	MCLG	MCL	SMCL
Analytical Parameters (Units)																	
APPENDIX IX METALS (mg/l)																	
Antimony	0.060	ND	ND	UJ	ND	UJ	NA	BMDL J	ND	NA	ND	ND	ND	0.05	0	NS	NS
Arsenic	0.01	0.016	0.029	0.035 DJ	BMDL	BMDL	NA	0.02	0.018	NA	BMDL	0.056 D	BMDL	0.05	0	0.05	NS
Barium	0.020	0.160	0.140	0.24	0.048	0.062	NA	0.13	0.14	NA	0.072	0.72	0.08	1	5*	1	NS
Beryllium	0.001	ND	ND	0.0018 B	ND	BMDL B	NA	0.001	0.001	NA	BMDL B	0.004	BMDL B	NS	0	NS	NS
Cadmium	0.002	0.0039	0.004	BMDL	ND	BMDL	NA	ND	ND	NA	BMDL	0.019	BMDL	0.01	0.005*	0.05	NS
Chromium	0.01	BMDL	BMDL	0.098 J	BMDL	0.026 J	NA	0.017	0.022	NA	0.012	0.23	0.013	0.05	0.1	0.1	NS
Cobalt	0.02	0.064	0.053	0.085 J	BMDL	BMDL B	NA	BMDL B	BMDL B	NA	BMDL B	0.056	BMDL B	NS	NS	NS	NS
Copper	0.01	0.035 B	0.039 B	0.081 J	BMDL	0.015 J	NA	0.017	0.017	NA	BMDL	0.24	BMDL B	NS	1.3	1.3	NS
Lead	0.005	0.0096	0.010	0.047 D	0.005	0.015 D	NA	0.041	0.037	NA	0.03	0.54	0.013	NS	0	0.05	NS
Mercury	0.0002	ND	ND	ND	ND	BMDL	NA	ND	ND	NA	ND	0.00032	ND	0.002	0.002	0.002	NS
Nickel	0.02	ND	ND	0.055	BMDL	BMDL	NA	BMDL	BMDL	NA	BMDL	0.1	BMDL	NS	0.1	0.1	NS
Tin	0.05	BMDL	BMDL	R	BMDL	R	NA	ND	BMDL J	NA	ND	0.093	ND	NS	NS	NS	NS
Vanadium	0.02	0.022	0.022	0.11	BMDL	BMDL B	NA	0.021	0.022	NA	BMDL B	0.27	BMDL	NS	NS	NS	NS
Zinc	0.02	0.034 B	0.052 B	0.14 J	0.045	0.053 J	NA	0.05	0.059	NA	0.074	0.44	0.03	NS	NS	NS	NS
APPENDIX IX VOLATILE ORGANIC COMPOUNDS (ug/l)																	
Acetone	10.0	59.1	52.7 D	BMDL J	ND	ND	NA	ND	ND	NA	ND	10.7	ND	NS	NS	NS	NS
Benzene	4.4	149	103 D	13.3 J	ND	ND	NA	ND	ND	NA	ND	ND	ND	NS	0	5	NS
Ethylbenzene	7.2	82	51.9 D	23.2 J	ND	ND	NA	ND	ND	NA	ND	ND	ND	NS	700	700	30
Methylene Chloride	2.8	ND	ND	UJ	4.13 B	UJ	NA	ND	ND	NA	ND	4.13 B	UJ	NS	0	5	NS
Toluene	6.0	ND	ND	UJ	ND	ND	NA	ND	ND	NA	BMDL B	ND	ND	NS	2000	2000	40
Xylenes (total)	10.0	95.7	BMDL	37.1 J	ND	ND	NA	ND	ND	NA	ND	ND	ND	NS	10000	10000	NS
TOTAL VOLATILE ORGANIC COMPOUNDS		365.8	207.6 D	73.6 J	ND	ND	NA	ND	ND	NA	ND	10.7	ND				
APPENDIX IX SEMI-VOLATILE ORGANIC COMPOUNDS (ug/l)																	
Acenaphthene	2.2	ND	ND	R	ND	ND	NA	ND	ND	NA	ND	UJ	R	NS	NS	NS	NS
Anthracene	2.2	UJ	UJ	R	UJ	UJ	NA	UJ	ND	NA	ND	UJ	R	NS	NS	NS	NS
bis(2-Ethylhexyl)phthalate	12	ND	ND	R	UJ	ND	NA	ND	ND	NA	ND	UJ	R	NS	NS	NS	NS
o-Cresol	12	R	R	R	R	R	NA	ND	ND	NA	ND	R	ND	NS	NS	NS	NS
1,3-Dichlorobenzene	2.2	ND	ND	R	ND	ND	NA	ND	ND	NA	ND	ND	R	NS	75	75	NS
1,2-Dichlorobenzene	2.2	ND	ND	R	ND	ND	NA	ND	ND	NA	ND	NO	R	NS	75	75	NS
2,4-Dimethylphenol	3.1	R	R	R	R	R	NA	UJ	ND	NA	ND	R	ND	NS	NS	NS	NS
Fluorene	2.2	89.4 D	584 D	775 DJ	ND	ND	NA	ND	ND	NA	ND	UJ	R	NS	NS	NS	NS
2-Methylnaphthalene	12	8MDL DJ	801 D	814 DJ	ND	ND	NA	UJ	ND	NA	ND	UJ	ND	NS	NS	NS	NS
Naphthalene	1.8	56.7 DJ	211 D	228 DJ	ND	ND	NA	UJ	ND	NA	ND	UJ	R	NS	NS	NS	NS
Phenol	1.7	BMDL DJ	R	R	R	R	NA	ND	ND	NA	ND	ND	ND	NS	NS	NS	NS
Phenanthrene	8.2	BMDL DJ	330 D	485 DJ	UJ	UJ	NA	UJ	ND	NA	ND	UJ	R	NS	NS	NS	NS
WET CHEMISTRY																	
Cyanide (total) (mg/l)	.025	BMDL	BMDL	BMDL	0.0825	BMDL	NA	BMDL	BMDL	NA	BMDL	BMDL	BMDL	NS	0.2	0.2	NS
Sulfide (as S) (mg/l)	.05	0.28	0.36	0.05	BMDL	BMDL	NA	BMDL J	BMDL J	NA	BMDL J	BMDL	0.16 J	NS	NS	NS	250
Specific Conductance (um/cm)[2]		731	658	NA	1040	1392	NA	772	772	NA	425	630	756	NS	NS	NS	-
pH (std)[2]		6.38	6.25	NA	6.73	5.82	NA	5.17	5.17	NA	5.50	6.4	5.19	NS	NS	NS	6.5-8

Explanation:

ND - Compound was not detected
J - Compound is quantitatively suspect; compound was detected in the field and/or laboratory blank at a similar level
BMDL - Below Method Detection Limit
D - Dilution required to determine concentration
IND - Indeterminate; standard and/or spike could not be detected at current method levels
J - Quantitation is approximate due to limitations identified in the QA review
NA - Not Applicable/Not Analyzed
NS - No standard available
R - Unreliable result; analyte may or may not be present in this sample
UJ - Analyte was not detected, but the quantitation limit is probably higher due to a bias identified during the QA review
* - Proposed

Notes:

1. Standard detection limits shown only; detection limit may vary for individual compounds. Actual detection limits are located in the complete laboratory analytical reports.
2. Specific conductance and pH measured in the laboratory (ETC) for first round sampling only (September 1990); all others measured in the field by Dames & Moore field personnel.

Regulatory Limits/Guidelines:

NIPDWR - National Interim Primary Drinking Water Standard in mg/l
MCLG - Maximum Contaminant Level Goal in mg/l
MCL - Maximum Contaminant Level in mg/l
SMCL - Secondary Contaminant Level Goal in mg/l

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TABLE 3
PHASE I - BALLFIELDS REMEDIAL EVALUATION
DETECTED COMPOUNDS
GROUND WATER SAMPLES
CHEVRON OIL REFINERY
PHILADELPHIA, PENNSYLVANIA

Dames & Moore Sample Number Laboratory Sample Number Sample Date	Detection Limit[1]	BF105 HA3055 9/90	BF105 HA3622 12/90	BF106 HA3057 9/90	BF106 HA3626 12/90	BF107 HA3051 9/90	BF107 HA3625 12/90	FB HA3066 9/90	FB HA3630 12/90	TB HA3067 9/90	TB HA3631 12/90	Regulatory Limits/Guidelines NIPDWR	 MCLG	 MCL	 SMCL
Analytical Parameters (Units)															
APPENDIX IX METALS (mg/l)															
Antimony	0.060	ND	.081 J	ND	UJ	ND	BMDL J	ND	ND J	NA	NA	0.06	0	NS	NS
Arsenic	0.01	0.015	.03 D	0.012	0.024	0.015	0.018	ND	ND	NA	NA	0.05	0	0.05	NS
Barium	0.020	0.15	0.24	0.150	0.280	0.13	0.11	ND	ND	NA	NA	1	5*	1	NS
Beryllium	0.001	0.0014	0.005	ND	0.0018	ND	BMDL B	ND	BMDL B	NA	NA	NS	0	NS	NS
Cadmium	0.002	0.0096	BMDL	0.0032	ND	0.0045	BMDL	ND	ND	NA	NA	0.01	0.005*	0.05	NS
Chromium	0.01	0.049	0.12	0.052	0.16 J	0.011	BMDL B	ND	ND	NA	NA	0.05	0.1	0.1	NS
Cobalt	0.02	0.032	0.061	BMDL	0.034 J	BMDL	BMDL B	ND	ND	NA	NA	NS	NS	NS	NS
Copper	0.01	0.042	0.086	0.030 B	0.067 J	0.015	BMDL	0.15 B	ND	NA	NA	NS	1.3	1.3	NS
Lead	0.005	0.017	0.056	0.024	0.065 J	BMDL	BMDL	BMDL	BMDL	NA	NA	NS	0	0.05	NS
Mercury	0.0002	ND	BMDL	BMDL	0.00037	UJ	ND	ND	ND	NA	NA	0.002	0.002	0.002	NS
Nickel	0.02	0.029	0.075	0.020	0.062	BMDL	BMDL	ND	ND	NA	NA	NS	0.1	0.1	NS
Tin	0.05	0.083	BMDL J	0.056	BMDL BR	BMDL	BMDL J	ND	BMDL J	NA	NA	NS	NS	NS	NS
Vanadium	0.02	0.066	0.13	0.047	0.11	0.025	BMDL	ND	ND	NA	NA	NS	NS	NS	NS
Zinc	0.02	0.11	0.23	0.089 B	0.22 J	0.046	0.029	.029	BMDL	NA	NA	NS	NS	NS	NS
APPENDIX IX VOLATILE ORGANIC COMPOUNDS (ug/l)															
Acetone	10.0	BMDL	ND	ND	UJ	ND	ND	BMDL	ND	ND	ND	NS	NS	NS	NS
Benzene	4.4	ND	ND	29700 D	30700 DJ	543 D	611	ND	ND	ND	ND	NS	0	5	NS
Ethylbenzene	7.2	ND	ND	BMDL D	BMDL DJ	613 D	608	ND	ND	ND	ND	NS	700	700	30
Methylene Chloride	2.8	ND	ND	ND	UJ	71 B	ND	ND	ND	ND	ND	NS	0	5	NS
Toluene	6.0	ND	ND	ND	UJ	ND	ND	ND	ND	ND	ND	NS	2000	2000	40
Xylenes (total)	10.0	ND	ND	BMDL D	UJ	829 D	ND	ND	ND	ND	ND	NS	10000	10000	NS
TOTAL VOLATILE ORGANIC COMPOUNDS		BMDL	ND	29700 D	30700 DJ	1986 D	1119	BMDL	ND	ND	ND				
APPENDIX IX SEMI-VOLATILE ORGANIC COMPOUNDS (ug/l)															
Acenaphthene	2.2	R	R	UJ	UJ	ND	R	UJ	ND	NA	NA	NS	NS	NS	NS
Anthracene	2.2	R	R	UJ	UJ	UJ	36 J	UJ	ND	NA	NA	NS	NS	NS	NS
bis(2-Ethylhexyl)phthalate	12	R	R	ND	ND	UJ	R	ND	ND	NA	NA	NS	NS	NS	NS
o-Cresol	12	R	R	R	R	R	ND	R	ND	NA	NA	NS	NS	NS	NS
1,3-Dichlorobenzene	2.2	R	R	UJ	ND	ND	R	ND	ND	NA	NA	NS	75	75	NS
1,2-Dichlorobenzene	2.2	R	R	UJ	ND	ND	R	ND	ND	NA	NA	NS	75	75	NS
2,4-Dimethylphenol	3.1	R	R	R	R	R	UJ	R	ND	NA	NA	NS	NS	NS	NS
Fluorene	2.2	R	R	23.9 J	40.1	27	50.8 J	UJ	ND	NA	NA	NS	NS	NS	NS
2-Methylnaphthalene	12	ND	R	161 J	214	143 J	268 J	UJ	ND	NA	NA	NS	NS	NS	NS
Naphthalene	1.8	R	R	184 J	281	140 J	192 J	UJ	ND	NA	NA	NS	NS	NS	NS
Phenol	1.7	ND	R	R	R	ND	19.9	R	ND	NA	NA	NS	NS	NS	NS
Phenanthrene	6.2	R	R	18.7 DJ	45.2	18.4 J	R	UJ	ND	NA	NA	NS	NS	NS	NS
WET CHEMISTRY															
Cyanide (total) (mg/l)	.025	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	NA	NA	NS	0.2	0.2	NS
Sulfide (as S) (mg/l)	.05	BMDL	BMDL J	BMDL	0.07	BMDL	BMDL J	BMDL	BMDL J	NA	NA	NS	NS	NS	250
Specific Conductance (um/cm)[2]		9640	1104	1010	1017	726	1185	<10	NA	NA	NA	NS	NS	NS	-
pH (std)[2]		6.69	5.97	6.36	5.10	6.31	4.60	6.19	NA	NA	NA	NS	NS	NS	6.5-8

Explanation:

ND - Compound was not detected
B - Compound is quantitatively suspect; compound was detected in the field and/or laboratory blank at a similar level
BMDL - Below Method Detection Limit
D - Dilution required to determine concentration
IND - Indeterminate; standard and/or spike could not be detected at current method levels
J - Quantitation is approximate due to limitations identified in the QA review
NA - Not Applicable/Not Analyzed
NS - No standard available
R - Unreliable result; analyte may or may not be present in this sample
UJ - Analyte was not detected, but the quantitation limit is probably higher due to a bias identified during the QA review
* - Proposed

Notes:

1. Standard detection limits shown only; detection limit may vary for individual compounds. Actual detection limits are located in the complete laboratory analytical reports.
2. Specific conductance and pH measured in the laboratory (ETC) for first round sampling only (September 1990); all others measured in the field by Dames & Moore field personnel.

Regulatory Limits/Guidelines:
NIPDWR - National Interim Primary Drinking Water Standard in mg/l
MCLG - Maximum Contaminant Level Goal in mg/l
MCL - Maximum Contaminant Level in mg/l
SMCL - Secondary Contaminant Level Goal in mg/l

TABLE 4

GROUND WATER ELEVATIONS
CHEVRON OIL REFINERY
PHILADELPHIA, PENNSYLVANIA
OCTOBER 4, 1990

WELL ID	WELL ELEVATION (feet)	DEPTH TO WATER (feet)	DEPTH TO FREE-PHASE HYDROCARBONS (feet)	FREE-PHASE HYDROCARBONS THICKNESS (feet)	GROUND WATER ELEVATION (feet)	CORRECTED GROUND WATER ELEVATION (feet)
SHALLOW WELLS						
BF-88	12.93	11.53	ND	NA	1.40	NA
BF-89	11.81	10.94	ND	NA	0.87	NA
BF-90	9.68	2.37	ND	NA	7.31	NA
BF-99	13.37	12.17	12.05	0.12	1.20	1.30
BF-100	14.62	13.76	ND	NA	0.86	NA
BF-103	16.73	15.71	ND	NA	1.02	NA
BF-104	13.00	11.42	NA	NA	1.58	NA
BF-105	13.26	13.39	ND	NA	-0.13	NA
BF-106	14.83	14.95	14.93	0.02	-0.12	-.103
BF-107	13.65	13.57	13.55	0.02	0.08	.097
C-95	14.84	6.13	ND	NA	8.71	NA
C-50	15.35	8.01	ND	NA	7.34	NA
DEEP WELLS						
A-19D	11.69	14.37	ND	NA	-2.68	NA
B-48D	9.82	12.75	ND	NA	-2.93	NA
C-50D	13.76	13.05	ND	NA	0.71	NA

Explanation:

ND - Not Detected
NA - Not Applicable

Notes:

1. All measurements taken to top of PVC casing on 10/4/90 between 1140 and 1330 hours.
2. All measurements taken using an ORS (Oil Recovery Services) interphase probe.
3. Elevations are in feet above mean sea level based on National Geodetic Vertical Datum.
4. Corrected water table elevation equals the free-phase hydrocarbon thickness times the approximate specific gravity of the free-phase hydrocarbon (assumed 0.85) plus the water table elevation.

AAW012F5

TABLE 4A

GROUND WATER ELEVATIONS
CHEVRON OIL REFINERY
PHILADELPHIA, PENNSYLVANIA
DECEMBER 11, 1990

WELL ID	WELL ELEVATION (feet)	DEPTH TO WATER (feet)	DEPTH TO FREE-PHASE HYDROCARBONS (feet)	FREE-PHASE HYDROCARBONS THICKNESS (feet)	GROUND WATER ELEVATION (feet)	CORRECTED GROUND WATER ELEVATION (feet)
SHALLOW WELLS						
BF-88	12.93	11.96	ND	NA	0.97	NA
BF-90	9.68	2.18	ND	NA	7.50	NA
BF-99	13.37	12.65	12.50	0.15	0.72	0.85
BF-100	14.62	14.23	ND	NA	0.39	NA
BF-101	9.03	8.03	ND	NA	1.00	NA
BF-102	8.40	2.90	ND	NA	5.50	NA
BF-103	16.73	DRY	NA	NA	NA	NA
BF-104	13.00	11.58	ND	NA	1.42	NA
BF-105	13.26	13.85	ND	NA	-0.59	NA
BF-106	14.83	15.48	15.44	0.04	-0.65	-0.62
BF-107	13.65	14.08	14.04	0.04	-0.43	-0.40
C-95	14.84	6.88	ND	NA	7.96	NA
DEEP WELLS						
A-19D	11.69	14.93	ND	NA	-3.24	NA
A-21D	12.80	17.64	ND	NA	-5.46	NA
B-48D	9.82	13.41	ND	NA	-3.59	NA
C-50D	13.76	13.62	ND	NA	0.14	NA

Explanation:

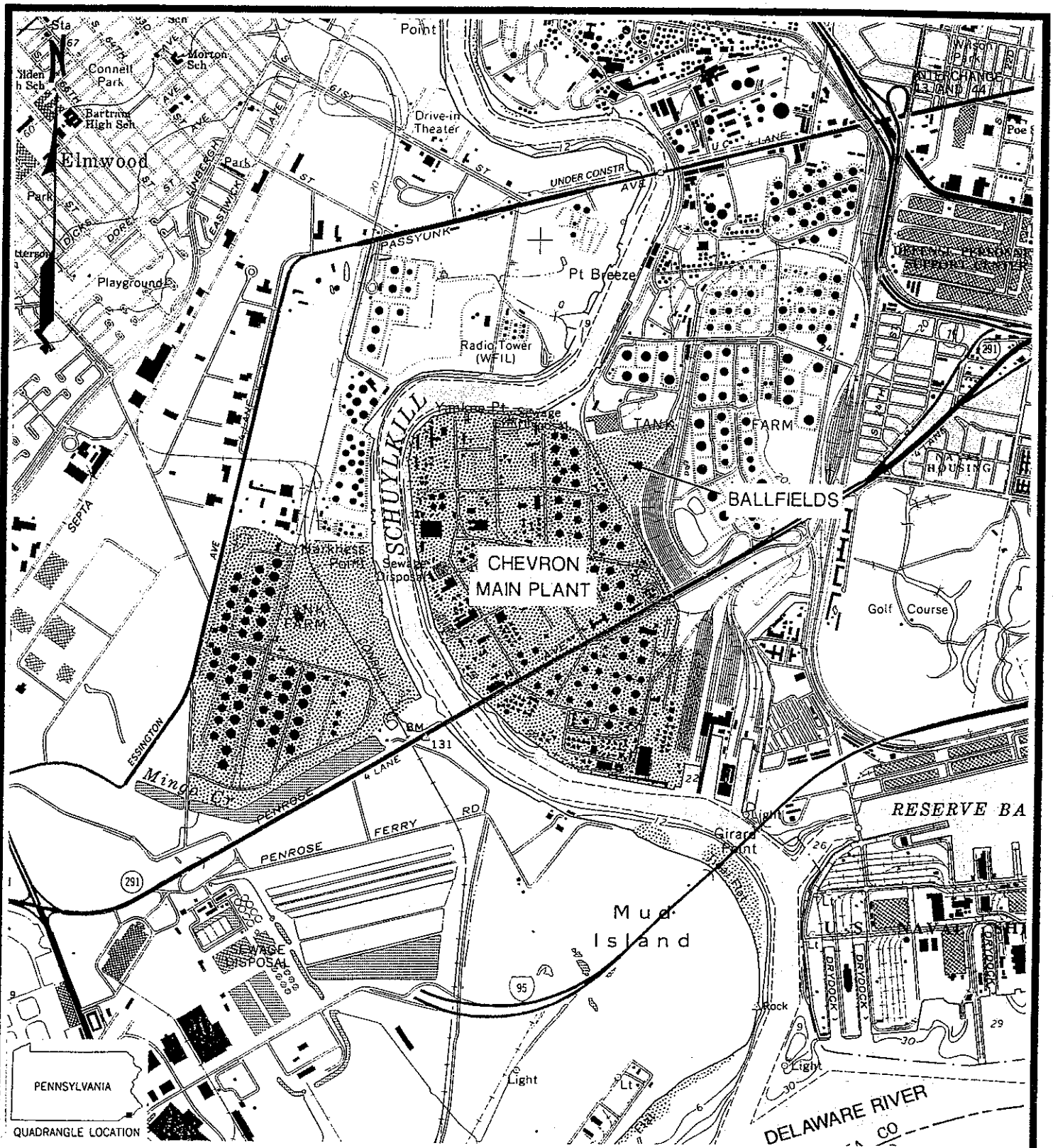
ND - Not Detected
NA - Not Applicable

Notes:

1. All measurements taken to top of PVC casing on 12/11/90 between 0930 and 1145 hours.
2. All measurements taken using an ORS (Oil Recovery Services) interphase probe.
3. Elevations are in feet above mean sea level based on National Geodetic Vertical Datum.
4. Corrected water table elevation equals the free-phase hydrocarbon thickness times the approximate specific gravity of the free-phase hydrocarbon (assumed 0.85) plus the water table elevation.

AAW012F5

FIGURES



0 1000 2000 3000 FEET

GRAPHIC SCALE

CONTOUR INTERVAL = 20 FEET

REFERENCE:
A PORTION OF USGS 7.5 MINUTE TOPOGRAPHIC MAP; PHILADELPHIA QUADRANGLE, PENNSYLVANIA, 1967, PHOTOREVISED 1985.

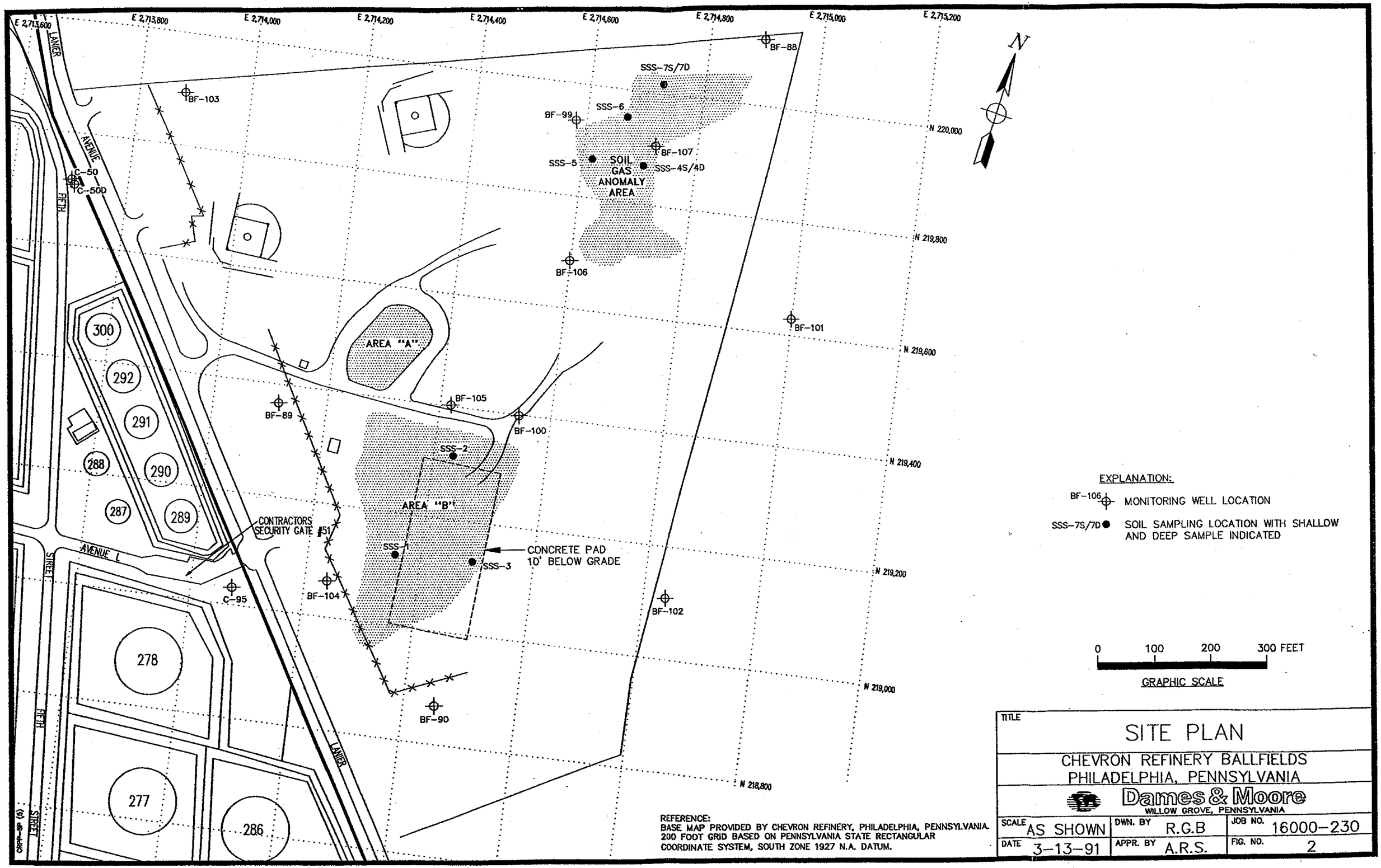
CRPP-SVM (1)

TITLE
SITE VICINITY MAP

PROJ. CHEVRON SCHUYLKILL RIVER TANK FARM
PHILADELPHIA, PENNSYLVANIA

Dames & Moore
WILLOW GROVE, PENNSYLVANIA

SCALE AS SHOWN	DWN. BY R.G.B.	JOB NO. 16000-230
DATE 2-18-91	APPR. BY M.P.	FIG. NO. 1



REFERENCE:
BASE MAP PROVIDED BY CHEVRON REFINERY, PHILADELPHIA, PENNSYLVANIA.
200 FOOT GRID BASED ON PENNSYLVANIA STATE RECTANGULAR
COORDINATE SYSTEM, SOUTH ZONE 1927 N.A. DATUM.

TITLE

SITE PLAN

CHEVRON REFINERY BALLFIELDS
PHILADELPHIA, PENNSYLVANIA

Dames & Moore
WILLOW GROVE, PENNSYLVANIA

SCALE	AS SHOWN	DWN. BY	R.G.B	JOB NO.	16000-230
DATE	3-13-91	APPR. BY	A.R.S.	FIG. NO.	2

EXPLANATION:

8.0 VERTICAL ELEVATIONS REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM (NGUD)

MW 102 + MONITORING WELL LOCATION

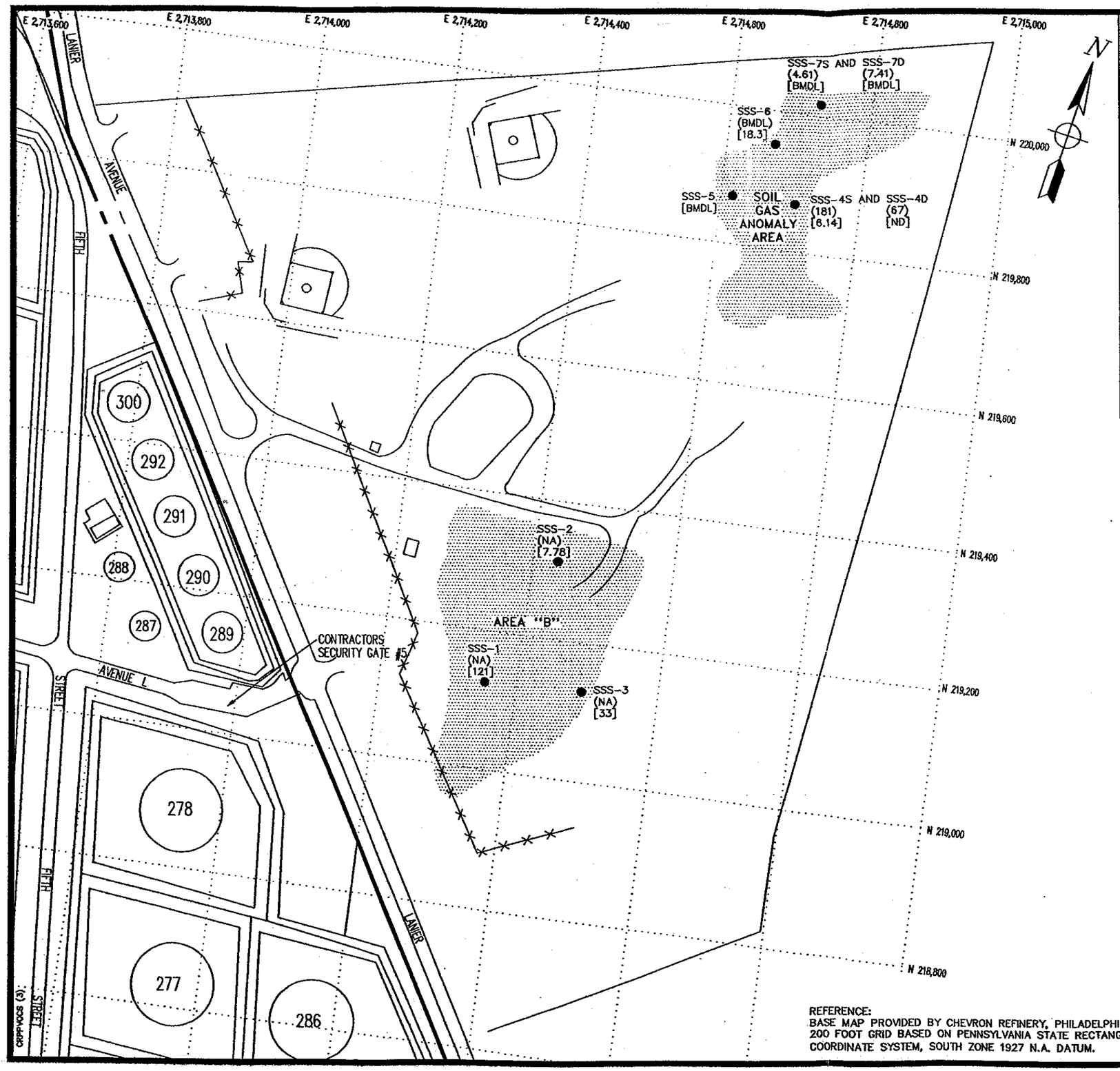
NOTE:

FIELD ELEVATIONS TAKEN ON DECEMBER 11, 1990.

SOURCE:
PENNONI ASSOCIATES INC.
515 GROVE STREET
HADDON HEIGHTS, NEW JERSEY 08035

TITLE: TOPOGRAPHIC SURVEY		
PROJECT: CHEVRON REFINERY BALLFIELDS PHILADELPHIA, PENNSYLVANIA		
Dames & Moore WILLOW GROVE, PENNSYLVANIA		
SCALE: 1"=100'	DWN. BY: R.G.B.	JOB NO.: 16000-230
DATE: 1-29-91	APPR. BY: A.R.S.	FIG. NO.: 3

QRPP--TS (1)



DETECTED VOCs IN SOIL SAMPLES

SAMPLE ID	SAMPLE DEPTH(1)	TOTAL VOC COMPOUNDS(2)	TCLP VOC COMPOUNDS(3)	CONCENTRATION(4)
SSS-1	3.0	NA	BENZENE	121ug/kg
SSS-2	6.0	NA	BENZENE	7.78ug/kg
SSS-3	4.0	NA	BENZENE	33ug/kg
SSS-4S	5.0	METHYLENE CHLORIDE BENZENE METHYL ETHYL KEYTONE	 BENZENE	5.79ug/kgJ 33.3ug/kg 35.8ug/kg 6.1ug/kg
SSS-4D	8.0	METHYLENE CHLORIDE BENZENE ETHYLBENZENE TOTAL XYLENES	 ND	3.61ug/kgJ 5.46ug/kg 26.3ug/kg 31.4ug/kg ND
SSS-5	7.0	METHYLENE CHLORIDE BENZENE ETHYLBENZENE TOTAL XYLENES	 ND	3,470ug/kg 78,200ug/kg 75,400ug/kg 293,000ug/kg BMDL
SSS-6	10.0	ND	 BENZENE	ND 18.3ug/kg
SSS-7S	2.0	METHYLENE CHLORIDE	 ND	4.61ug/kgJ BMDL
SSS-7D	8.0	METHYLENE CHLORIDE	 ND	7.41ug/kgJ BMDL

EXPLANATION:

SSS-4S● SOIL SAMPLE LOCATION
(181) TOTAL VOC CONCENTRATION
[6.14] TCLP VOC CONCENTRATION
BMDL BELOW MINIMUM DETECTION UNIT
ND NOT DETECTED
NA NOT ANALYZED
J ESTIMATED VALUE

NOTES:

(1) DEPTH IN FEET BELOW LAND SURFACE
(2) VOC COMPOUNDS AS DETECTED BY USEPA METHOD No. 8240.
(3) VOC COMPOUNDS DETECTED BY TOXIC CHARACTERISTIC LEACHING PROCEDURE METHOD.
(4) ALL CONCENTRATIONS IN MICROGRAMS PER KILOGRAM (ug/kg) OR APPROXIMATE PARTS PER BILLION (ppb).

0 100 200 300 FEET

GRAPHIC SCALE

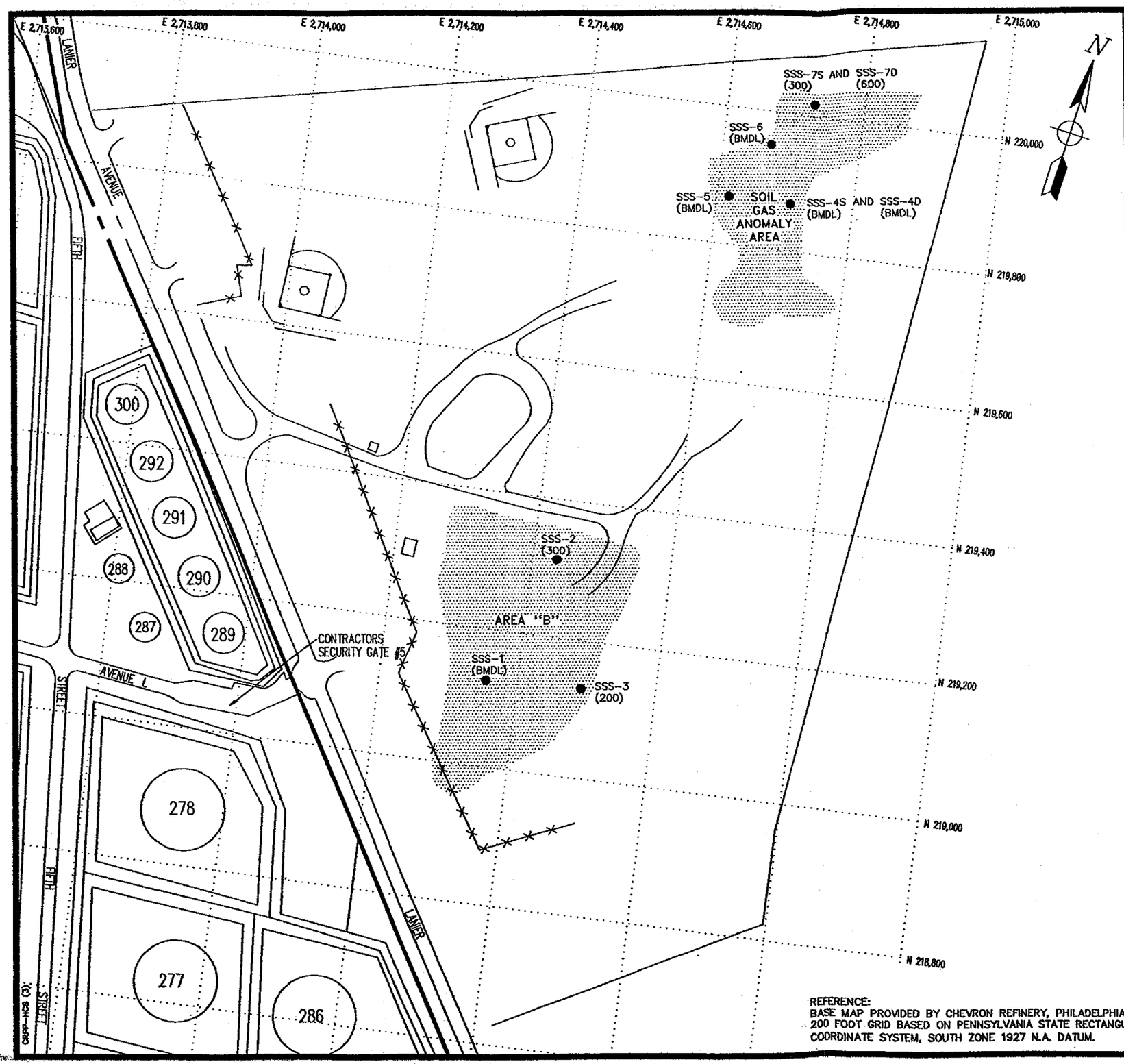
REFERENCE:
BASE MAP PROVIDED BY CHEVRON REFINERY, PHILADELPHIA, PENNSYLVANIA. 200 FOOT GRID BASED ON PENNSYLVANIA STATE RECTANGULAR COORDINATE SYSTEM, SOUTH ZONE 1927 N.A. DATUM.

TITLE
CONCENTRATIONS OF TOTAL AND TCLP VOCs IN SOIL
CHEVRON REFINERY BALLFIELDS
PHILADELPHIA, PENNSYLVANIA

Dames & Moore
WILLOW GROVE, PENNSYLVANIA

SCALE	DWN. BY	JOB NO.
AS SHOWN	R.G.B	16000-230
DATE	APPR. BY	FIG. NO.
3-13-91	A.R.S.	4

QRPPVOCS (3)



DETECTED TCLP METALS IN SAMPLES				
SAMPLE ID	SAMPLE DEPTH(1)	TCLP METALS(2)	DETECTED CONCENTRATION(3)	TCLP CONCENTRATION(4)
SSS-1	3.0	ARSENIC	0.031	5.0
		BARIUM	0.81	100.0
		CHROMIUM	0.037	5.0
SSS-2	6.0	ARSENIC	0.011	5.0
		BARIUM	0.81	100.0
		CHROMIUM	0.12	5.0
SSS-3	4.0	ARSENIC	0.12	5.0
		BARIUM	0.84	100.0
		CHROMIUM	0.01	5.0
		SILVER	0.057	5.0
SSS-4S	5.0	ARSENIC	0.12	5.0
		BARIUM	0.66	100.0
		LEAD	0.83	5.0
		CADMIUM	0.004	1.0
SSS-4D	8.0	ARSENIC	0.01	5.0
		BARIUM	0.3	100.0
		CADMIUM	0.002	1.0
		CHROMIUM	0.033	5.0
		LEAD	0.13	5.0
SSS-5	7.0	ARSENIC	0.019	5.0
SSS-6	10.0	BARIUM	0.28	100.0
		CHROMIUM	0.56	5.0
		LEAD	0.11	5.0
SSS-7S	2.0	BARIUM	0.38	100.0
		LEAD	0.27	5.0
SSS-7D	8.0	BARIUM	0.066	100.0
		CADMIUM	0.004	1.0
		CHROMIUM	0.064	5.0
		LEAD	0.079	5.0

EXPLANATION:

SSS-2 (300) ● SOIL SAMPLE LOCATION SHOWING TOTAL HEXAVALENT CHROMIUM CONCENTRATION IN mg/kg

BMDL BELOW MINIMUM DETECTION UNIT

NOTES:

(1) DENOTES SAMPLE DEPTH IN FEET BELOW GROUND SURFACE.

(2) SPECIFIC METAL DETECTED BY TOXIC CHARACTERISTIC LEACHING PROCEDURE (TCLP) ANALYSES.

(3) ALL CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (mg/kg) OR APPROXIMATE PARTS PER MILLION (ppm).

(4) CONCENTRATION LIMIT FOR CHARACTERISTIC OF TOXICITY.

0 100 200 300 FEET

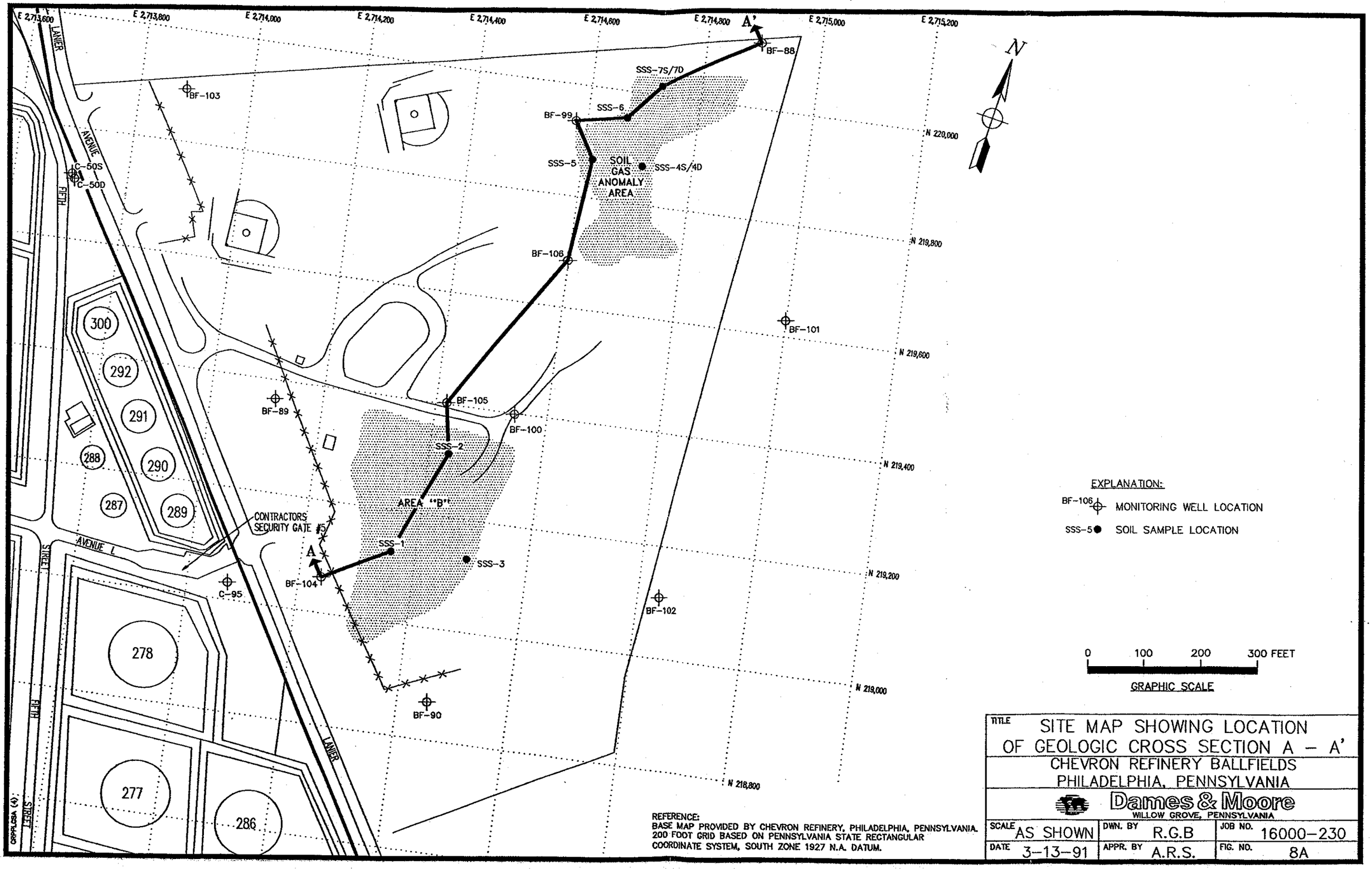
GRAPHIC SCALE

REFERENCE:
BASE MAP PROVIDED BY CHEVRON REFINERY, PHILADELPHIA, PENNSYLVANIA.
200 FOOT GRID BASED ON PENNSYLVANIA STATE RECTANGULAR COORDINATE SYSTEM, SOUTH ZONE 1927 N.A. DATUM.

TITLE CONCENTRATIONS OF HEXAVALENT CHROMIUM AND TCLP METALS IN SOIL
CHEVRON REFINERY BALLFIELDS
PHILADELPHIA, PENNSYLVANIA

Dames & Moore
WILLOW GROVE, PENNSYLVANIA

SCALE	AS SHOWN	DWN. BY	R.G.B	JOB NO.	16000-230
DATE	3-13-91	APPR. BY	A.R.S.	FIG. NO.	6

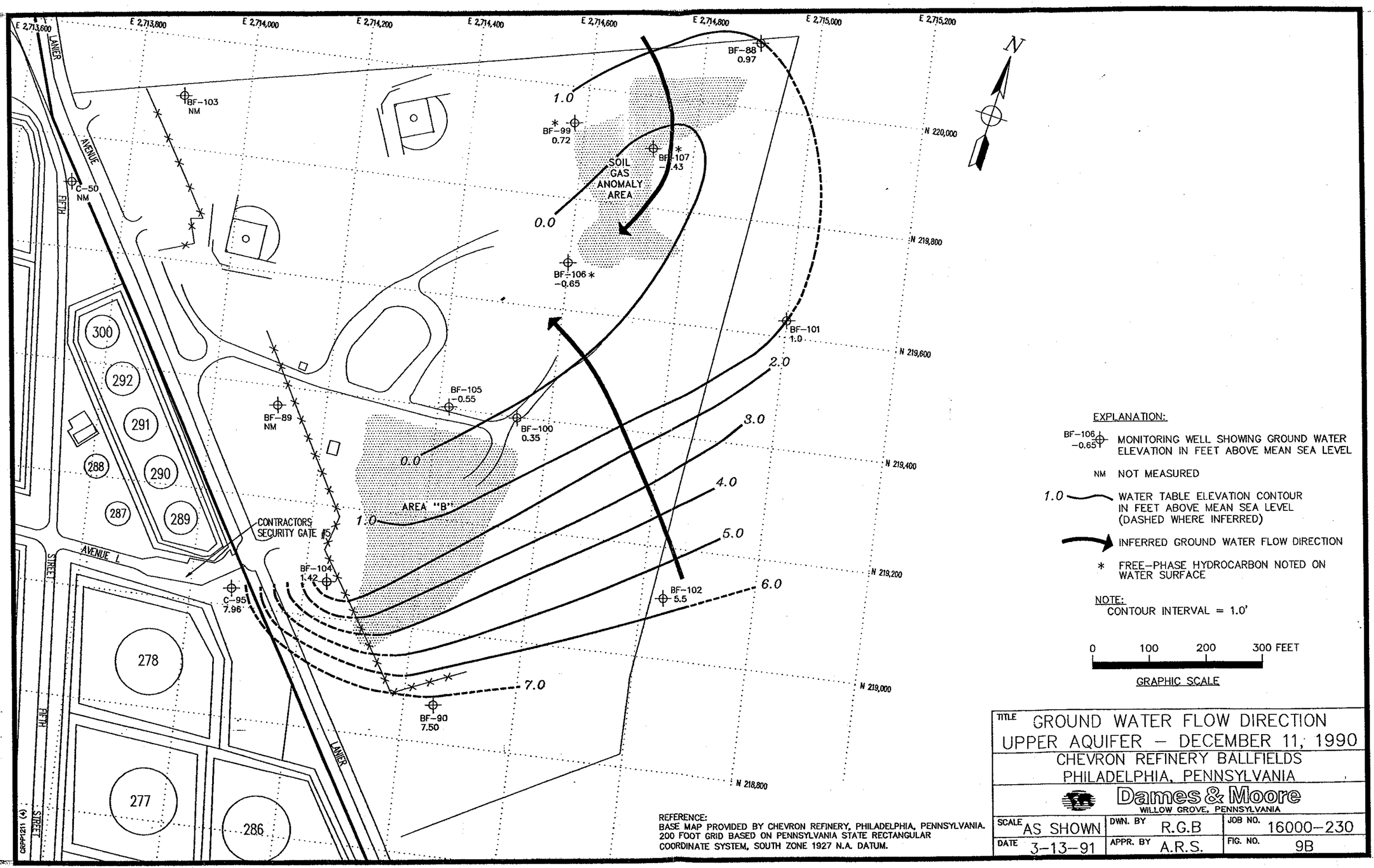


REFERENCE:
BASE MAP PROVIDED BY CHEVRON REFINERY, PHILADELPHIA, PENNSYLVANIA.
200 FOOT GRID BASED ON PENNSYLVANIA STATE RECTANGULAR
COORDINATE SYSTEM, SOUTH ZONE 1927 N.A. DATUM.

TITLE: SITE MAP SHOWING LOCATION OF GEOLOGIC CROSS SECTION A – A'
CHEVRON REFINERY BALLFIELDS
PHILADELPHIA, PENNSYLVANIA

Dames & Moore
WILLOW GROVE, PENNSYLVANIA

SCALE	DWN. BY	JOB NO.
AS SHOWN	R.G.B	16000-230
DATE	APPR. BY	FIG. NO.
3-13-91	A.R.S.	8A



EXPLANATION:

BF-106 −0.65 — MONITORING WELL SHOWING GROUND WATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

NM — NOT MEASURED

1.0 — WATER TABLE ELEVATION CONTOUR IN FEET ABOVE MEAN SEA LEVEL (DASHED WHERE INFERRED)

INFERRED GROUND WATER FLOW DIRECTION

* — FREE-PHASE HYDROCARBON NOTED ON WATER SURFACE

NOTE:
CONTOUR INTERVAL = 1.0'

0 100 200 300 FEET

GRAPHIC SCALE

REFERENCE:
BASE MAP PROVIDED BY CHEVRON REFINERY, PHILADELPHIA, PENNSYLVANIA.
200 FOOT GRID BASED ON PENNSYLVANIA STATE RECTANGULAR COORDINATE SYSTEM, SOUTH ZONE 1927 N.A. DATUM.

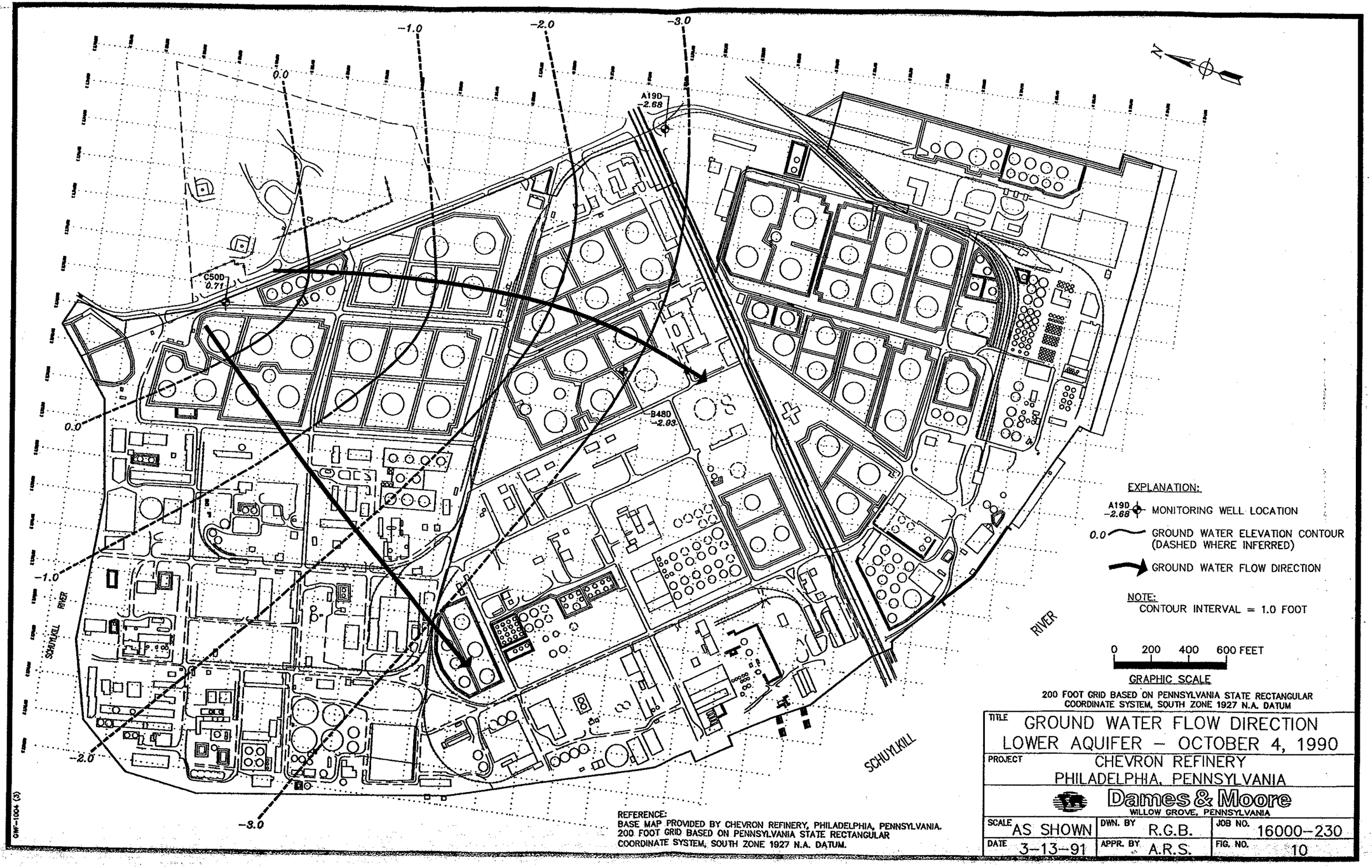
TITLE: GROUND WATER FLOW DIRECTION
UPPER AQUIFER – DECEMBER 11, 1990

CHEVRON REFINERY BALLFIELDS
PHILADELPHIA, PENNSYLVANIA

Dames & Moore
WILLOW GROVE, PENNSYLVANIA

SCALE	DWN. BY	JOB NO.
AS SHOWN	R.G.B	16000-230
DATE	APPR. BY	FIG. NO.
3-13-91	A.R.S.	9B

CRPP1211 (4)



REFERENCE:
BASE MAP PROVIDED BY CHEVRON REFINERY, PHILADELPHIA, PENNSYLVANIA.
200 FOOT GRID BASED ON PENNSYLVANIA STATE RECTANGULAR COORDINATE SYSTEM, SOUTH ZONE 1927 N.A. DATUM.

TITLE: GROUND WATER FLOW DIRECTION LOWER AQUIFER – OCTOBER 4, 1990		
PROJECT: CHEVRON REFINERY PHILADELPHIA, PENNSYLVANIA		
Dames & Moore WILLOW GROVE, PENNSYLVANIA		
SCALE: AS SHOWN	DWN. BY: R.G.B.	JOB NO.: 16000-230
DATE: 3-13-91	APPR. BY: A.R.S.	FIG. NO.: 10

OWF-1004 (3)

APPENDIX A

APPENDIX A

HISTORICAL INVESTIGATIONS OF BALLFIELDS AREA

APPENDIX A-1

FINAL REPORT
INVESTIGATIONS OF AREA B
BALLFIELDS
CHEVRON REFINERY
PHILADELPHIA, PENNSYLVANIA

AUGUST 30, 1988

Dames & Moore

CONTENTS

TABLES

FIGURES

To accomplish these objectives, we performed a scope of work consisting of these tasks:

Task 1 - Acquisition and Review of Historical Aerial Photographs
Task 2 - Sampling Grid Preparation
Task 3 - Soil Sample Collection
Task 4 - Laboratory Analysis
Task 5 - Data Evaluation
Task 6 - Report Preparation

Task 1 has already been discussed under Section 1.2. Tasks 2 and 3 are discussed in Section 3.0, and the results of Tasks 4 and 5 are presented in Section 4.0. Section 5.0 presents our conclusions. Section 6.0 presents our recommendations.

3.0 FIELD PROCEDURES

This section describes the field procedures conducted during this investigation. Also presented are our field observations and measurements.

3.1 SAMPLING GRID PREPARATION

On March 18, 1988, Dames & Moore field personnel took measurements in order to draw a rough map of Area B (Figure 2). From this map, 19 test pit locations were measured and marked in the field.

Dames & Moore collected soil samples for laboratory analysis by excavating 19 test pits in Area B using a backhoe (see Figure 2). Excavation of the pits began on March 21, 1988, and was completed by March 22, 1988. The pits were approximately 3 to 6 feet wide and were excavated until concrete was encountered approximately 3 feet below the original ground surface. Excavated soil was placed adjacent to each pit.

3.2 SOIL SAMPLE COLLECTION

Soil samples were obtained for visual examination, photoionization detector (PID) headspace readings, and laboratory analysis from 17 of the 19 pits (see Tables 1 and 2). At each of the 17 locations, samples for visual examination and PID headspace analysis were taken at approximate 3-foot intervals. See Table 1 for sample depths. Composite soil samples for laboratory analysis were obtained from the pile of excavated soil adjacent to each pit.

Each of the 17 samples collected for chemical analyses was placed in a laboratory-prepared glass jar with a Teflon-lined cap, packed in a cooler with ice, and shipped to Century Laboratories of Thorofare, New Jersey, for analysis as discussed under Section 4.2. In addition, separate samples were placed in driller jars and transported to our soils laboratory in Trevose, Pennsylvania, where headspace measurements of volatile organic

compounds (VOCs) were obtained using a PID (see Table 1 for PID headspace readings). PID scans were also conducted throughout the piles of excavated soil (see Figure 3 and Section 3.3 for PID readings measured in field). Photographs were taken of all pits. The pits were backfilled with excavated soil and the area was graded to a level surface. Marker stakes were left at all locations.

3.3 FIELD OBSERVATIONS AND MEASUREMENTS

Observations and measurements were made during excavation and sampling of the pits. Our observations and measurements are:

- The Area B soil mound ranges in height from approximately 6 to 12 feet, with the highest part located in the east-central portion of the mound.
- The mound covers approximately 110,000 square feet of surface area.
- Approximately 32,000 cubic yards of soil exist in the mound.
- The mound was vegetated.
- No ponded water existed on top of the mound.
- In general, two soil types exist in Area B. The first and most abundant type of soil can be found in the northern three-quarters of the mound. This soil consists of black, oil-saturated silty clay with trace sand and has a petroleum hydrocarbon odor. The silty clay becomes gravelly in areas. PID readings ranged from 0 to 60 ppm (PID units) in the excavated soil. Within this soil are small lenses of a white sand-like material and small lenses of oil-saturated silt and clay containing white nodules. Approximately 23,000 cubic yards of this type of soil is present in Area B.

  The second type of soil exists in the southern quarter of the mound and is also found as a thin veneer covering the northern three-quarters of the mound. This soil was also the predominant type noted in Test Pit 3. It consists of a brown silty clay with little to some fine to medium sand, and trace to little fine gravel, and has a petroleum hydrocarbon odor in isolated areas. PID readings ranged from 0 to 10 ppm (PID units). Approximately 9,000 cubic yards of this type of soil exists. A line delineating the two soil types is shown on Figure 2. A cross section depicting the soil types and other observations noted during the field investigation is presented on Figure 3.

- A concrete pad was encountered beneath the entire area excavated at Test Pits B2, B5, B6, B7, B8, B10, B13, B14, and B15. Test Pits B4, B16, and B17 were partially underlain by concrete (see Figure 2).

- Below the concrete (as noted in Test Pits B14, B16, and B17) is a black silty sand with gravel, tar, slag, wood, pipes, and other miscellaneous debris. This layer has a slight petroleum hydrocarbon odor and is believed to be the same material that is found throughout the Ballfields area (i.e., the bed of old railroad yard). Below this layer is a light-brown silty sand with trace gravel and trace to little clay.

- Ground water, possibly perched, was encountered in Test Pits B3, B11, B14, and B16, approximately 3 feet below the concrete.

- Area B contains various types of debris scattered evenly throughout the northern three-quarters of the mound. Very little debris was found within the southern quarter of the mound. The debris consists of metal, bars, pipes, tires, rubber, concrete, macadam, wood, and other miscellaneous materials.

4.0 RESULTS

This section contains the results of the PID headspace analysis and laboratory analysis performed on selected soil samples.

4.1 PID HEADSPACE ANALYSIS

All soil samples collected were transported to our laboratory in Trevose, Pennsylvania, for PID headspace analysis (see Table 1). Significant positive readings were obtained from several soil samples. Soil samples collected from the northern three-quarters of the mound had PID readings that ranged from 0 to 150 ppm (PID units). Samples collected from the southern quarter had PID readings of 0 ppm (PID units).

4.2 CHEMICAL ANALYSIS

Dames & Moore collected 17 composite soil samples for laboratory analysis. Composite samples B1, B2, B3, B4, B5, B6, B7, B9, B10, B11, B12, B13, B14, and B16 were analyzed for those parameters on the Modified Skinner List for Petroleum Refinery Waste (see Appendix A) plus polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH), and total cyanide. Composite samples B15 and B18 were analyzed for the same parameters previously mentioned, with the exception of the VOC portion of the Modified Skinner List. In addition, composite samples B5, B11, and B15 were also analyzed for Extraction Procedure Toxicity (EP Tox) organics and inorganics. Composite sample B18-RRB,

- In comparison to cleanup guidelines or concentrations of concern typically used by state officials, the concentrations of B/Ns, VOCs, TPH, and metals are significant for those soils in the northern three-quarters of Area B. Typical cleanup guidelines used by the Pennsylvania Department of Environmental Rsources (PADER) for the various parameters detected in the Area B soils are presented on Table 3. Note that the levels presented on Table 3 are subject to change based on the area of contamination and the potential for impact to the enviornment.

- The southern quarter of Area B contains insignificant concentrations of B/Ns, VOCs, TPH, and metals.

- The concentrations of B/Ns, VOCs, and TPH were not as elevated in Test Pits B3 and B6 as they were in other pits in the northern three-quarters of Area B.

- The concentrations of PCBs throughout Area B are insignificant, except for an isolated area surrounding Test Pit B1.

- Based on our experience, the total cyanide concentrations are insignificant throughout the mound of Area B soils.

- Based on the RCRA characterization analysis (see Appendix B), the soil appears to be non-hazardous.

- Sample B18-RRB, which was collected below the Area B soils from an asphlt-like material believed to be an old railroad bed, contained a significant concentration of lead (637 ppm). No other parameters tested were detected in significant concentrations in this sample.

6.0 RECOMMENDATIONS

Dames & Moore recommends that a feasibility study be performed to evaluate the most cost-effective and environmentally sound remedial alternative for the contaminants found in the Area B soils.

Remedial alternatives that should be investigated during the feasibility study include, but should not be limited to off-site disposal, on-site treatment such as bioremediation (landfarming), incineration by the rotary kiln method, and stabilization.

Dames & Moore appreciated the opportunity to prepare this report for Chevron and we look forward to working with you in the future.

DAMES & MOORE
A Professional Limited Partnership

Frank J. Vernese (FJV)
Partner, Ltd.

Ralph T. Golia
Ralph T. Golia, P.G.
Project Manager

David Wagner
David J. Wagner
Staff Geologist

FJV/RTG/DJW:lb

2904R

TABLE 1

GENERAL SOIL SAMPLING DATA
BALLFIELDS - AREA B
CHEVRON REFINERY
PHILADELPHIA, PENNSYLVANIA
MARCH 23, 1988

Sample Point I.D.	Approximate Depth (ft)	PID Headspace Readings - ppm (PID Units)
B1	3	40
	6	50
	9	25
B2	3	50
	6	30
B3	3	70
	6	115
B4	3	10
	6	15
B5	2.5	20
	3-5	30
	6	40
B6	2.5	0
	5	1
B7	3	35
	6	70
B8	3	15
	6	100
B9	3	50
	6	15
B10	3	95
	6	60
B11	3	0
	6	50
	9	70
B12	3	1
	6	70
	9	70
B13	3	0
	6	0
B14	2	150
	5	110
B15	3	0
	6	0
B16	3	0
	6	0
B18	3	0
	6	0

2812R

TABLE 2

SUMMARY OF ANALYTICAL LABORATORY DATA
BALLFIELDS - AREA B
CHEVRON REFINERY
PHILADELPHIA, PENNSYLVANIA
MARCH 23, 1988

mposite Sample I.D.	B1	B2	B3	B4	B5	B6	B7	B9	B10	B11	B12	B13	B14	B15	B16	B18	B18-RRB
rameters																	
se/Neutral Extractable Organics (ug/kg)																	
Flourene	970	58000	710	26000	34000	J	360000	U	14000	30000	J	U	16000	U	U	U	U
Flouranthene	390	U	110	77000	U	J	8600	5200	U	U	U	95	520	U	U	U	U
Pyrene	1600	38000	1300	160000	10000	590	32000	12000	U	60000	J	100	2000	U	180	130	U
Chrysene	1200	16000	400	38000	8700	J	18000	J	U	U	U	U	1300	U	U	U	U
Phenanthrene	2800	62000	770	62000	24000	J	160000	J	J	58000	J	U	10000	U	U	U	93
Naphthalene	420	46000	U	U	U	U	90000	U	U	U	U	U	2200	U	U	U	U
Benzo(a)Anthracene	J	U	J	41000	3600	U	U	U	U	U	U	J	U	U	U	U	U
Benzo(a)Pyrene	740	U	320	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Anthracene	U	J	U	23000	U	U	U	U	U	U	U	U	U	U	U	U	U
Di-N-Butylphthalate	U	U	180	U	U	U	U	U	U	U	U	U	U	U	130	U	J,B
Bis(2-Ethylhexyl) Phthalate	U	U	470	U	U	U	U	U	U	U	U	J,B	U	J	U	U	U
Benzo(b)Flouranthene	U	U	U	32000	U	U	U	U	U	U	U	U	U	U	U	U	U
Indeno (1,2,3-cd)Pyrene	U	U	U	27000	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo(g,h,i) Perylene	U	U	U	8100	U	U	U	U	U	U	U	U	U	U	U	U	U
TOTAL*	8120	220000	4260	494100	80300	590	668600	17200	14000	148000	-	195	32020	-	310	130	93
olatile Organics (ug/kg)																	
Benzene	140	60000	U	U	9000	U	2800	U	66000	J	J	U	U	NS	U	NS	U
Toluene	5	55000	J	J	U	U	J	U	U	U	U	U	U	NS	U	NS	U
Xylenes	88	330000	6	U	U	U	37000	U	110000	18000	7900	U	U	NS	U	NS	U
Ethylbenzene	62	47000	U	U	U	U	52000	U	30000	5200	2500	U	U	NS	U	NS	U
TOTAL*	295	492000	6	-	9000	-	91800	-	206000	23200	10400	-	-	NS	-	NS	-

TABLE 2 (Continued)

SUMMARY OF ANALYTICAL LABORATORY DATA
BALLFIELDS - AREA B
CHEVRON REFINERY
PHILADELPHIA, PENNSYLVANIA
MARCH 23, 1988

Composite Sample I.D.	B1	B2	B3	B4	B5	B6	B7	B9	B10	B11	B12	B13	B14	B15	B16	B18	B18-RRB
Parameters																	
Metals (mg/kg)																	
Antimony	3.24	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	21.2
Barium	101	383	9.40	143	86.0	112	225	141	178	210	182	51.9	89.2	40.7	58.1	34.8	41.5
Beryllium	U	U	U	U	1.36	U	1.61	U	1.29	2.51	U	U	U	U	U	U	U
Cadmium	U	3.00	U	1.93	3.00	2.64	3.50	1.62	2.33	2.41	2.70	1.42	2.18	1.33	1.67	1.44	U
Chromium	55.9	3710	99.2	165	103	73.7	1190	125	425	668	421	19.7	340	19.4	18.3	16.1	5.35
Cobalt	10.6	66.0	17.2	17.6	16.1	14.2	62.4	10.1	19.4	28.2	24.7	U	U	U	U	U	U
Mercury	0.507	2.64	0.751	1.77	1.78	0.867	3.08	1.31	2.48	2.52	1.35	0.269	0.218	0.217	0.333	U	U
Nickel	20.3	83.1	40.6	122	84.6	88.1	258	26.8	54.1	66.6	38.0	11.4	48.4	11.70	11.9	11.1	13.8
Vanadium	37.9	71.4	35.0	69.1	186	201	243	54.8	105	95.8	80.9	26.3	70.4	25.3	23.6	24.2	U
Arsenic	99.5	16.5	7.74	36.7	2.18	3.47	22.9	9.41	10.1	7.76	10.3	6.87	6.80	3.98	5.48	4.49	3.98
Lead	280	263	216	472	183	237	479	191	264	242	559	110	151	46.3	179	30.3	637
Selenium	0.926	1.01	U	0.942	2.46	U	5.38	1.88	3.62	3.10	2.94	1.89	3.81	2.11	2.82	2.37	2.68
Miscellaneous (mg/kg)																	
Total Cyanide	0.3	3.7	0.5	U	0.72	U	1.4	0.4	2.7	U	1.7	U	3.2	U	0.2	U	NS
Total Petroleum Hydrocarbons	5800	18000	580	5400	2200	1200	32000	13000	9800	82	13000	150	3500	82	740	170	NS
PCBs																	
Aroclor 1248	51	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	U	U	1.4	0.4	U	U	U	U	U	U	U	0.3	U	U	0.53	U	U

Key:
U - Indicates compound was analyzed for but not detected, based on necessary concentration/dilution
B - This flag is used when the analyte is found in the blank as well as the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.
J - Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicates the presence of a compound at levels below the specified detection limit.
NS - Not Sampled.
* - Total Excluding B & J

Sample B18-RRB was taken below the concrete from the bed of the old railroad yard.
2815R

TABLE 3

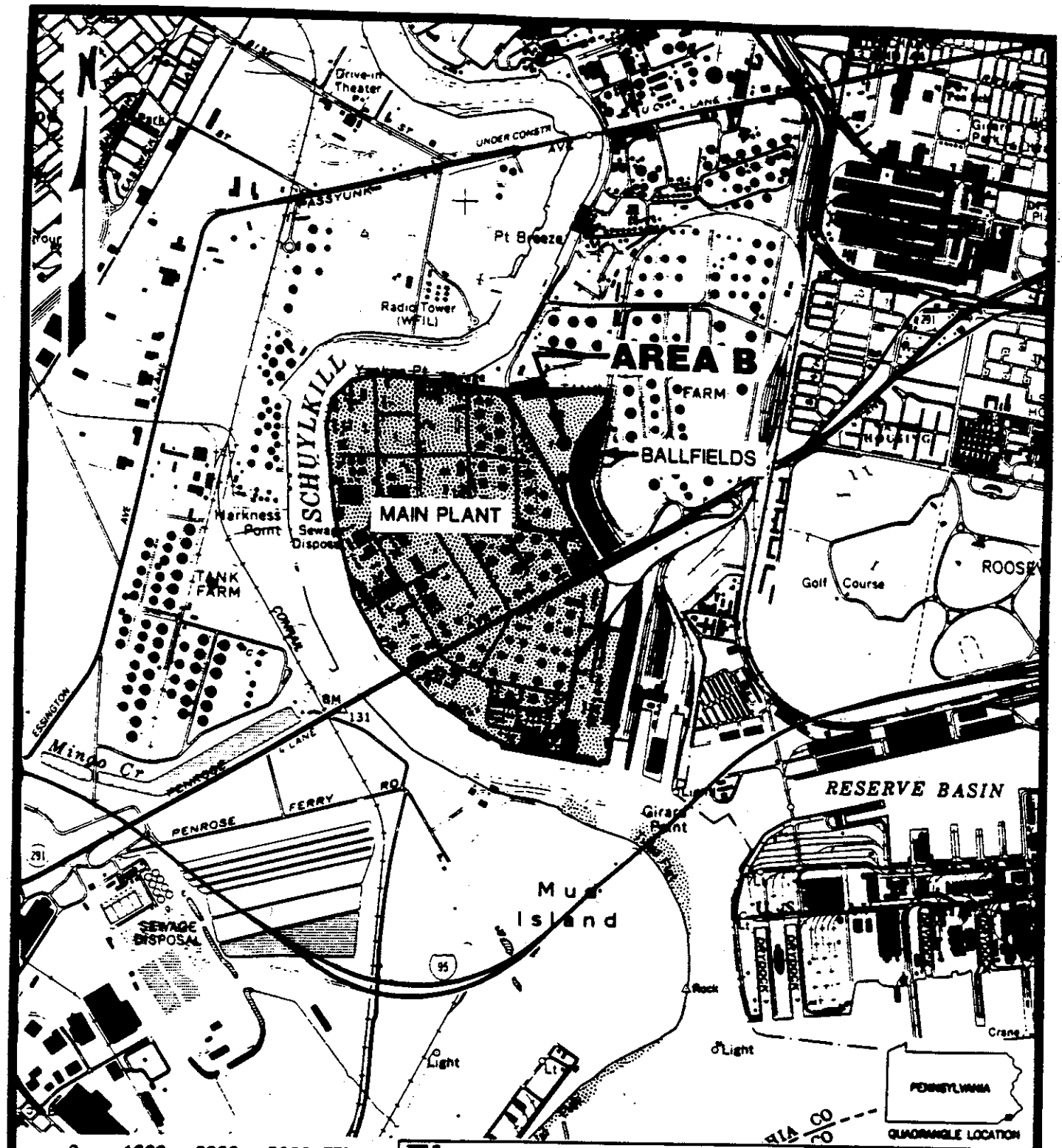
TYPICAL PADER CLEANUP GUIDELINES
BALLFIELDS - AREA B
CHEVRON REFINERY
PHILADELPHIA, PENNSYLVANIA

Parameter	Action Level	
	Soil	Water
Total Petroleum Hydrocarbons	100 ppm	1 ppm
Total Volatile Organics	1 ppm	10 ppb
Total Base/Neutral Extractables + Library Search	No Level Exists	50 ppb
Total Acid Extractables + Library Search	No Level Exists	50 ppb
PCBs	1 to 5 ppm	No Level Exists
Metals	EPA EP Tox Levels	EPA Primary Drinking Water Standards
Pesticides/Herbicides	EPA Standards	EPA Primary Drinking Water Standards
Cyanide	10 to 15 ppm	<0.2 ppm
Total Phenols	No Level Exists	4 ppm

Note:

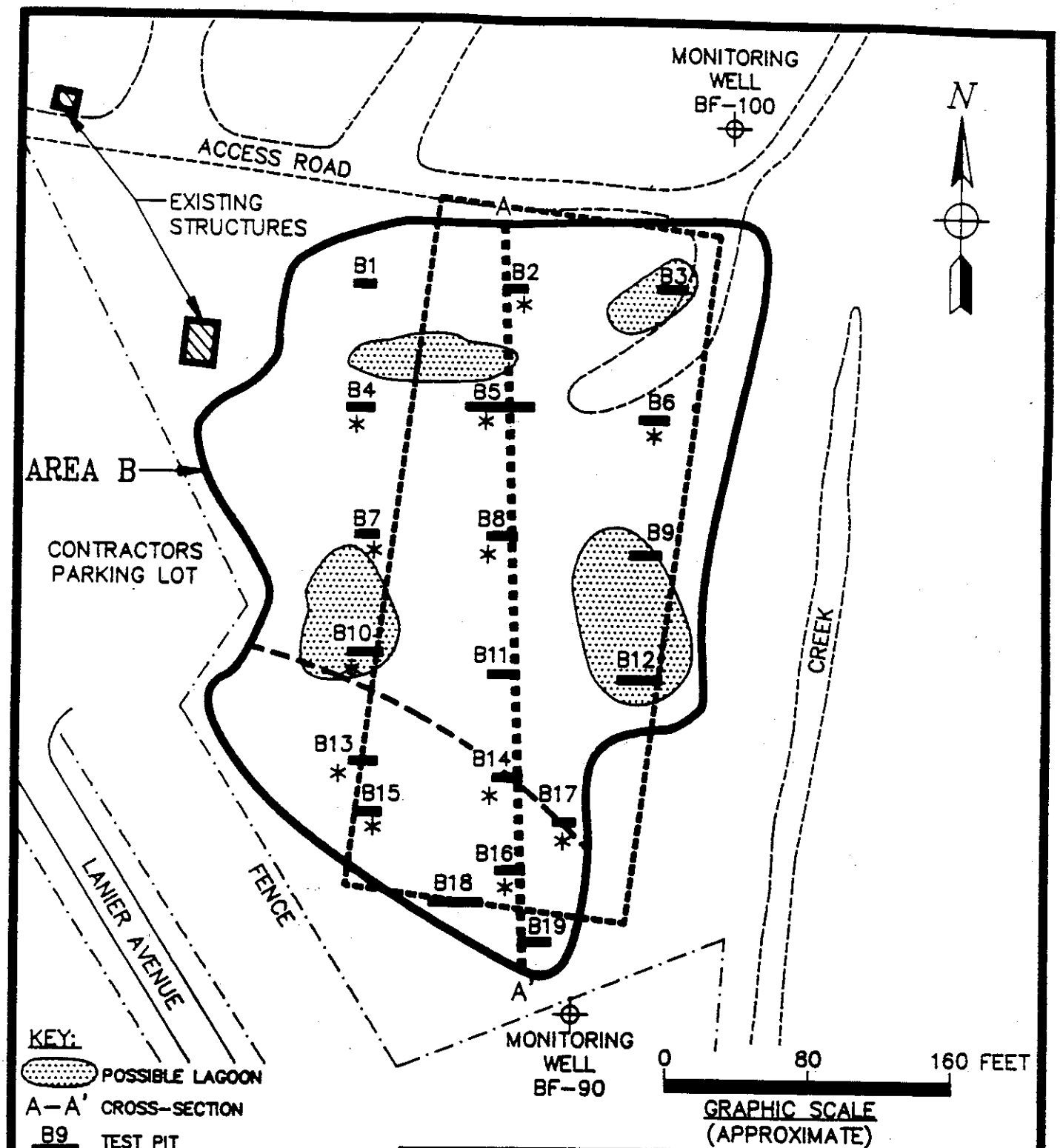
These levels were provided to us by Jim Dolan of PADER's Norristown office. These levels are not official or even published guidelines. All levels are actually determined on a case-by-case basis.

3466R



REFERENCE:
A PORTION OF USGS 7.5 MINUTE TOPOGRAPHIC MAP; PHILADELPHIA QUADRANGLE, PENNSYLVANIA, 1967, PHOTOREVISED 1985.

TITLE	SITE VICINITY MAP		
PROJECT	CHEVRON REFINERY PHILADELPHIA, PENNSYLVANIA		
	Dames & Moore TREVOSE, PENNSYLVANIA		
SCALE AS NOTED	DWN. BY R.G.B.	JOB NO. 16000-034	
DATE 5-9-88	APPR. BY D.J.W.	FIG. NO. 1	

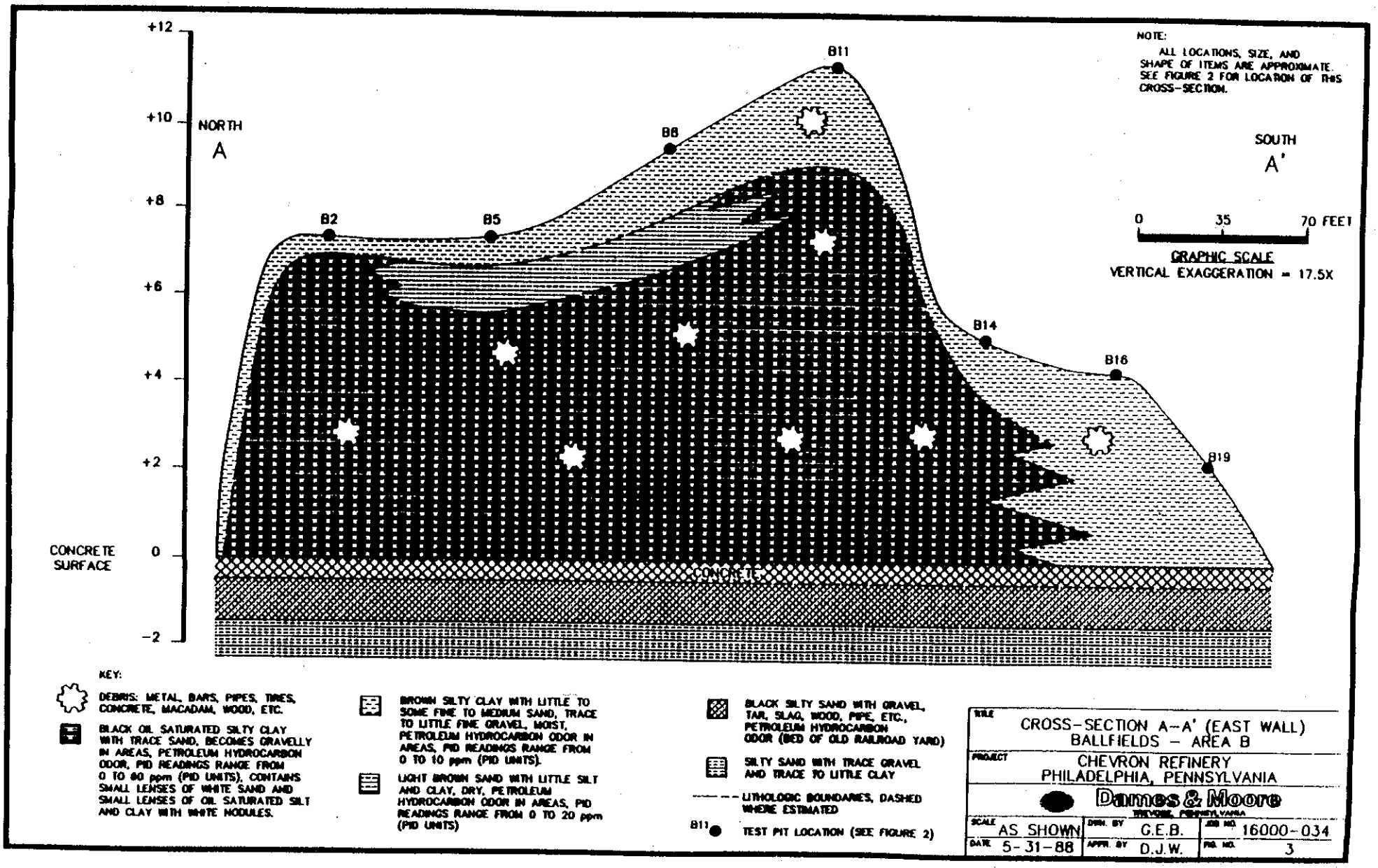


TITLE: PLOT PLAN SHOWING TEST PIT LOCATIONS
BALLFIELDS - AREA B

PROJECT: CHEVRON REFINERY
PHILADELPHIA, PENNSYLVANIA

Dames & Moore
TREVOSE, PENNSYLVANIA

SCALE	DWN. BY	JOB NO.
AS NOTED	R.G.B.	16000-034
DATE	APPR. BY	FIG. NO.
5-31-88	D.J.W.	2


+12
+10
+8
+6
+4
+2
0
-2
CONCRETE SURFACE
NORTH
A
SOUTH
A'
B11
B8
B2
B5
B14
B16
B19
CONCRETE
NOTE:
ALL LOCATIONS, SIZE, AND SHAPE OF ITEMS ARE APPROXIMATE. SEE FIGURE 2 FOR LOCATION OF THIS CROSS-SECTION.
0
35
70 FEET
GRAPHIC SCALE
VERTICAL EXAGGERATION = 17.5X
KEY:
DEBRIS: METAL, BARS, PIPES, TIRES, CONCRETE, MACADAM, WOOD, ETC.
BLACK OIL SATURATED SILTY CLAY WITH TRACE SAND, BECOMES GRAVELLY IN AREAS, PETROLEUM HYDROCARBON ODOR, PID READINGS RANGE FROM 0 TO 60 ppm (PID UNITS), CONTAINS SMALL LENSES OF WHITE SAND AND SMALL LENSES OF OIL SATURATED SILT AND CLAY WITH WHITE NODULES.
BROWN SILTY CLAY WITH LITTLE TO SOME FINE TO MEDIUM SAND, TRACE TO LITTLE FINE GRAVEL, MOIST, PETROLEUM HYDROCARBON ODOR IN AREAS, PID READINGS RANGE FROM 0 TO 10 ppm (PID UNITS).
LIGHT BROWN SAND WITH LITTLE SILT AND CLAY, DRY, PETROLEUM HYDROCARBON ODOR IN AREAS, PID READINGS RANGE FROM 0 TO 20 ppm (PID UNITS)
BLACK SILTY SAND WITH GRAVEL, TAR, SLAG, WOOD, PIPE, ETC., PETROLEUM HYDROCARBON ODOR (BED OF OLD RAILROAD YARD)
SILTY SAND WITH TRACE GRAVEL AND TRACE TO LITTLE CLAY
LITHOLOGIC BOUNDARIES, DASHED WHERE ESTIMATED
B11 TEST PIT LOCATION (SEE FIGURE 2)
TITLE
CROSS-SECTION A-A' (EAST WALL)
BALLFIELDS - AREA B
PROJECT
CHEVRON REFINERY
PHILADELPHIA, PENNSYLVANIA
Dames & Moore
WILLOW GROVE, PENNSYLVANIA
SCALE AS SHOWN
DRN. BY G.E.B.
JOB NO. 16000-034
DATE 5-31-88
APPR. BY D.J.W.
FIG. NO. 3

APPENDIX A

Modified Skinner List for Petroleum Refinery Wastes

SUBJECT: **PETROLEUM REFINERY WASTE-PRW MODIFIED SKINNER LIST - JULY 198**

I. VOLATILE PARAMETERS

NPDES Number	CAS Number	Compound
3V	71-43-2	Benzene
-	75-15-0	Carbon Disulfide
7V	108-90-7	Chlorobenzene
11V	67-66-3	Chloroform
15V	107-06-2	1,2 - Dichloroethane
-	123-91-1	1,4 - Dioxane
19V	100-41-4	Ethyl benzene
-	106-93-4	Ethylene dibromide
-	78-93-3	Methyl ethyl ketone
-	100-42-5	Styrene
25V	108-88-2	Toluene
-	95-47-6	Xylene (O,M & P)

II. ACID PARAMETERS

NPDES Number	CAS Number	Compound
-	108-98-5	Benzenethiol
-	95-48-7	Cresols (O, M & P)
3A	105-67-9	2,4 - Dimethylphenol
5A	51-28-5	2,4 - Dinitrophenol
7A	100-02-7	4-Nitrophenol
10A	108-95-2	Phenol

III. BASE NEUTRAL PARAMETERS

NPDES Number	CAS Number	Compound
3B	120-12-7	Anthracene
5B	56-55-3	Benzo(a)anthracene
7B	205-99-2	Benzo(b)Fluoranthene
9B	207-08-9	Benzo(k)Fluoranthene
6B	50-32-8	Benzo(a)pyrene
13B	117-81-7	Bis(2-ethylhexyl)phthalate
15B	85-68-7	Butyl benzyl phthalate
18B	218-01-9	Chrysene
-	224-42-0	Dibenz(a,h)acridine
19B	53-70-3	Dibenz(a,h)anthracene
20-22B	95-50-1	Dichlorobenzenes (1,2 1,3 & 1,4)
24B	84-66-2	Diethylphthalate

SUBJECT: **PETROLEUM REFINERY WASTE - PRW**
MODIFIED SKINNER LIST - JULY 1986

III. BASE NEUTRAL PARAMETERS

NPDES Number	CAS Number	Compound
-	57-97-6	7,12-Dimethylbenz(a)anthracene
25B	131-11-3	Dimethylphthalate
26B	84-74-2	Di(n)butyl phthalate
29B	117-84-0	Di(n)octyl phthalate
31B	206-44-0	Fluoranthene
-	95-13-6	Indene
-	3351-28-8	Methyl Chrysene
-	90-12-0	1 - Methyl napthalene
39B	91-20-3	Napthalene
44B	85-01-8	Phenanthrene
45B	129-00-0	Pyrene
-	110-86-1	Pyridine
-	91-22-5	Quinoline

IV. METAL PARAMETERS

NPDES Number	CAS Number	Compound
1M	7440-36-0	Antimony
2M	7440-38-2	Arsenic
-	7440-39-3	Barium
3M	7440-41-7	Beryllium
4M	7440-43-9	Cadmium
5M	7440-47-3	Chromium
-	7440-48-4	Cobalt
7M	7439-92-1	Lead
8M	7439-97-6	Mercury
9M	7440-02-0	Nickel
10M	7782-49-2	Selenium
-	7440-62-2	Vanadium

5/87 - LD/PRW.MARKSAVE

APPENDIX B

Laboratory Reports
and Quality Control Summaries

CENTURY LABORATORIES, INC.

1501 Grandview Ave., Thorofare, NJ 08086 609/848-3939

REPORT #: 88-0629
DATE: 04/21/88

CLIENT — DAMES & MOORE
4620 Street Road
Trevose, Pa. 19047

SUBJECT — Seventeen (17) samples submitted by the client on 03/23/88, and identified as: Project: Chevron - Ballfields Area B.

AUTHORIZATION — David Wagner

PURPOSE — Chemical Analysis

PROCEDURE — Samples were analyzed in accordance with procedures presented in the following:

1. "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods", 2nd Ed., 1984 U.S. Environmental Protection Agency (SW-846)
2. "Methods for the Chemical Analysis of Water and Wastes", March, 1979, U.S. Environmental Protection Agency (EPA-600/4-79-020)

CENTURY LABORATORIES, INC.

Rodney T. Miller

Rodney T. Miller

1h
NJ DEP CERTIFICATION NO: 08153

REPORT NARRATIVE

Samples B7 Comp, B2 Comp, B10 Comp, B9 Comp, B12 Comp, B14 Comp, and B11 Comp were prepped as medium level samples in the PAT-VOA analysis because of matrix problems indicated by the prescreen or the appearance of the sample. The minimum detection limit is elevated when a sample is prepped as a medium level sample.

Samples B18 RRB and B6 Comp in the PAT-VOA analysis were rerun because a surrogate was out of control limits. The surrogate was out again in both samples indicating matrix problems.

The following samples analyzed for PCB's have been diluted due to matrix interference. This accounts for elevated detection limits.

880629 -	B7 Comp	B7 Comp	B5 Comp
	B2 Comp	B9 Comp	B11 Comp
	B4 Comp	B10 Comp	B18 RRB
	B6 Comp	B12 Comp	

The following Dames & Moore samples analyzed for extractables method 8270, were diluted prior to analysis based on matrix interference. This accounts for elevated detection limits.

88-0629 -	B7 Comp	6 fold
	B4 Comp	9 fold
	B6 Comp	3 fold
	B14 Comp	6 fold

The following samples were prepared at a medium level due to high levels of matrix interference. This accounts for elevated detection limits.

88-0629 -	B2 Comp
	B7 Comp
	B9 Comp
	B10 Comp
	B12 Comp
	B5 Comp

Sample number B-3 Comp was reanalyzed due to poor surrogate recoveries. The initial run was reported since the reanalysis displayed matrix interference.

CENTURY LABORATORIES, INC.

REPORT OF ANALYSIS

Client: DAMES & MOORE

Date: 04-22-88
Job No: 880629

Date Received: 03-23-88 1240

Sample ID: B1 COMP
Date/Time Collected: 03-21-88

	Parameter	Results	Units
M SC	Cyanide	0.3	mg/kg
M SC	Petroleum Hydrocarbons	5800	mg/kg
	Antimony	3.24	mg/kg
	Barium	101	mg/kg
	Beryllium	<1.16	mg/kg
	Cadmium	<1.16	mg/kg
	Chromium	55.9	mg/kg
	Cobalt	10.6	mg/kg
	Mercury	0.507	mg/kg
	Nickel	20.3	mg/kg
	Vanadium	37.9	mg/kg
	Arsenic	99.5	mg/kg
	Lead	280	mg/kg
	Selenium	0.926	mg/kg

< = Less than.
Parameter not detected at or above value shown.

CENTURY LABORATORIES, INC.

REPORT OF ANALYSIS

Client: DAMES & MOORE

Date: 04-22-88
Job No: 880629

Date Received: 03-23-88 1240

Sample ID: B2 COMP
Date/Time Collected: 03-21-88

Parameter	Results	Units
Cyanide	3.7	mg/kg
Petroleum Hydrocarbons	18000	mg/kg
Antimony	<1.27	mg/kg
Barium	383	mg/kg
Beryllium	<1.27	mg/kg
Cadmium	3.00	mg/kg
Chromium	3710	mg/kg
Cobalt	66.0	mg/kg
Mercury	2.64	mg/kg
Nickel	83.1	mg/kg
Vanadium	71.4	mg/kg
Arsenic	16.5	mg/kg
Lead	263	mg/kg
Selenium	1.01	mg/kg

< - Less than.
Parameter not detected at or above value shown.

CENTURY LABORATORIES, INC.

REPORT OF ANALYSIS

Client: DAMES & MOORE

Date: 04-22-88
Job No: 880629

Date Received: 03-23-88 1240

Sample ID: B3 COMP
Date/Time Collected: 03-21-88

Parameter	Results	Units
Cyanide	0.5	mg/l
Petroleum Hydrocarbons	580	mg/kg*
Antimony	<1.17	mg/kg
Barium	94.0	mg/kg
Beryllium	<1.18	mg/kg
Cadmium	<1.18	mg/kg
Chromium	99.2	mg/kg
Cobalt	17.2	mg/kg
Mercury	0.751	mg/kg
Nickel	40.6	mg/kg
Vanadium	35.0	mg/kg
Arsenic	7.74	mg/kg
Lead	216	mg/kg
Selenium	<0.704	mg/kg

* Wet Weight
< - Less than.
Parameter not detected at or above value shown.

CENTURY LABORATORIES, INC.

REPORT OF ANALYSIS

Client: DAMES & MOORE

Date: 04-22-88
Job No: 880629

Date Received: 03-23-88 1240

Sample ID: B6 COMP
Date/Time Collected: 03-21-88

Parameter	Results	Units
Cyanide	<0.1	mg/l
Petroleum Hydrocarbons	1200	mg/kg
Antimony	<1.33	mg/kg
Barium	112	mg/kg
Beryllium	<1.34	mg/kg
Cadmium	2.64	mg/kg
Chromium	73.7	mg/kg
Cobalt	14.2	mg/kg
Mercury	0.867	mg/kg
Nickel	88.1	mg/kg
Vanadium	201	mg/kg
Arsenic	3.47	mg/kg
Lead	237	mg/kg
Selenium	<0.800	mg/kg

< = Less than.
Parameter not detected at or above value shown.

CENTURY LABORATORIES, INC.

REPORT OF ANALYSIS

Client: DAMES & MOORE

Date: 04-22-88
Job No: 880629

Date Received: 03-23-88 1240

Sample ID: B9 COMP
Date/Time Collected: 03-21-88

Parameter	Results	Units
Cyanide	0.4	mg/l
Petroleum Hydrocarbons	13000	mg/kg
Antimony	<1.18	mg/kg
Barium	141	mg/kg
Beryllium	<1.18	mg/kg
Cadmium	1.62	mg/kg
Chromium	125	mg/kg
Cobalt	10.1	mg/kg
Mercury	1.31	mg/kg
Nickel	26.8	mg/kg
Vanadium	54.8	mg/kg
Arsenic	9.41	mg/kg
Lead	191	mg/kg
Selenium	1.88	mg/kg

< = Less than.
Parameter not detected at or above value shown.

CENTURY LABORATORIES, INC.

REPORT OF ANALYSIS

Client: DAMES & MOORE

Date: 04-22-88
Job No: 880629

Date Received: 03-23-88 1240

Sample ID: B10 COMP
Date/Time Collected: 03-21-88

Parameter	Results	Units
Cyanide	2.7	mg/kg
Petroleum Hydrocarbons	9800	mg/kg
Antimony	<1.29	mg/kg
Barium	178	mg/kg
Beryllium	1.29	mg/kg
Cadmium	2.33	mg/kg
Chromium	425	mg/kg
Cobalt	19.4	mg/kg
Mercury	2.48	mg/kg
Nickel	54.1	mg/kg
Vanadium	105	mg/kg
Arsenic	10.1	mg/kg
Lead	264	mg/kg
Selenium	3.62	mg/kg

< = Less than.
Parameter not detected at or above value shown.

CENTURY LABORATORIES, INC.

REPORT OF ANALYSIS

Client: DAMES & MOORE

Date: 04-22-88
Job No: 880629

Date Received: 03-23-88 1240

Sample ID: B11 COMP
Date/Time Collected: 03-21-88

Parameter	Results	Units
Cyanide	<0.1	mg/kg
Petroleum Hydrocarbons	82	mg/kg
Antimony	<1.17	mg/kg
Barium	210	mg/kg
Beryllium	2.51	mg/kg
Cadmium	2.41	mg/kg
Chromium	668	mg/kg
Cobalt	28.2	mg/kg
Mercury	2.52	mg/kg
Nickel	66.6	mg/kg
Vanadium	95.8	mg/kg
Arsenic	7.76	mg/kg
Lead	242	mg/kg
Selenium	3.10	mg/kg

< = Less than.
Parameter not detected at or above value shown.

CENTURY LABORATORIES, INC.

REPORT OF ANALYSIS

Client: DAMES & MOORE

Date: 04-22-88
Job No: 880629

Date Received: 03-23-88 1240

Sample ID: B16 COMP
Date/Time Collected: 03-22-88

Parameter	Results	Units
Cyanide	0.2	mg/kg
Petroleum Hydrocarbons	740	mg/kg
Antimony	<1.19	mg/kg
Barium	58.1	mg/kg
Beryllium	<1.19	mg/kg
Cadmium	1.67	mg/kg
Chromium	18.3	mg/kg
Cobalt	<11.9	mg/kg
Mercury	0.333	mg/kg
Nickel	11.9	mg/kg
Vanadium	23.6	mg/kg
Arsenic	5.48	mg/kg
Lead	179	mg/kg
Selenium	2.86	mg/kg

< = Less than.
Parameter not detected at or above value shown.

CENTURY LABORATORIES, INC.

REPORT OF ANALYSIS

Client: DAMES & MOORE

Date: 04-22-88
Job No: 880629

Date Received: 03-23-88 1240

Sample ID: B18 COMP
Date/Time Collected: 03-22-88

Parameter	Results	Units
Cyanide	<0.1	mg/kg
Petroleum Hydrocarbons	170	mg/kg
Antimony	<1.18	mg/kg
Barium	34.8	mg/kg
Beryllium	<1.18	mg/kg
Cadmium	1.44	mg/kg
Chromium	16.1	mg/kg
Cobalt	<11.8	mg/kg
Mercury	<0.118	mg/kg
Nickel	11.1	mg/kg
Vanadium	24.2	mg/kg
Arsenic	4.49	mg/kg
Lead	30.3	mg/kg
Selenium	2.37	mg/kg

< = Less than.
Parameter not detected at or above value shown.

CENTURY LABORATORIES, INC.

REPORT OF ANALYSIS

Client: DAMES & MOORE

Date: 04-22-88
Job No: 880629

Date Received: 03-23-88 1240

Sample ID: B18 RRB
Date/Time Collected: 03-22-88

Parameter	Results	Units
Antimony	21.2	mg/kg
Barium	41.5	mg/kg
Beryllium	<1.21	mg/kg
Cadmium	<1.21	mg/kg
Chromium	5.35	mg/kg
Cobalt	<12.1	mg/kg
Mercury	<0.122	mg/kg
Nickel	13.8	mg/kg
Vanadium	<12.1	mg/kg
Arsenic	3.89	mg/kg
Lead	637	mg/kg
Selenium	2.68	mg/kg

< = Less than.
Parameter not detected at or above value shown.

CENTURY LABORATORIES, INC.

CLIENT: Dames & Moore
CLIENT ID: Chevron - Ballfields Area B
DATE COLLECTED: 03/21/88

Report #: 88-0629

April 21, 1988

LABORATORY ANALYSIS - PCB's (AROCLORS)

Results (ug/kg)

Parameter	B6 COMP	B7 COMP	B9 COMP	B10 COMP
Aroclor 1016	2000 U	6100 U	880 U	1300 U
Aroclor 1221	2000 U	6100 U	880 U	3900 U
Aroclor 1232	2000 U	6100 U	880 U	1300 U
Aroclor 1242	2000 U	6100 U	350 U	390 U
Aroclor 1248	2000 U	6100 U	350 U	390 U
Aroclor 1254	400 U	2000 U	350 U	390 U
Aroclor 1260	400 U	2000 U	350 U	390 U

DEFINITIONS:

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

CENTURY LABORATORIES, INC.

Report #: 88-0629

CLIENT: Dames & Moore
CLIENT ID: Chevron - Ballfields Area B
DATE COLLECTED: 03/21/88

April 21, 1988

LABORATORY ANALYSIS - PCB's (AROCLORS)

Results (ug/kg)

Parameter	B12 COMP	B13 COMP	B14 COMP	B16 COMP
Aroclor 1016	1800 U	180 U	2000 U	180 U
Aroclor 1221	1800 U	180 U	2000 U	180 U
Aroclor 1232	1800 U	180 U	2000 U	180 U
Aroclor 1242	1800 U	180 U	2000 U	180 U
Aroclor 1248	1800 U	180 U	2000 U	180 U
Aroclor 1254	1800 U	300	270 J	530
Aroclor 1260	1800 U	180 U	410 U	180 U

DEFINITIONS:

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.
J	Indicates the presence of the compounds at levels less than the specified detection limits. Value presented is an estimated value.

CENTURY LABORATORIES, INC.

Report #: 88-0629

CLIENT: Dames & Moore
CLIENT ID: Chevron - Ballfields Area B
DATE COLLECTED: 03/21/88

April 21, 1988

LABORATORY ANALYSIS - PCB's (AROCLORS)

Results (ug/kg)

Parameter	B5 COMP	B11 COMP	B15 COMP
Aroclor 1016	1200 U	5800 U	350 U
Aroclor 1221	1200 U	5800 U	350 U
Aroclor 1232	1200 U	5800 U	350 U
Aroclor 1242	410 U	5800 U	350 U
Aroclor 1248	410 U	1900 U	350 U
Aroclor 1254	410 U	1900 U	350 U
Aroclor 1260	410 U	1900 U	350 U

DEFINITIONS:

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

CENTURY LABORATORIES, INC.

Report #: 88-0629

CLIENT: Dames & Moore
CLIENT ID: Chevron - Ballfields Area B
DATE COLLECTED: 03/22/88

April 21, 1988

LABORATORY ANALYSIS - PCB's (AROCLORS)

Results (ug/kg)

Parameter	B18 COMP
Aroclor 1016	350 U
Aroclor 1221	350 U
Aroclor 1232	350 U
Aroclor 1242	350 U
Aroclor 1248	350 U
Aroclor 1254	350 U
Aroclor 1260	350 U

DEFINITIONS:

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

CENTURY LABORATORIES, INC.

Report #: 88-0629

CLIENT: Dames & Moore
CLIENT ID: Chevron - Ballfields Area B
DATE COLLECTED: 03/22/88

April 21, 1988

LABORATORY ANALYSIS - PCB's (AROCLORS)

Results (ug/kg)

Parameter	B18 RRB
Aroclor 1016	1800 U
Aroclor 1221	1800 U
Aroclor 1232	1800 U
Aroclor 1242	1800 U
Aroclor 1248	1800 U
Aroclor 1254	1800 U
Aroclor 1260	1800 U

DEFINITIONS:

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B1 Comp
% Moisture: 13.50

Report #: 880629
Century ID: 4882

	ug/kg			ug/kg	
1,4-Dioxane	120	U	Chloroethane	12	U
1,2-Dichloropropane	7	U	Bromomethane	12	U
trans-1,3-Dichloropropene	6	U	Vinyl chloride	12	U
Trichloroethene	2	U	Chloroethane	12	U
Chlorodibromomethane	4	U	Methylene chloride	3	U
1,1,2-Trichloroethane	6	U	Acetone	34	B (B=5)
Benzene	140		Carbon disulfide	6	U
cis-1,3-Dichloropropene	6	U	1,1-Dichloroethene	3	U
2-Chloroethyl vinyl ether	12	U	1,1-Dichloroethane	5	U
Bromoform	5	U	trans-1,2-Dichloroethene	2	U
4-Methyl-2-pentanone	12	U	Chloroform	2	U
2-Hexanone	12	U	1,2-Dichloroethane	3	U
Tetrachloroethene	5	U	2-Butanone	12	U
1,1,2,2-Tetrachloroethane	8	U	1,1,1-Trichloroethane	4	U
Toluene	5		Carbon tetrachloride	3	U
Chlorobenzene	7	U	Vinyl acetate	12	U
Ethylbenzene	62		Bromodichloromethane	3	U
Styrene	6	U	Xylenes	88	
1,2-&1,4-Dichlorobenzenes	2	U	1,3-Dichlorobenzene	6	U
Trichlorofluoromethane	2	U			

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B2 Comp
% Moisture: 21.14

Report #: 880629
Century ID: 4883

	ug/kg			ug/kg	
1,4-Dioxane	160000	U	Chloromethane	16000	U
1,2-Dichloropropane	9500	U	Bromomethane	16000	U
trans-1,3-Dichloropropene	7900	U	Vinyl chloride	16000	U
Trichloroethene	3000	U	Chloroethane	16000	U
Chlorodibromomethane	4900	U	Methylene chloride	4400	U
1,1,2-Trichloroethane	7900	U	Acetone	16000	U
Benzene	60000		Carbon disulfide	7900	U
cis-1,3-Dichloropropene	7900	U	1,1-Dichloroethene	4400	U
2-Chloroethyl vinyl ether	16000	U	1,1-Dichloroethane	7400	U
Bromoform	7400	U	trans-1,2-Dichloroethene	2500	U
4-Methyl-2-pentanone	16000	U	Chloroform	2500	U
2-Hexanone	16000	U	1,2-Dichloroethane	4400	U
Tetrachloroethene	6500	U	2-Butanone	16000	U
1,1,2,2-Tetrachloroethane	11000	U	1,1,1-Trichloroethane	6000	U
Toluene	55000		Carbon tetrachloride	4400	U
Chlorobenzene	9500	U	Vinyl acetate	16000	U
Ethylbenzene	47000		Bromodichloromethane	3500	U
Styrene	7900	U	Xylenes	330000	
1,2-&1,4-Dichlorobenzenes	3200	U	1,3-Dichlorobenzene	7900	U
Trichlorofluoromethane	3200	U			

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B3 Comp
% Moisture: 14.77

Report #: 880629
Century ID: 4884

	ug/kg		ug/kg
1,4-Dioxane	120 U	Chloromethane	12 U
1,2-Dichloropropane	7 U	Bromomethane	12 U
trans-1,3-Dichloropropene	6 U	Vinyl chloride	12 U
Trichloroethene	2 U	Chloroethane	12 U
Chlorodibromomethane	4 U	Methylene chloride	3 U
1,1,2-Trichloroethane	6 U	Acetone	3 J
Benzene	5 U	Carbon disulfide	6 U
cis-1,3-Dichloropropene	6 U	1,1-Dichloroethene	3 U
2-Chloroethyl vinyl ether	12 U	1,1-Dichloroethane	6 U
Bromoform	6 U	trans-1,2-Dichloroethene	2 U
4-Methyl-2-pentanone	12 U	Chloroform	2 U
2-Hexanone	12 U	1,2-Dichloroethane	3 U
Tetrachloroethene	5 U	2-Butanone	12 U
1,1,2,2-Tetrachloroethane	8 U	1,1,1-Trichloroethane	4 U
Toluene	3 J	Carbon tetrachloride	3 U
Chlorobenzene	7 U	Vinyl acetate	12 U
Ethylbenzene	8 U	Bromodichloromethane	3 U
Styrene	6 U	Xylenes	6
1,2-&1,4-Dichlorobenzenes	2 U	1,3-Dichlorobenzene	6 U
Trichlorofluoromethane	2 U		

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B4 Comp
% Moisture: 15.00

Report #: 880629
Century ID: 4885

	ug/kg		ug/kg
1,4-Dioxane	120 U	Chloromethane	12 U
1,2-Dichloropropane	7 U	Bromomethane	12 U
trans-1,3-Dichloropropene	6 U	Vinyl chloride	12 U
Trichloroethene	2 U	Chloroethane	12 U
Chlorodibromomethane	4 U	Methylene chloride	13
1,1,2-Trichloroethane	6 U	Acetone	40 B (B=8)
Benzene	5 U	Carbon disulfide	6 U
cis-1,3-Dichloropropene	6 U	1,1-Dichloroethene	3 U
2-Chloroethyl vinyl ether	12 U	1,1-Dichloroethane	6 U
Bromoform	6 U	trans-1,2-Dichloroethene	2 U
4-Methyl-2-pentanone	12 U	Chloroform	2 U
2-Hexanone	12 U	1,2-Dichloroethane	3 U
Tetrachloroethene	5 U	2-Butanone	7 J
1,1,2,2-Tetrachloroethane	8 U	1,1,1-Trichloroethane	4 U
Toluene	3 J	Carbon tetrachloride	3 U
Chlorobenzene	7 U	Vinyl acetate	12 U
Ethylbenzene	8 U	Bromodichloromethane	3 U
Styrene	6 U	Xylenes	6 U
1,2-&1,4-Dichlorobenzenes	2 U	1,3-Dichlorobenzene	6 U
Trichlorofluoromethane	2 U		

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B5 Comp
% Moisture: 26.78

Report #: 880629
Century ID: 4894

	ug/kg		ug/kg	
1,4-Dioxane	17000	U	Chloroethane	1700 U
1,2-Dichloropropane	1000	U	Bromoethane	1700 U
trans-1,3-Dichloropropene	850	U	Vinyl chloride	1700 U
Trichloroethene	320	U	Chloroethane	1700 U
Chlorodibromoethane	530	U	Methylene chloride	480 U
1,1,2-Trichloroethane	850	U	Acetone	1700 U
Benzene	9000		Carbon disulfide	850 U
cis-1,3-Dichloropropene	850	U	1,1-Dichloroethene	480 U
2-Chloroethyl vinyl ether	1700	U	1,1-Dichloroethane	800 U
Bromoform	800	U	trans-1,2-Dichloroethene	270 U
4-Methyl-2-pentanone	1700	U	Chloroform	270 U
2-Hexanone	1700	U	1,2-Dichloroethane	480 U
Tetrachloroethene	700	U	2-Butanone	2600 B (B=2900)
1,1,2,2-Tetrachloroethane	1200	U	1,1,1-Trichloroethane	650 U
Toluene	1000	U	Carbon tetrachloride	480 U
Chlorobenzene	1000	U	Vinyl acetate	1700 U
Ethylbenzene	1200	U	Bromodichloromethane	380 U
Styrene	850	U	Xylenes	850 U
1,2-&1,4-Dichlorobenzenes	340	U	1,3-Dichlorobenzene	850 U
Trichlorofluoromethane	340	U		

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B6 Comp
% Moisture: 21.03

Report #: 880629
Century ID: 4886

	ug/kg		ug/kg
1,4-Dioxane	130 U	Chloromethane	13 U
1,2-Dichloropropane	8 U	Bromomethane	13 U
trans-1,3-Dichloropropene	6 U	Vinyl chloride	13 U
Trichloroethene	2 U	Chloroethane	13 U
Chlorodibromomethane	4 U	Methylene chloride	4 U
1,1,2-Trichloroethane	6 U	Acetone	7 J
Benzene	6 U	Carbon disulfide	6 U
cis-1,3-Dichloropropene	6 U	1,1-Dichloroethene	4 U
2-Chloroethyl vinyl ether	13 U	1,1-Dichloroethane	6 U
Bromoform	6 U	trans-1,2-Dichloroethene	2 U
4-Methyl-2-pentanone	13 U	Chloroform	2 U
2-Hexanone	13 U	1,2-Dichloroethane	4 U
Tetrachloroethene	5 U	2-Butanone	13 U
1,1,2,2-Tetrachloroethane	9 U	1,1,1-Trichloroethane	5 U
Toluene	8 U	Carbon tetrachloride	4 U
Chlorobenzene	8 U	Vinyl acetate	13 U
Ethylbenzene	9 U	Bromodichloromethane	3 U
Styrene	6 U	Xylenes	6 U
1,2-&1,4-Dichlorobenzenes	3 U	1,3-Dichlorobenzene	6 U
Trichlorofluoromethane	3 U		

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B7 Comp
% Moisture: 25.72

Report #: 880629
Century ID: 4887

	ug/kg			ug/kg	
1,4-Dioxane	170000	U	Chloroethane	17000	U
1,2-Dichloropropane	10000	U	Bromoethane	17000	U
trans-1,3-Dichloropropene	8400	U	Vinyl chloride	17000	U
Trichloroethene	3200	U	Chloroethane	17000	U
Chlorodibromomethane	5200	U	Methylene chloride	4700	U
1,1,2-Trichloroethane	8400	U	Acetone	17000	U
Benzene	28000		Carbon disulfide	8400	U
cis-1,3-Dichloropropene	8400	U	1,1-Dichloroethene	4700	U
2-Chloroethyl vinyl ether	17000	U	1,1-Dichloroethane	7900	U
Bromoform	7900	U	trans-1,2-Dichloroethene	2700	U
4-Methyl-2-pentanone	17000	U	Chloroform	2700	U
2-Hexanone	17000	U	1,2-Dichloroethane	4700	U
Tetrachloroethene	6900	U	2-Butanone	17000	U
1,1,2,2-Tetrachloroethane	12000	U	1,1,1-Trichloroethane	6400	U
Toluene	5900	J	Carbon tetrachloride	4700	U
Chlorobenzene	10000	U	Vinyl acetate	17000	U
Ethylbenzene	52000		Bromodichloromethane	3700	U
Styrene	8400	U	Xylenes	37000	
1,2-&1,4-Dichlorobenzenes	3400	U	1,3-Dichlorobenzene	8400	U
Trichlorofluoromethane	3400	U			

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B10 Comp
% Moisture: 77.29

Report #: 880629
Century ID: 4889

	ug/kg			ug/kg	
1,4-Dioxane	13000	U			
Chloroethane	22000	U	1,2-Dichloropropane	13000	U
Bromoethane	22000	U	trans-1,3-Dichloropropene	11000	U
Vinyl chloride	22000	U	Trichloroethene	4200	U
Chloroethane	22000	U	Chlorodibromoethane	6800	U
Methylene chloride	6200	U	1,1,2-Trichloroethane	11000	U
Acetone	22000	U	Benzene	66000	
Carbon disulfide	11000	U	cis-1,3-Dichloropropene	11000	U
1,1-Dichloroethene	6200	U	2-Chloroethyl vinyl ether	22000	U
1,1-Dichloroethane	10000	U	Bromoform	10000	U
trans-1,2-Dichloroethene	3500	U	4-Methyl-2-pentanone	22000	U
Chloroform	3500	U	2-Hexanone	22000	U
1,2-Dichloroethane	6200	U	Tetrachloroethene	9000	U
2-Butanone	22000	U	1,1,2,2-Tetrachloroethane	15000	U
1,1,1-Trichloroethane	8400	U	Toluene	13000	U
Carbon tetrachloride	6200	U	Chlorobenzene	13000	U
Vinyl acetate	22000	U	Ethylbenzene	30000	
Bromodichloromethane	4800	U	Styrene	11000	U
Xylenes	110000		1,2-&1,4-Dichlorobenzenes	4400	U
1,3-Dichlorobenzene	11000	U	Trichlorofluoromethane	4400	U

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B9 Comp
% Moisture: 15.00

Report #: 880629
Century ID: 4888

	ug/kg			ug/kg	
1,4-Dioxane	15000	U	Chloromethane	1500	U
1,2-Dichloropropane	880	U	Bromomethane	1500	U
trans-1,3-Dichloropropene	740	U	Vinyl chloride	1500	U
Trichloroethene	280	U	Chloroethane	1500	U
Chlorodibromomethane	460	U	Methylene chloride	410	U
1,1,2-Trichloroethane	740	U	Acetone	2900	B(B=1400)
Benzene	650	U	Carbon disulfide	740	U
cis-1,3-Dichloropropene	740	U	1,1-Dichloroethene	410	U
2-Chloroethyl vinyl ether	1500	U	1,1-Dichloroethane	690	U
Bromoform	690	U	trans-1,2-Dichloroethene	240	U
4-Methyl-2-pentanone	1500	U	Chloroform	240	U
2-Hexanone	1500	U	1,2-Dichloroethane	410	U
Tetrachloroethene	600	U	2-Butanone	3700	B(B=2500)
1,1,2,2-Tetrachloroethane	1000	U	1,1,1-Trichloroethane	560	U
Toluene	880	U	Carbon tetrachloride	410	U
Chlorobenzene	880	U	Vinyl acetate	1500	U
Ethylbenzene	1100	U	Bromodichloromethane	320	U
Styrene	740	U	Xylenes	740	U
1,2-&1,4-Dichlorobenzenes	290	U	1,3-Dichlorobenzene	740	U
Trichlorofluoromethane	290	U			

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B11 Comp
% Moisture: 22.73

Report #: 880629
Century ID: 4895

	ug/kg			ug/kg	
1,4-Dioxane	65000	U	Chloromethane	6500	U
1,2-Dichloropropane	3900	U	Bromomethane	6500	U
trans-1,3-Dichloropropene	3200	U	Vinyl chloride	6500	U
Trichloroethene	1200	U	Chloroethane	6500	U
Chlorodibromomethane	2000	U	Methylene chloride	1800	U
1,1,2-Trichloroethane	3200	U	Acetone	6500	U
Benzene	2100	J	Carbon disulfide	3200	U
cis-1,3-Dichloropropene	3200	U	1,1-Dichloroethene	1800	U
2-Chloroethyl vinyl ether	6500	U	1,1-Dichloroethane	3000	U
Bromoform	3000	U	trans-1,2-Dichloroethene	1000	U
4-Methyl-2-pentanone	6500	U	Chloroform	1000	U
2-Hexanone	6500	U	1,2-Dichloroethane	1800	U
Tetrachloroethene	2700	U	2-Butanone	6500	U
1,1,2,2-Tetrachloroethane	4500	U	1,1,1-Trichloroethane	2500	U
Toluene	3900	U	Carbon tetrachloride	1800	U
Chlorobenzene	3900	U	Vinyl acetate	6500	U
Ethylbenzene	5200		Bromodichloromethane	1400	U
Styrene	3200	U	Xylenes	18000	
1,2-&1,4-Dichlorobenzenes	1300	U	1,3-Dichlorobenzene	3200	U
Trichlorofluoromethane	1300	U			

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B12 Comp
% Moisture: 18.36

Report #: 880629
Century ID: 4890

	ug/kg			ug/kg	
1,4-Dioxane	15000	U	Chloromethane	1500	U
1,2-Dichloropropane	920	U	Bromomethane	1500	U
trans-1,3-Dichloropropene	770	U	Vinyl chloride	1500	U
Trichloroethene	290	U	Chloroethane	1500	U
Chlorodibromomethane	470	U	Methylene chloride	430	U
1,1,2-Trichloroethane	770	U	Acetone	1500	B(B=1400)
Benzene	690	J	Carbon disulfide	770	U
cis-1,3-Dichloropropene	770	U	1,1-Dichloroethene	430	U
2-Chloroethyl vinyl ether	1500	U	1,1-Dichloroethane	720	U
Bromoform	720	U	trans-1,2-Dichloroethene	240	U
4-Methyl-2-pentanone	1500	U	Chloroform	240	U
2-Hexanone	1500	U	1,2-Dichloroethane	430	U
Tetrachloroethene	630	U	2-Butanone	2800	B(B=2500)
1,1,2,2-Tetrachloroethane	1100	U	1,1,1-Trichloroethane	580	U
Toluene	920	U	Carbon tetrachloride	430	U
Chlorobenzene	920	U	Vinyl acetate	1500	U
Ethylbenzene	2500		Bromodichloromethane	340	U
Styrene	770	U	Xylenes	7900	
1,2-&1,4-Dichlorobenzenes	310	U	1,3-Dichlorobenzene	770	U
Trichlorofluoromethane	310	U			

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B13 Comp
% Moisture: 15.61

Report #: 880629
Century ID: 4891

	ug/kg		ug/kg
1,4-Dioxane	120 U	Chloromethane	12 U
1,2-Dichloropropane	7 U	Bromomethane	12 U
trans-1,3-Dichloropropene	6 U	Vinyl chloride	12 U
Trichloroethene	2 U	Chloroethane	12 U
Chlorodibromomethane	4 U	Methylene chloride	3 U
1,1,2-Trichloroethane	6 U	Acetone	12 B (B=5)
Benzene	5 U	Carbon disulfide	6 U
cis-1,3-Dichloropropene	6 U	1,1-Dichloroethene	3 U
2-Chloroethyl vinyl ether	12 U	1,1-Dichloroethane	6 U
Bromoform	6 U	trans-1,2-Dichloroethene	2 U
4-Methyl-2-pentanone	12 U	Chloroform	2 U
2-Hexanone	12 U	1,2-Dichloroethane	3 U
Tetrachloroethene	5 U	2-Butanone	12 U
1,1,2,2-Tetrachloroethane	8 U	1,1,1-Trichloroethane	5 U
Toluene	7 U	Carbon tetrachloride	3 U
Chlorobenzene	7 U	Vinyl acetate	12 U
Ethylbenzene	9 U	Bromodichloromethane	3 U
Styrene	6 U	Xylenes	6 U
1,2-&1,4-Dichlorobenzenes	2 U	1,3-Dichlorobenzene	6 U
Trichlorofluoromethane	2 U		

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CENTURY LABORATORIES, INC.
Report of Results

VOLATILE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B14 Comp
% Moisture: 26.52

Report #: 880629
Century ID: 4892

	ug/kg			ug/kg	
1,4-Dioxane	68000	U	Chloromethane	6800	U
1,2-Dichloropropane	4100	U	Bromomethane	6800	U
trans-1,3-Dichloropropene	3400	U	Vinyl chloride	6800	U
Trichloroethene	1300	U	Chloroethane	6800	U
Chlorodibromomethane	2100	U	Methylene chloride	1900	U
1,1,2-Trichloroethane	3400	U	Acetone	6800	U
Benzene	3000	U	Carbon disulfide	3400	U
cis-1,3-Dichloropropene	3400	U	1,1-Dichloroethene	1900	U
2-Chloroethyl vinyl ether	6800	U	1,1-Dichloroethane	3200	U
Bromoform	3200	U	trans-1,2-Dichloroethene	1100	U
4-Methyl-2-pentanone	6800	U	Chloroform	1100	U
2-Hexanone	6800	U	1,2-Dichloroethane	1900	U
Tetrachloroethene	2800	U	2-Butanone	6800	U
1,1,2,2-Tetrachloroethane	4700	U	1,1,1-Trichloroethane	2600	U
Toluene	4100	U	Carbon tetrachloride	1900	U
Chlorobenzene	4100	U	Vinyl acetate	6800	U
Ethylbenzene	4900	U	Bromodichloromethane	1500	U
Styrene	3400	U	Xylenes	3400	U
1,2-&1,4-Dichlorobenzenes	1400	U	1,3-Dichlorobenzene	3400	U
Trichlorofluoromethane	1400	U			

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CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B2 Comp
% Moisture: 21.14

Report #: 880629
Century ID: 4883

	ug/kg			ug/kg	
Phenol	3800	U	Acenaphthene	4800	U
bis(2-Chloroethyl)Ether	14000	U	2,4-Dinitrophenol	110000	U
2-Chlorophenol	8400	U	4-Nitrophenol	6100	U
1,3-Dichlorobenzene	4800	U	1,4-Dichlorobenzene	11000	U
2,4-Dinitrotoluene	14000	U	2,6-Dinitrotoluene	4800	U
1,2-Dichlorobenzene	4800	U	Diethylphthalate	4800	U
4-Chlorophenyl-phenylether	11000	U	bis(2-chloroisopropyl)Ether	14000	U
Fluorene	58000		N-Nitroso-Di-n-Propylamine	25000	U
4,6-Dinitro-2-Methylphenol	61000	U	Hexachloroethane	4100	U
N-Nitrosodiphenylamine (1)	4800	U	Nitrobenzene	4800	U
4-Bromophenyl-phenylether	4800	U	Isophorone	5600	U
Hexachlorobenzene	4800	U	Pentachlorophenol	9100	U
2,4-Dimethylphenol	6800	U	Phenanthrene	62000	
Anthracene	3600	J	bis(2-Chloroethoxy)Methane	13000	U
Di-n-Butylphthalate	6300	U	2,4-Dichlorophenol	6800	U
Fluoranthene	5600	U	1,2,4-Trichlorobenzene	4800	U
Pyrene	38000		Naphthalene	46000	
Butylbenzylphthalate	6300	U	3,3'-Dichlorobenzidine	42000	U
Hexachlorobutadiene	2300	U	Benzo(a)Anthracene	20000	U
4-Chloro-3-Methylphenol	7600	U	bis(2-ethylhexyl)phthalate	6300	U
Chrysene	16000		Hexachlorocyclopentadiene	25000	U
Di-n-Octyl Phthalate	6300	U	2,4,6-Trichlorophenol	6800	U
Benzo(b)Fluoranthene	12000	U	Benzo(k)Fluoranthene	6300	U
2-Chloronaphthalene	4800	U	Benzo(a)Pyrene	6300	U
Indeno(1,2,3-cd)Pyrene	9400	U	Dimethyl Phthalate	4100	U
Dibenz(a,h)Anthracene	6300	U	Acenaphthylene	8900	U
Benzo(g,h,i)Perylene	10000	U	2-Nitrophenol	9100	U

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B4 Comp
% Moisture: 15.06

Report #: 880629
Century ID: 4885

	ug/kg			ug/kg	
Phenol	530	U	Acenaphthene	670	U
bis(2-Chloroethyl)Ether	2000	U	2,4-Dinitrophenol	15000	U
2-Chlorophenol	1200	U	4-Nitrophenol	850	U
1,3-Dichlorobenzene	670	U	1,4-Dichlorobenzene	1600	U
2,4-Dinitrotoluene	2000	U	2,6-Dinitrotoluene	670	U
1,2-Dichlorobenzene	670	U	Diethylphthalate	670	U
4-Chlorophenyl-phenylether	1500	U	bis(2-chloroisopropyl)Ether	2000	U
Fluorene	26000		N-Nitroso-Di-n-Propylamine	3500	U
4,6-Dinitro-2-Methylphenol	8500	U	Hexachloroethane	570	U
N-Nitrosodiphenylamine (1)	670	U	Nitrobenzene	670	U
4-Bromophenyl-phenylether	670	U	Isophorone	780	U
Hexachlorobenzene	670	U	Pentachlorophenol	1300	U
2,4-Dimethylphenol	950	U	Phenanthrene	62000	
Anthracene	23000		bis(2-Chloroethoxy)Methane	1900	U
Di-n-Butylphthalate	880	U	2,4-Dichlorophenol	950	U
Fluoranthene	77000		1,2,4-Trichlorobenzene	670	U
Pyrene	160000		Naphthalene	570	U
Butylbenzylphthalate	880	U	3,3'-Dichlorobenzidine	5800	U
Hexachlorobutadiene	320	U	Benzo(a)Anthracene	41000	
4-Chloro-3-Methylphenol	1100	U	bis(2-ethylhexyl)phthalate	880	U
Chrysene	38000		Hexachlorocyclopentadiene	3500	U
Di-n-Octyl Phthalate	880	U	2,4,6-Trichlorophenol	950	U
Benzo(b)Fluoranthene	32000		Benzo(k)Fluoranthene	880	U
2-Chloronaphthalene	670	U	Benzo(a)Pyrene	880	U
Indeno(1,2,3-cd)Pyrene	27000		Dimethyl Phthalate	570	U
Dibenz(a,h)Anthracene	880	U	Acenaphthylene	1200	U
Benzo(g,h,i)Perylene	8100		2-Nitrophenol	1300	U

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B5 Comp
% Moisture: 26.78

Report #: 880629
Century ID: 4894

	ug/kg			ug/kg	
Phenol	4100	U	Acenaphthene	5200	U
bis(2-Chloroethyl)Ether	16000	U	2,4-Dinitrophenol	110000	U
2-Chlorophenol	9000	U	4-Nitrophenol	6600	U
1,3-Dichlorobenzene	5200	U	1,4-Dichlorobenzene	12000	U
2,4-Dinitrotoluene	16000	U	2,6-Dinitrotoluene	5200	U
1,2-Dichlorobenzene	5200	U	Diethylphthalate	5200	U
4-Chlorophenyl-phenylether	11000	U	bis(2-chloroisopropyl)Ether	16000	U
Fluorene	34000		N-Nitroso-Di-n-Propylamine	27000	U
4,6-Dinitro-2-Methylphenol	66000	U	Hexachloroethane	4400	U
N-Nitrosodiphenylamine (1)	5200	U	Nitrobenzene	5200	U
4-Bromophenyl-phenylether	5200	U	Isophorone	6000	U
Hexachlorobenzene	5200	U	Pentachlorophenol	9800	U
2,4-Dimethylphenol	7400	U	Phenanthrene	24000	
Anthracene	5200	U	bis(2-Chloroethoxy)Methane	14000	U
Di-n-Butylphthalate	6800	U	2,4-Dichlorophenol	7400	U
Fluoranthene	6000	U	1,2,4-Trichlorobenzene	5200	U
Pyrene	10000		Naphthalene	4100	J
Butylbenzylphthalate	6800	U	3,3'-Dichlorobenzidine	45000	U
Hexachlorobutadiene	2500	U	Benzo(a)Anthracene	3600	
4-Chloro-3-Methylphenol	8200	U	bis(2-ethylhexyl)phthalate	6800	U
Chrysene	8700		Hexachlorocyclopentadiene	27000	U
Di-n-Octyl Phthalate	6800	U	2,4,6-Trichlorophenol	7400	U
Benzo(b)Fluoranthene	13000	U	Benzo(k)Fluoranthene	6800	U
2-Chloronaphthalene	5200	U	Benzo(a)Pyrene	6800	U
Indeno(1,2,3-cd)Pyrene	10000	U	Dimethyl Phthalate	4400	U
Dibenz(a,h)Anthracene	6800	U	Acenaphthylene	9600	U
Benzo(g,h,i)Perylene	11000	U	2-Nitrophenol	9800	U

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B6 Comp
% Moisture: 25.01

Report #: 880629
Century ID: 4886

	ug/kg			ug/kg	
Phenol	200	U	Acenaphthene	250	U
bis(2-Chloroethyl)Ether	760	U	2,4-Dinitrophenol	5600	U
2-Chlorophenol	440	U	4-Nitrophenol	320	U
1,3-Dichlorobenzene	250	U	1,4-Dichlorobenzene	590	U
2,4-Dinitrotoluene	760	U	2,6-Dinitrotoluene	250	U
1,2-Dichlorobenzene	250	U	Diethylphthalate	250	U
4-Chlorophenyl-phenylether	560	U	bis(2-chloroisopropyl)Ether	760	U
Fluorene	170	J	N-Nitroso-Di-n-Propylamine	1300	U
4,6-Dinitro-2-Methylphenol	3200	U	Hexachloroethane	210	U
N-Nitrosodiphenylamine (1)	250	U	Nitrobenzene	250	U
4-Bromophenyl-phenylether	250	U	Isophorone	290	U
Hexachlorobenzene	250	U	Pentachlorophenol	480	U
2,4-Dimethylphenol	360	U	Phenanthrene	310	J
Anthracene	250	U	bis(2-Chloroethoxy)Methane	710	U
Di-n-Butylphthalate	330	U	2,4-Dichlorophenol	360	U
Fluoranthene	120	J	1,2,4-Trichlorobenzene	250	U
Pyrene	590		Naphthalene	210	U
Butylbenzylphthalate	330	U	3,3'-Dichlorobenzidine	2200	U
Hexachlorobutadiene	120	U	Benzo(a)Anthracene	1000	U
4-Chloro-3-Methylphenol	400	U	bis(2-ethylhexyl)phthalate	330	U
Chrysene	330	U	Hexachlorocyclopentadiene	1300	U
Di-n-Octyl Phthalate	330	U	2,4,6-Trichlorophenol	360	U
Benzo(b)Fluoranthene	640	U	Benzo(k)Fluoranthene	330	U
2-Chloronaphthalene	250	U	Benzo(a)Pyrene	330	U
Indeno(1,2,3-cd)Pyrene	490	U	Dimethyl Phthalate	210	U
Dibenz(a,h)Anthracene	330	U	Acenaphthylene	470	U
Benzo(g,h,i)Perylene	550	U	2-Nitrophenol	480	U

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B7 Comp
% Moisture: 25.72

Report #: 880629
Century ID: 4887

	ug/kg			ug/kg	
Phenol	8100	U	Acenaphthene	10000	U
bis(2-Chloroethyl)Ether	31000	U	2,4-Dinitrophenol	230000	U
2-Chlorophenol	18000	U	4-Nitrophenol	13000	U
1,3-Dichlorobenzene	10000	U	1,4-Dichlorobenzene	24000	U
2,4-Dinitrotoluene	31000	U	2,6-Dinitrotoluene	10000	U
1,2-Dichlorobenzene	10000	U	Diethylphthalate	10000	U
4-Chlorophenyl-phenylether	23000	U	bis(2-chloroisopropyl)Ether	31000	U
Fluorene	360000		N-Nitroso-Di-n-Propylamine	54000	U
4,6-Dinitro-2-Methylphenol	130000	U	Hexachloroethane	8600	U
N-Nitrosodiphenylamine (1)	10000	U	Nitrobenzene	10000	U
4-Bromophenyl-phenylether	10000	U	Isophorone	12000	U
Hexachlorobenzene	10000	U	Pentachlorophenol	19000	U
2,4-Dimethylphenol	15000	U	Phenanthrene	160000	
Anthracene	9200	J	bis(2-Chloroethoxy)Methane	29000	U
Di-n-Butylphthalate	13000	U	2,4-Dichlorophenol	15000	U
Fluoranthene	8600		1,2,4-Trichlorobenzene	10000	U
Pyrene	32000		Naphthalene	90000	
Butylbenzylphthalate	13000	U	3,3'-Dichlorobenzidine	89000	U
Hexachlorobutadiene	4800	U	Benzo(a)Anthracene	42000	U
4-Chloro-3-Methylphenol	16000	U	bis(2-ethylhexyl)phthalate	13000	U
Chrysene	18000		Hexachlorocyclopentadiene	54000	U
Di-n-Octyl Phthalate	13000	U	2,4,6-Trichlorophenol	15000	U
Benzo(b)Fluoranthene	26000	U	Benzo(k)Fluoranthene	13000	U
2-Chloronaphthalene	10000	U	Benzo(a)Pyrene	13000	U
Indeno(1,2,3-cd)Pyrene	20000	U	Dimethyl Phthalate	8600	U
Dibenz(a,h)Anthracene	13000	U	Acenaphthylene	19000	U
Benzo(g,h,i)Perylene	22000	U	2-Nitrophenol	19000	U

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B9 Comp
% Moisture: 14.97

Report #: 880629
Century ID: 4888

	ug/kg			ug/kg	
Phenol	3500	U	Acenaphthene	4500	U
bis(2-Chloroethyl)Ether	13000	U	2,4-Dinitrophenol	99000	U
2-Chlorophenol	7800	U	4-Nitrophenol	5600	U
1,3-Dichlorobenzene	4500	U	1,4-Dichlorobenzene	10000	U
2,4-Dinitrotoluene	13000	U	2,6-Dinitrotoluene	4500	U
1,2-Dichlorobenzene	4500	U	Diethylphthalate	4500	U
4-Chlorophenyl-phenylether	9900	U	bis(2-chloroisopropyl)Ether	13000	U
Fluorene	4500	U	N-Nitroso-Di-n-Propylamine	24000	U
4,6-Dinitro-2-Methylphenol	56000	U	Hexachloroethane	3800	U
N-Nitrosodiphenylamine (1)	4500	U	Nitrobenzene	4500	U
4-Bromophenyl-phenylether	4500	U	Isophorone	5200	U
Hexachlorobenzene	4500	U	Pentachlorophenol	8500	U
2,4-Dimethylphenol	6400	U	Phenanthrene	11000	J
Anthracene	4500	U	bis(2-Chloroethoxy)Methane	12000	U
Di-n-Butylphthalate	5900	U	2,4-Dichlorophenol	6400	U
Fluoranthene	5200		1,2,4-Trichlorobenzene	4500	U
Pyrene	12000		Naphthalene	3800	U
Butylbenzylphthalate	5900	U	3,3'-Dichlorobenzidine	39000	U
Hexachlorobutadiene	2100	U	Benzo(a)Anthracene	18000	U
4-Chloro-3-Methylphenol	7100	U	bis(2-ethylhexyl)phthalate	5900	U
Chrysene	3500	J	Hexachlorocyclopentadiene	24000	U
Di-n-Octyl Phthalate	5900	U	2,4,6-Trichlorophenol	6400	U
Benzo(b)Fluoranthene	11000	U	Benzo(k)Fluoranthene	5900	U
2-Chloronaphthalene	4500	U	Benzo(a)Pyrene	5900	U
Indeno(1,2,3-cd)Pyrene	8700	U	Dimethyl Phthalate	3800	U
Dibenz(a,h)Anthracene	5900	U	Acenaphthylene	8200	U
Benzo(g,h,i)Perylene	9600	U	2-Nitrophenol	8500	U

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B10 Comp
% Moisture: 22.71

Report #: 880629
Century ID: 4889

	ug/kg			ug/kg	
Phenol	3900	U	Acenaphthene	4900	U
bis(2-Chloroethyl)Ether	15000	U	2,4-Dinitrophenol	110000	U
2-Chlorophenol	8500	U	4-Nitrophenol	6200	U
1,3-Dichlorobenzene	4900	U	1,4-Dichlorobenzene	11000	U
2,4-Dinitrotoluene	15000	U	2,6-Dinitrotoluene	4900	U
1,2-Dichlorobenzene	4900	U	Diethylphthalate	4900	U
4-Chlorophenyl-phenylether	11000	U	bis(2-chloroisopropyl)Ether	15000	U
Fluorene	14000		N-Nitroso-Di-n-Propylamine	26000	U
4,6-Dinitro-2-Methylphenol	62000	U	Hexachloroethane	4100	U
N-Nitrosodiphenylamine (1)	4900	U	Nitrobenzene	4900	U
4-Bromophenyl-phenylether	4900	U	Isophorone	5700	U
Hexachlorobenzene	4900	U	Pentachlorophenol	9300	U
2,4-Dimethylphenol	7000	U	Phenanthrene	8000	J
Anthracene	4900	U	bis(2-Chloroethoxy)Methane	14000	U
Di-n-Butylphthalate	6500	U	2,4-Dichlorophenol	7000	U
Fluoranthene	5700	U	1,2,4-Trichlorobenzene	4900	U
Pyrene	4900	U	Naphthalene	4100	U
Butylbenzylphthalate	6500	U	3,3'-Dichlorobenzidine	43000	U
Hexachlorobutadiene	2300	U	Benzo(a)Anthracene	20000	U
4-Chloro-3-Methylphenol	7800	U	bis(2-ethylhexyl)phthalate	6500	U
Chrysene	6500	U	Hexachlorocyclopentadiene	26000	U
Di-n-Octyl Phthalate	6500	U	2,4,6-Trichlorophenol	7000	U
Benzo(b)Fluoranthene	12000	U	Benzo(k)Fluoranthene	6500	U
2-Chloronaphthalene	4900	U	Benzo(a)Pyrene	6500	U
Indeno(1,2,3-cd)Pyrene	9600	U	Dimethyl Phthalate	4100	U
Dibenz(a,h)Anthracene	6500	U	Acenaphthylene	9100	U
Benzo(g,h,i)Perylene	11000	U	2-Nitrophenol	9300	U

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B11 Comp
% Moisture: 22.73

Report #: 880629
Century ID: 4895

	ug/kg			ug/kg	
Phenol	19000	U	Acenaphthene	25000	U
bis(2-Chloroethyl)Ether	74000	U	2,4-Dinitrophenol	540000	U
2-Chlorophenol	43000	U	4-Nitrophenol	31000	U
1,3-Dichlorobenzene	25000	U	1,4-Dichlorobenzene	57000	U
2,4-Dinitrotoluene	74000	U	2,6-Dinitrotoluene	25000	U
1,2-Dichlorobenzene	25000	U	Diethylphthalate	25000	U
4-Chlorophenyl-phenylether	54000	U	bis(2-chloroisopropyl)Ether	74000	U
Fluorene	30000		N-Nitroso-Di-n-Propylamine	130000	U
4,6-Dinitro-2-Methylphenol	310000	U	Hexachloroethane	21000	U
N-Nitrosodiphenylamine (1)	25000	U	Nitrobenzene	25000	U
4-Bromophenyl-phenylether	25000	U	Isophorone	28000	U
Hexachlorobenzene	25000	U	Pentachlorophenol	47000	U
2,4-Dimethylphenol	35000	U	Phenanthrene	58000	
Anthracene	25000	U	bis(2-Chloroethoxy)Methane	69000	U
Di-n-Butylphthalate	32000	U	2,4-Dichlorophenol	35000	U
Fluoranthene	28000	U	1,2,4-Trichlorobenzene	25000	U
Pyrene	60000		Naphthalene	21000	U
Butylbenzylphthalate	32000	U	3,3'-Dichlorobenzidine	210000	U
Hexachlorobutadiene	12000	U	Benzo(a)Anthracene	100000	U
4-Chloro-3-Methylphenol	39000	U	bis(2-ethylhexyl)phthalate	32000	U
Chrysene	32000	U	Hexachlorocyclopentadiene	130000	U
Di-n-Octyl Phthalate	32000	U	2,4,6-Trichlorophenol	35000	U
Benzo(b)Fluoranthene	62000	U	Benzo(k)Fluoranthene	32000	U
2-Chloronaphthalene	25000	U	Benzo(a)Pyrene	32000	U
Indeno(1,2,3-cd)Pyrene	48000	U	Dimethyl Phthalate	21000	U
Dibenz(a,h)Anthracene	32000	U	Acenaphthylene	45000	U
Benzo(g,h,i)Perylene	53000	U	2-Nitrophenol	47000	U

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B12 Comp
% Moisture: 18.36

Report #: 880629
Century ID: 4890

	ug/kg			ug/kg	
Phenol	3700	U	Acenaphthene	4700	U
bis(2-Chloroethyl)Ether	14000	U	2,4-Dinitrophenol	100000	U
2-Chlorophenol	8100	U	4-Nitrophenol	5900	U
1,3-Dichlorobenzene	4700	U	1,4-Dichlorobenzene	11000	U
2,4-Dinitrotoluene	14000	U	2,6-Dinitrotoluene	4700	U
1,2-Dichlorobenzene	4700	U	Diethylphthalate	4700	U
4-Chlorophenyl-phenylether	10000	U	bis(2-chloroisopropyl)Ether	14000	U
Fluorene	3200	J	N-Nitroso-Di-n-Propylamine	24000	U
4,6-Dinitro-2-Methylphenol	59000	U	Hexachloroethane	3900	U
N-Nitrosodiphenylamine (1)	4700	U	Nitrobenzene	4700	U
4-Bromophenyl-phenylether	4700	U	Isophorone	5400	U
Hexachlorobenzene	4700	U	Pentachlorophenol	8800	U
2,4-Dimethylphenol	6600	U	Phenanthrene	5100	J
Anthracene	4700	U	bis(2-Chloroethoxy)Methane	13000	U
Di-n-Butylphthalate	6100	U	2,4-Dichlorophenol	6600	U
Fluoranthene	5400	U	1,2,4-Trichlorobenzene	4700	U
Pyrene	3700	J	Naphthalene	3900	U
Butylbenzylphthalate	6100	U	3,3'-Dichlorobenzidine	40000	U
Hexachlorobutadiene	2200	U	Benzo(a)Anthracene	19000	U
4-Chloro-3-Methylphenol	7300	U	bis(2-ethylhexyl)phthalate	6100	U
Chrysene	6100	U	Hexachlorocyclopentadiene	24000	U
Di-n-Octyl Phthalate	6100	U	2,4,6-Trichlorophenol	6600	U
Benzo(b)Fluoranthene	12000	U	Benzo(k)Fluoranthene	6100	U
2-Chloronaphthalene	4700	U	Benzo(a)Pyrene	6100	U
Indeno(1,2,3-cd)Pyrene	9100	U	Dimethyl Phthalate	3900	U
Dibenz(a,h)Anthracene	6100	U	Acenaphthylene	8600	U
Benzo(g,h,i)Perylene	10000	U	2-Nitrophenol	8800	U

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B13 Comp
% Moisture: 15.61

Report #: 880629
Century ID: 4891

	ug/kg			ug/kg	
Phenol	59	U	Acenaphthene	75	U
bis(2-Chloroethyl)Ether	230	U	2,4-Dinitrophenol	1700	U
2-Chlorophenol	130	U	4-Nitrophenol	95	U
1,3-Dichlorobenzene	75	U	1,4-Dichlorobenzene	170	U
2,4-Dinitrotoluene	230	U	2,6-Dinitrotoluene	75	U
1,2-Dichlorobenzene	75	U	Diethylphthalate	75	U
4-Chlorophenyl-phenylether	170	U	bis(2-chloroisopropyl)Ether	230	U
Fluorene	75	U	N-Nitroso-Di-n-Propylamine	390	U
4,6-Dinitro-2-Methylphenol	950	U	Hexachloroethane	63	U
N-Nitrosodiphenylamine (1)	75	U	Nitrobenzene	75	U
4-Bromophenyl-phenylether	75	U	Isophorone	87	U
Hexachlorobenzene	75	U	Pentachlorophenol	140	U
2,4-Dimethylphenol	110	U	Phenanthrene	210	U
Anthracene	75	U	bis(2-Chloroethoxy)Methane	210	U
Di-n-Butylphthalate	79	J,B (B=32)	2,4-Dichlorophenol	110	U
Fluoranthene	95		1,2,4-Trichlorobenzene	75	U
Pyrene	100		Naphthalene	63	U
Butylbenzylphthalate	99	U	3,3'-Dichlorobenzidine	650	U
Hexachlorobutadiene	36	U	Benzo(a)Anthracene	110	J
4-Chloro-3-Methylphenol	120	U	bis(2-ethylhexyl)phthalate	99	U
Chrysene	99	U	Hexachlorocyclopentadiene	390	U
Di-n-Octyl Phthalate	99	U	2,4,6-Trichlorophenol	110	U
Benzo(b)Fluoranthene	190	U	Benzo(k)Fluoranthene	99	U
2-Chloronaphthalene	75	U	Benzo(a)Pyrene	99	U
Indeno(1,2,3-cd)Pyrene	150	U	Dimethyl Phthalate	63	U
Dibenz(a,h)Anthracene	99	U	Acenaphthylene	140	U
Benzo(g,h,i)Perylene	160	U	2-Nitrophenol	140	U

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B14 Comp
% Moisture: 26.52

Report #: 880629
Century ID: 4892

	ug/kg			ug/kg	
Phenol	410	U	Acenaphthene	520	U
bis(2-Chloroethyl)Ether	1600	U	2,4-Dinitrophenol	11000	U
2-Chlorophenol	900	U	4-Nitrophenol	650	U
1,3-Dichlorobenzene	520	U	1,4-Dichlorobenzene	1200	U
2,4-Dinitrotoluene	1600	U	2,6-Dinitrotoluene	520	U
1,2-Dichlorobenzene	520	U	Diethylphthalate	520	U
4-Chlorophenyl-phenylether	1100	U	bis(2-chloroisopropyl)Ether	1600	U
Fluorene	16000		N-Nitroso-Di-n-Propylamine	2700	U
4,6-Dinitro-2-Methylphenol	6500	U	Hexachloroethane	440	U
N-Nitrosodiphenylamine (1)	520	U	Nitrobenzene	520	U
4-Bromophenyl-phenylether	520	U	Isophorone	600	U
Hexachlorobenzene	520	U	Pentachlorophenol	980	U
2,4-Dimethylphenol	730	U	Phenanthrene	10000	
Anthracene	520	U	bis(2-Chloroethoxy)Methane	1400	U
Di-n-Butylphthalate	680	U	2,4-Dichlorophenol	730	U
Fluoranthene	520		1,2,4-Trichlorobenzene	520	U
Pyrene	2000		Naphthalene	2200	
Butylbenzylphthalate	680	U	3,3'-Dichlorobenzidine	4500	U
Hexachlorobutadiene	240	U	Benzo(a)Anthracene	2100	U
4-Chloro-3-Methylphenol	820	U	bis(2-ethylhexyl)phthalate	680	U
Chrysene	1300		Hexachlorocyclopentadiene	2700	U
Di-n-Octyl Phthalate	680	U	2,4,6-Trichlorophenol	730	U
Benzo(b)Fluoranthene	1300	U	Benzo(k)Fluoranthene	680	U
2-Chloronaphthalene	520	U	Benzo(a)Pyrene	680	U
Indeno(1,2,3-cd)Pyrene	1000	U	Dimethyl Phthalate	440	U
Dibenz(a,h)Anthracene	680	U	Acenaphthylene	950	U
Benzo(g,h,i)Perylene	1100	U	2-Nitrophenol	980	U

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B15 Comp
% Moisture: 14.56

Report #: 880629
Century ID: 4896

	ug/kg		ug/kg
Phenol	59 U	Acenaphthene	74 U
bis(2-Chloroethyl)Ether	220 U	2,4-Dinitrophenol	1600 U
2-Chlorophenol	130 U	4-Nitrophenol	94 U
1,3-Dichlorobenzene	74 U	1,4-Dichlorobenzene	170 U
2,4-Dinitrotoluene	220 U	2,6-Dinitrotoluene	74 U
1,2-Dichlorobenzene	74 U	Diethylphthalate	74 U
4-Chlorophenyl-phenylether	160 U	bis(2-chloroisopropyl)Ether	220 U
Fluorene	74 U	N-Nitroso-Di-n-Propylamine	390 U
4,6-Dinitro-2-Methylphenol	940 U	Hexachloroethane	62 U
N-Nitrosodiphenylamine (1)	74 U	Nitrobenzene	74 U
4-Bromophenyl-phenylether	74 U	Isophorone	86 U
Hexachlorobenzene	74 U	Pentachlorophenol	140 U
2,4-Dimethylphenol	110 U	Phenanthrene	210 U
Anthracene	74 U	bis(2-Chloroethoxy)Methane	210 U
Di-n-Butylphthalate	98 U	2,4-Dichlorophenol	110 U
Fluoranthene	86 U	1,2,4-Trichlorobenzene	74 U
Pyrene	74 U	Naphthalene	62 U
Butylbenzylphthalate	98 U	3,3'-Dichlorobenzidine	640 U
Hexachlorobutadiene	35 U	Benzo(a)Anthracene	300 U
4-Chloro-3-Methylphenol	120 U	bis(2-ethylhexyl)phthalate	47 J
Chrysene	98 U	Hexachlorocyclopentadiene	390 U
Di-n-Octyl Phthalate	98 U	2,4,6-Trichlorophenol	110 U
Benzo(b)Fluoranthene	190 U	Benzo(k)Fluoranthene	98 U
2-Chloronaphthalene	74 U	Benzo(a)Pyrene	98 U
Indeno(1,2,3-cd)Pyrene	140 U	Dimethyl Phthalate	62 U
Dibenz(a,h)Anthracene	98 U	Acenaphthylene	140 U
Benzo(g,h,i)Perylene	160 U	2-Nitrophenol	140 U

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B16 Comp
% Moisture: 16.02

Report #: 880629
Century ID: 4893

	ug/kg			ug/kg	
Phenol	60	U	Acenaphthene	75	U
bis(2-Chloroethyl)Ether	230	U	2,4-Dinitrophenol	1700	U
2-Chlorophenol	130	U	4-Nitrophenol	95	U
1,3-Dichlorobenzene	75	U	1,4-Dichlorobenzene	170	U
2,4-Dinitrotoluene	230	U	2,6-Dinitrotoluene	75	U
1,2-Dichlorobenzene	75	U	Diethylphthalate	75	U
4-Chlorophenyl-phenylether	170	U	bis(2-chloroisopropyl)Ether	230	U
Fluorene	75	U	N-Nitroso-Di-n-Propylamine	400	U
4,6-Dinitro-2-Methylphenol	950	U	Hexachloroethane	64	U
N-Nitrosodiphenylamine (1)	75	U	Nitrobenzene	75	U
4-Bromophenyl-phenylether	75	U	Isophorone	87	U
Hexachlorobenzene	75	U	Pentachlorophenol	140	U
2,4-Dimethylphenol	110	U	Phenanthrene	210	U
Anthracene	75	U	bis(2-Chloroethoxy)Methane	210	U
Di-n-Butylphthalate	130		2,4-Dichlorophenol	110	U
Fluoranthene	87	U	1,2,4-Trichlorobenzene	75	U
Pyrene	180		Naphthalene	64	U
Butylbenzylphthalate	99	U	3,3'-Dichlorobenzidine	650	U
Hexachlorobutadiene	36	U	Benzo(a)Anthracene	310	U
4-Chloro-3-Methylphenol	120	U	bis(2-ethylhexyl)phthalate	99	U
Chrysene	99	U	Hexachlorocyclopentadiene	400	U
Di-n-Octyl Phthalate	99	U	2,4,6-Trichlorophenol	110	U
Benzo(b)Fluoranthene	190	U	Benzo(k)Fluoranthene	99	U
2-Chloronaphthalene	75	U	Benzo(a)Pyrene	99	U
Indeno(1,2,3-cd)Pyrene	150	U	Dimethyl Phthalate	64	U
Dibenz(a,h)Anthracene	99	U	Acenaphthylene	140	U
Benzo(g,h,i)Perylene	160	U	2-Nitrophenol	140	U

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

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J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B18 Comp
% Moisture: 15.46

Report #: 880629
Century ID: 4898

	ug/kg			ug/kg	
Phenol	59	U	Acenaphthene	75	U
bis(2-Chloroethyl)Ether	220	U	2,4-Dinitrophenol	1700	U
2-Chlorophenol	130	U	4-Nitrophenol	95	U
1,3-Dichlorobenzene	75	U	1,4-Dichlorobenzene	170	U
2,4-Dinitrotoluene	220	U	2,6-Dinitrotoluene	75	U
1,2-Dichlorobenzene	75	U	Diethylphthalate	75	U
4-Chlorophenyl-phenylether	170	U	bis(2-chloroisopropyl)Ether	220	U
Fluorene	75	U	N-Nitroso-Di-n-Propylamine	390	U
4,6-Dinitro-2-Methylphenol	950	U	Hexachloroethane	63	U
N-Nitrosodiphenylamine (1)	75	U	Nitrobenzene	75	U
4-Bromophenyl-phenylether	75	U	Isophorone	87	U
Hexachlorobenzene	75	U	Pentachlorophenol	140	U
2,4-Dimethylphenol	110	U	Phenanthrene	210	U
Anthracene	75	U	bis(2-Chloroethoxy)Methane	210	U
Di-n-Butylphthalate	99	U	2,4-Dichlorophenol	110	U
Fluoranthene	87	U	1,2,4-Trichlorobenzene	75	U
Pyrene	130		Naphthalene	63	U
Butylbenzylphthalate	99	U	3,3'-Dichlorobenzidine	650	U
Hexachlorobutadiene	35	U	Benzo(a)Anthracene	310	U
4-Chloro-3-Methylphenol	120	U	bis(2-ethylhexyl)phthalate	99	U
Chrysene	99	U	Hexachlorocyclopentadiene	390	U
Di-n-Octyl Phthalate	99	U	2,4,6-Trichlorophenol	110	U
Benzo(b)Fluoranthene	190	U	Benzo(k)Fluoranthene	99	U
2-Chloronaphthalene	75	U	Benzo(a)Pyrene	99	U
Indeno(1,2,3-cd)Pyrene	150	U	Dimethyl Phthalate	63	U
Dibenz(a,h)Anthracene	99	U	Acenaphthylene	140	U
Benzo(g,h,i)Perylene	160	U	2-Nitrophenol	140	U

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.
Report of Results

EXTRACTABLE ORGANICS ANALYSIS

Client: Dames & Moore
Sample ID: B18 RRB
% Moisture: 17.84

Report #: 880629
Century ID: 4897

	ug/kg		ug/kg
Phenol	61 U	Acenaphthene	77 U
bis(2-Chloroethyl)Ether	230 U	2,4-Dinitrophenol	1700 U
2-Chlorophenol	130 U	4-Nitrophenol	97 U
1,3-Dichlorobenzene	77 U	1,4-Dichlorobenzene	180 U
2,4-Dinitrotoluene	230 U	2,6-Dinitrotoluene	77 U
1,2-Dichlorobenzene	77 U	Diethylphthalate	41 J
4-Chlorophenyl-phenylether	170 U	bis(2-chloroisopropyl)Ether	230 U
Fluorene	77 U	N-Nitroso-Di-n-Propylamine	410 U
4,6-Dinitro-2-Methylphenol	970 U	Hexachloroethane	65 U
N-Nitrosodiphenylamine (1)	77 U	Nitrobenzene	77 U
4-Bromophenyl-phenylether	77 U	Isophorone	89 U
Hexachlorobenzene	77 U	Pentachlorophenol	150 U
2,4-Dimethylphenol	110 U	Phenanthrene	93
Anthracene	77 U	bis(2-Chloroethoxy)Methane	220 U
Di-n-Butylphthalate	57 J,B (B=32)	2,4-Dichlorophenol	110 U
Fluoranthene	89 U	1,2,4-Trichlorobenzene	77 U
Pyrene	77 U	Naphthalene	65 U
Butylbenzylphthalate	100 U	3,3'-Dichlorobenzidine	670 U
Hexachlorobutadiene	37 U	Benzo(a)Anthracene	320 U
4-Chloro-3-Methylphenol	120 U	bis(2-ethylhexyl)phthalate	100 U
Chrysene	100 U	Hexachlorocyclopentadiene	410 U
Di-n-Octyl Phthalate	100 U	2,4,6-Trichlorophenol	110 U
Benzo(b)Fluoranthene	190 U	Benzo(k)Fluoranthene	100 U
2-Chloronaphthalene	77 U	Benzo(a)Pyrene	100 U
Indeno(1,2,3-cd)Pyrene	150 U	Dimethyl Phthalate	65 U
Dibenz(a,h)Anthracene	100 U	Acenaphthylene	140 U
Benzo(g,h,i)Perylene	170 U	2-Nitrophenol	150 U

U Indicates compound was analyzed for but not detected (eg. 10U), based on necessary concentration/dilution. The number is the minimum attainable detection limit for the sample.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J Indicates an estimated value, based on assumption of a 1:1 response for tentatively identified compounds, or when mass spectral data indicate the presence of a compound at levels below the specified detection limit.

CENTURY LABORATORIES, INC.

DATE: 04/21/88

CLIENT: Dames & Moore
REPORT #: 88-0629
CLIENT ID: Chevron - Ballfields Area B
DATE COLLECTED: 03/21/88

CERTIFICATE OF ANALYSIS
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

LEACHATE ANALYSIS (mg/l):	*MAL	B5 COMP	B11 COMP	B15 COMP
Arsenic	5.0	<0.007	<0.007	<0.007
Barium	100.0	0.465	0.415	0.195
Cadmium	1.0	<0.005	<0.005	<0.005
Chromium	5.0	0.010	<0.010	<0.010
Lead	5.0	<0.100	<0.100	<0.100
Mercury	0.2	<0.0002	<0.0002	<0.0002
Selenium	1.0	<0.003	<0.003	<0.003
Silver	5.0	<0.010	<0.010	<0.010
Endrin	0.02	0.002 U	0.002 U	0.002 U
Lindane	0.4	0.04 U	0.04 U	0.04 U
Methoxychlor	10.0	1.0 U	1.0 U	1.0 U
Toxaphene	0.5	0.05 U	0.05 U	0.05 U
2,4-D	10.0	0.01 U	0.01 U	0.01 U
2,4,5-TP (Silvex)	1.0	0.003 U	0.003 U	0.003 U

*MAL - Maximum allowable level, as per 40 CFR 261
< - Less than. Parameter not detected at or above value shown.

DEFINITIONS:

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

CENTURY LABORATORIES, INC.

DATE: 04/21/88

CLIENT: Dames & Moore
REPORT #: 88-0629
CLIENT ID: Chevron - Ballfields Area B
DATE COLLECTED: 03/22/88

CERTIFICATE OF ANALYSIS
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

LEACHATE ANALYSIS (mg/l):	*MAL	B18 RRB
Arsenic	5.0	<0.007
Barium	100.0	0.164
Cadmium	1.0	<0.005
Chromium	5.0	<0.010
Lead	5.0	<0.100
Mercury	0.2	<0.0002
Selenium	1.0	<0.003
Silver	5.0	<0.010
Endrin	0.02	0.002 U
Lindane	0.4	0.04 U
Methoxychlor	10.0	1.0 U
Toxaphene	0.5	0.05 U
2,4-D	10.0	0.01 U
2,4,5-TP (Silvex)	1.0	0.003 U

*MAL - Maximum allowable level, as per 40 CFR 261
< - Less than. Parameter not detected at or above value shown.

DEFINITIONS:

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: AREA B CHEVRON

Project Title: BAKERFIELDS - AREA B

Job No. 16000-034

Field Personnel (Signature): [signature]

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
3/21/88		B1 Comp	SOIL	4 (INCLUDES VOA)		ANALYZE FOR:
		B2 Comp				MODIFIED SKINNER'S LIST,
		B3 Comp				PCBs, TOTAL CYANIDE,
		B4 Comp				TOTAL PETROLEUM HYDROCARBONS
	↓	B5 Comp				ALSO ANALYZE B5, B11 &
↓		B6 Comp	↓	↓		B15 FOR EP TOX -
		B7 Comp				METALS & ORGANICS.
		B9 Comp				
		B10 Comp				(NORMAL TURNAROUND
	↓	B11 Comp				
↓		B12 Comp	↓			SAMPLES HAVE STRONG
3/22/88		B13 Comp		2 (INCLUDES VOA)		TPH ODOR
		B14 Comp		4 (INCLUDES VOA)		
	↓	B15 Comp		2 (NO VOA)		
↓		B16 Comp		4 (INCLUDES VOA)		

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	3/23/88	10 19 AM	[signature]	3-23-88	10:01 AM	[signature]	3-23-88	12:40	[signature]	3/23/88	12:40
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: AREA B - CHEVRON

Project Title: BALLFIELDS - AREA B

Job No. 16000-034

Field Personnel (Signature): [signature]

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
3/22/88		B18-RRB	SOIL	3 (INCLUDES VOA)	NORMAL TURNAROUND	MODIFIED SKINNER LIST EP TOX AND PCB'S
						[illegible]
3/22/88		B18Comp	SOIL	2 (NO VOA)		ANALYZE FOR: MODIFIED SKINNER LIST, PCBs, TOTAL CYANIDE + TOTAL PET HYDROCARBONS
						SAMPLE HAVE STRONG TOTAL PET HYC. ODOR

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	3/22/88	10 10 AM	[signature]	3-23-88	10:[illegible]	[signature]	3-29-88	10:[illegible]	[signature]	3/29/88	1040

NET NATIONAL ENVIRONMENTAL TESTING, INC.

NET Mid-Atlantic, Inc.
1501 Grandview Avenue
P.O. Box 248
Thorofare, NJ 08086
Tel: (609) 848-3939
Fax: (609) 848-9195

August 23, 1988

Dames & Moore
2360 Maryland Road
Willow Grove, PA 19090

Dear Mr. Wagner:

Please find enclosed the QC Summaries that were requested for NET Mid-Atlantic, Inc. job number 880629.

The QC Summary report includes the Sample Surrogate Recoveries for ABN, VOA, and Pest/PCB. Also, included are the Matrix Spike and Matrix Spike Duplicate associated with this job.

Sincerely,

NET Mid-Atlantic, Inc.

Ken Bond

Ken Bond

ljs
Enclosures

NET Mid- Atlantic, Inc.

SOIL SURROGATE PERCENT RECOVERY SUMMARY

Client: DAMES & MOORE
Report #: FF-0629

		Volatiles			Extractables						Pesticides
Client ID	NET ID	Toluene-d8 (81-117)	BFB (74-121)	1,2-Dichloroethane-d4 (70-121)	Nitrobenzene-d5 (23-121)	2-Fluorobiphenyl (30-115)	p-terphenyl-d14 (18-137)	Phenol-d6 (24-113)	2-Fluorophenol (25-121)	2,4,6-Tribromophenol (19-122)	Dibutyl Chlorendate (20-130)**
A221N	376 MS				22*	86	60	29	33	27	
A221N	376 MSD				10*	86	40	27	25	21	
A235N	4F76 MS				67	73	90	51	66	71	
A235N	4F76 MSD				64	72	89	74	64	77	
A237N	4F95 MS				25	65	78	36	43	0*	
A237N	4F95 MSD				21*	54	72	39	40	0*	
A243N	5226 MS				46	53	89	56	52	74	
A243N	5226 MSD				54	56	85	62	57	79	
NA-7	F514MS	100	114	87							
NA-7	F514MSD	98	109	83							
50-45	4F91 MS	101	100	95							
60-45	4F91 MSD	100	99	96							

**Advisory limit only

Comments:

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

QC SAMPLE NO: 0352-3761

QC BATCH NO: A221N

COMPOUND NAME	SPIKE ADDED	SAMPLE RESULT	CONC. MS *	% RECOVERY	CONC. MSD **	% RECOVERY	RPD***
2-Chlorophenol	100 UG	N.D.	37 UG	37	36 UG	36	3 %
Phenol	100 UG	N.D.	23 UG	23	26 UG	26	12 %
p-chloro-m-cresol	100 UG	N.D.	24 UG	24	31 UG	31	25 %
4-Nitrophenol	100 UG	N.D.	14 UG	14	11 UG	11	24 %
Pentachlorophenol	100 UG	N.D.	41 UG	41	31 UG	31	28 %
1,4-Dichlorobenzene	50 UG	N.D.	19 UG	39	18 UG	36	5 %
N-Nitroso-di-n-propylamine	50 UG	N.D.	14 UG	28	13 UG	26	7 %
1,2,4-Trichlorobenzene	50 UG	N.D.	17 UG	34	15 UG	30	13 %
Acenaphthene	50 UG	N.D.	28 UG	56	27 UG	54	4 %
2,4-Dinitrotoluene	50 UG	N.D.	NR	0	NR UG	0	NC %
Pyrene	50 UG	N.D.	34 UG	68	39 UG	78	14 %
1,3 - Dichlorobenzene	50 UG	N.D.	18 UG	36	18 UG	36	0 %
1,2 - Dichlorobenzene	50 UG	N.D.	19 UG	38	17 UG	34	11 %

* Matrix Spike
** Matrix Spike Duplicate
*** Relative Percent Difference
NC = Not Calculatable
NR = No Recovery

Century Sample Numbers: 0352-3761 0352-3762 0352-3763 0352-3764 0335-3652R
0347-3708R 0347-3711R 0522-4555 0522-4556 0522-4570
0546-4622 0548-4649 0522-4557R 0548-4652R 0647-4994
0647-4996 0647-4997 0647-4998 0647-5000 0629-4883

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

QC SAMPLE NO: 88-0628-4876

QC BATCH NO: A235N

COMPOUND NAME	SPIKE ADDED	SAMPLE RESULT	CONC. MS *	% RECOVERY	CONC. MSD **	% RECOVERY	RPD***
2-Chlorophenol	100 UG	N.D.	64 UG	64	66 UG	66	3 %
Phenol	100 UG	N.D.	71 UG	71	76 UG	76	7 %
p-chloro-m-cresol	100 UG	N.D.	65 UG	65	71 UG	71	9 %
4-Nitrophenol	100 UG	N.D.	68 UG	68	83 UG	83	20 %
Pentachlorophenol	100 UG	N.D.	84 UG	84	88 UG	88	5 %
1,4-Dichlorobenzene	50 UG	N.D.	16 UG	32	19 UG	38	17 %
N-Nitroso-di-n-progylamine	50 UG	N.D.	32 UG	64	34 UG	68	6 %
1,2,4-Trichlorobenzene	50 UG	N.D.	23 UG	46	25 UG	50	8 %
Acenaphthene	50 UG	N.D.	34 UG	68	35 UG	70	3 %
2,4-Dinitrotoluene	50 UG	N.D.	39 UG	78	41 UG	82	5 %
Pyrene	50 UG	N.D.	52 UG	104	49 UG	98	6 %
1,3 - Dichlorobenzene	50 UG	N.D.	16 UG	32	19 UG	38	17 %
1,2 - Dichlorobenzene	50 UG	N.D.	18 UG	36	21 UG	42	15

* Matrix Spike

** Matrix Spike Duplicate

*** Relative Percent Difference

Century Sample Numbers:

88-0628-4876 88-0628-4877 88-0628-4878 88-0628-4879
88-0628-4880 88-0628-4881 88-0629-4882 88-0629-4884
88-0629-4885 88-0629-4886 88-0629-4891 88-0629-4892
88-0629-4893 88-0629-4896 88-0629-4897 88-0629-4898
88-0647-4993 88-0647-4994 88-0647-4995 88-0647-4999

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

QC SAMPLE NO: 880686-5226

QC BATCH NO: A243N

COMPOUND NAME	SPIKE ADDED	SAMPLE RESULT	CONC. MS *	% RECOVERY	CONC. MSD **	% RECOVERY	RPD***
2-Chlorophenol	100 UG	N.D.	48 UG	48	52 UG	52	8%
Phenol	100 UG	N.D.	47 UG	47	50 UG	50	6%
p-chloro-m-cresol	100 UG	N.D.	51 UG	51	46 UG	46	10%
4-Nitrophenol	100 UG	N.D.	57 UG	57	59 UG	59	3%
Pentachlorophenol	100 UG	N.D.	54 UG	54	58 UG	58	7%
1,4-Dichlorobenzene	50 UG	N.D.	25 UG	50	26 UG	52	4%
N-Nitroso-di-n-propylamine	50 UG	N.D.	23 UG	46	25 UG	50	8%
1,2,4-Trichlorobenzene	50 UG	N.D.	23 UG	46	24 UG	48	4%
Acenaphthene	50 UG	N.D.	27 UG	54	29 UG	58	7%
2,4-Dinitrotoluene	50 UG	N.D.	36 UG	72	39 UG	78	8%
Pyrene	50 UG	N.D.	42 UG	84	38 UG	76	10%
1,3 - Dichlorobenzene	50 UG	N.D.	24 UG	48	26 UG	52	8%
1,2 - Dichlorobenzene	50 UG	N.D.	23 UG	46	25 UG	50	8%

* Matrix Spike

** Matrix Spike Duplicate

*** Relative Percent Difference

Century Sample Numbers: 0686-5226 0693-5262 0693-5263 0693-5264 0693-5265
0693-5266 0693-5267 0693-5268 0693-5269 0693-5270
0693-5271 0629-4884R 0629-4888R 0629-4889R 0647-4996R
0675-5121R 0686-5194R 0686-5207R 0759-5726 0759-5727

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

QC SAMPLE NO: 880629-4891

QC BATCH NO: SO-45

NET Mid-Atlantic Sample Numbers: 880629-4891 880629-4882 880646-4992 880646-4988
880629-4886 880629-4884 880629-4885 880687-5229
880687-5230 880687-5231 880687-5233 880675-5122
880675-5128 880675-5129 880675-5130 880675-5134
880675-5133 880675-5121 880675-5131 880675-5135

COMPOUND NAME	SPIKE ADDED	SAMPLE RESULT	CONC. MS	% RECOVERY	CONC. MSD	% RECOVERY	RPD
	ug/kg		ug/kg		ug/kg		
Benzene	50	ND	51	101	52	104	3
Bromodichloromethane	50	ND	52	102	52	104	2
Bromoform	50	ND	50	100	53	106	6
Bromomethane	50	ND	56	112	54	108	4
Carbon Tetrachloride	50	ND	55	110	55	110	0
Chlorobenzene	50	ND	52	104	53	106	2
Chlorodibromomethane	50	ND	52	104	52	104	0
Chloroethane	50	ND	47	94	47	94	0
Chloroform	50	ND	54	108	55	110	2
Chloromethane	50	ND	38	76	38	76	0
1,1-Dichloroethane	50	ND	52	104	52	104	0
1,2-Dichloroethane	50	ND	51	102	53	106	4
1,1-Dichloroethene	50	ND	52	104	52	104	0
Total 1,2-Dichloroethene	50	ND	52	104	52	104	0
1,2-Dichloropropane	50	ND	50	100	50	100	0
cis-1,3-Dichloropropene	61	ND	62	102	62	102	0
Trans-1,3-Dichloropropene	39	ND	39	100	40	103	3
Ethylbenzene	50	ND	54	108	54	108	0
Fluorotrichloromethane	50	ND	53	--	--	--	--
Methylene chloride	50	ND	50	100	50	100	0
1,1,2,2, Tetrachloroethane	50	ND	48	96	49	98	2
Tetrachloroethene	50	ND	54	108	55	110	2
Toluene	50	ND	54	108	54	108	0
1,1,1-Trichloroethane	50	ND	55	110	55	110	0
1,1,2-Trichloroethane	50	ND	51	102	51	102	0
Trichloroethene	50	ND	53	106	55	110	4
Vinyl Chloride	50	ND	49	98	49	98	0
1,2-Dichlorobenzene	50	ND	53	106	56	112	6
1,3-Dichlorobenzene	50	ND	49	98	50	100	2
1,4-Dichlorobenzene	50	ND	49	98	44	88	11
1,2-Dichloroethane-d-4(ss)	50	ND	48	96	48	96	0
Toluene-d-8 (ss)	50	ND	51	102	50	100	2
Bromofluorobenzene (ss)	50	ND	50	100	49	98	0
2-Chloroethyl Vinyl ether	50	ND	47	94	47	94	2
Total Xylenes	150	ND	151	101	148	99	2

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

QC SAMPLE NO: 88-0629-4894

QC BATCH NO: MA - 7

CENTURY SAMPLES NUMBERS: 88-0629-4894 88-0629-4883 88-0629-4889 88-0629-4888
88-0629-4890 88-0629-4887 88-0629-4895 88-0629-4892
88-0686-5208 88-0686-5206 88-0686-5207 88-0686-5209
88-0702-5346 88-0686-5197

COMPOUND NAME	SPIKE ADDED	SAMPLE RESULT	CONC. MS	% RECOVERY	CONC. MSD	% RECOVERY	RPD
	NG		NG		NG		
Benzene	50	53	121	136	128	150	10
Bromodichloromethane	50	ND	150	100	149	98	2
Bromoform	50	ND	149	98	149	98	0
Bromomethane	50	ND	146	92	147	94	2
Carbon Tetrachloride	50	ND	152	104	153	106	2
Chlorobenzene	50	ND	159	116	157	114	2
Chlorodibromomethane	50	ND	151	102	151	102	0
Chloroethane	50	ND	148	46	150	100	4
Chloroform	50	ND	149	98	150	100	2
Chloromethane	50	ND	146	92	147	94	2
Dichlorodifluoromethane	50	ND					
1,1-Dichloroethane	50	ND	145	90	146	92	2
1,2-Dichloroethane	50	ND	148	96	149	98	2
1,1-Dichloroethene	50	ND	149	98	151	102	4
Trans 1,2-Dichloroethene	50	ND	149	98	150	100	2
1,2-Dichloropropane	50	ND	144	88	145	90	2
cis-1,3-Dichloropropene	61	ND	157	93	157	98	0
Trans-1,3-Dichloropropene	39	ND	138	97	139	100	3
Ethylbenzene	50	ND	152	104	152	104	0
Fluorotrichloromethane	50	ND					
Methylene chloride	50	ND	150	100	150	100	0
1,1,2,2, Tetrachloroethane	50	ND	142	84	141	82	2
Tetrachloroethene	50	ND	156	112	156	112	0
Toluene	50	ND	150	100	149	98	2
1,1,1-Trichloroethane	50	ND	151	102	152	104	2
1,1,2-Trichloroethane	50	ND	148	96	148	96	0
Trichloroethene	50	ND	152	104	153	106	2
Vinyl Chloride	50	ND	148	96	148	96	0
1,2-Dichlorobenzene	50	ND	156	112	151	102	9
1,3-Dichlorobenzene	50	ND	156	112	155	110	2
1,4-Dichlorobenzene	50	ND	152	104	154	108	4
1,2-Dichloroethane-d-4(ss)	50	ND	143	86	144	88	2
Toluene-d-8 (ss)	50	ND	149	98	147	94	4
Bromofluorobenzene (ss)	50	ND					
2-Chloroethyl Vinyl ester	50	ND	142	84	142	84	0
Bromofluorobenzene (ss)	50	ND	153	106	151	102	4
Total Xylenes	150	ND	1155	103	1152	101	2
o+p-Xylenes	50	ND					

QC MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

QC SAMPLE NO: 0548-4659

QC BATCH NO: P230M

COMPOUND NAME	SPIKE ADDED	SAMPLE RESULT	CONC. MS *	% RECOVERY	CONC. MSD **	% RECOVERY	RPD***
Aroclor 1232	1250 PG	1421	--	114	--	--	--

* Matrix Spike

** Matrix Spike Duplicate

*** Relative Percent Difference

CENTURY SAMPLE NUMBER: 0548-4659 0548-4661 0548-4662 0548-4663 0548-4664
0543-4611 0573-4733 0629-4882 0629-4883 0629-4884
0629-4885 0629-4886 0629-4887 0629-4888 0629-4889
0629-4890 0629-4891 0629-4892 0629-4893 0629-4894

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

QC SAMPLE NO: 0629-4895

QC BATCH NO: QC P236N

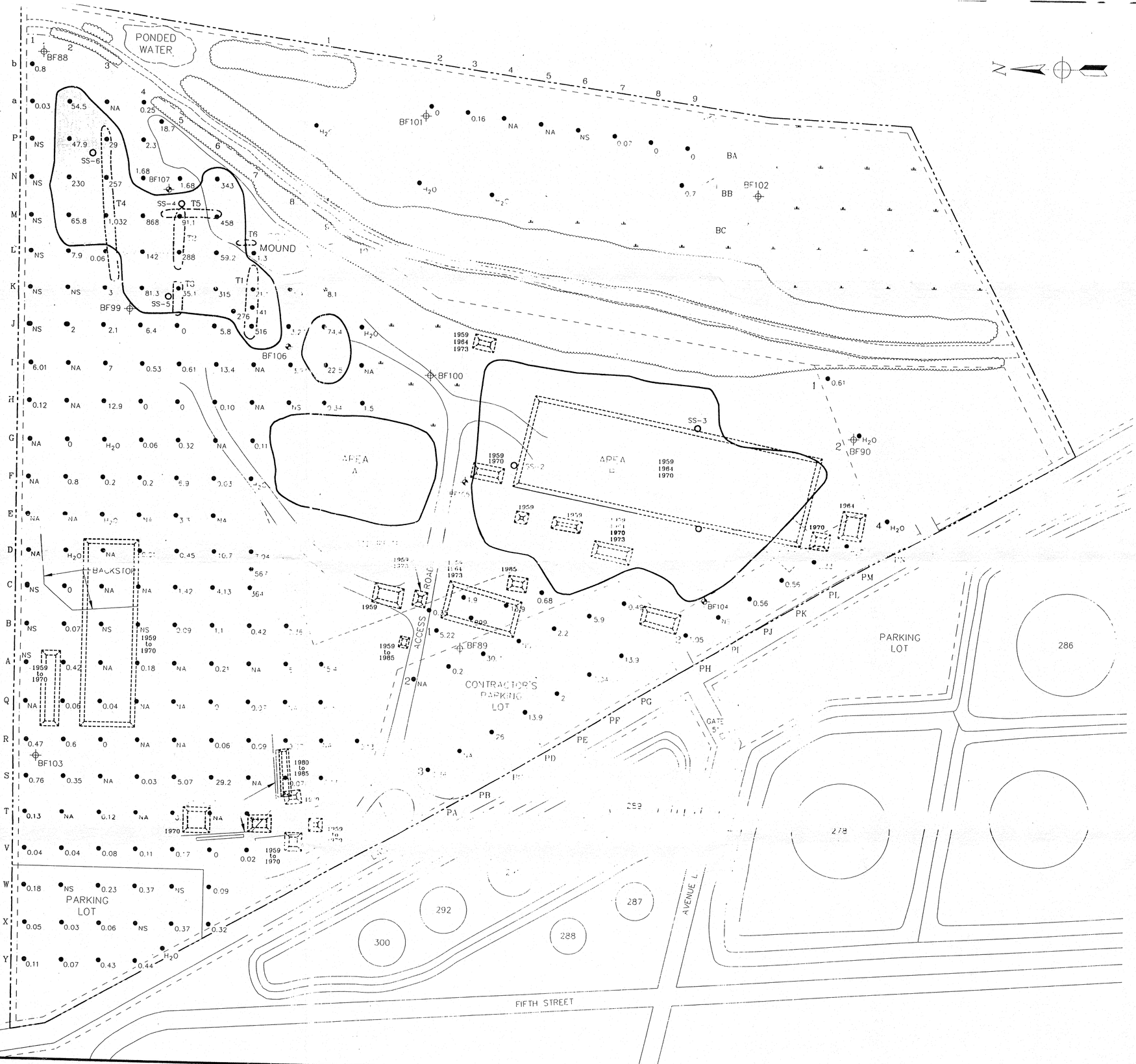
COMPOUND NAME	SPIKE ADDED	SAMPLE RESULT	CONC.	% RECOVERY
Aroclor 1232	1250 PG	N.D.	1044 NG	84

* Matrix Spike
** Martix Spike Duplicate
*** Relative Percent Difference

NET Mid-Atlantic Sample Numbers:

0629-4895	0629-4896	0629-4897	0629-4898
0687-5227	0687-5228	0687-5229	0687-5230
0687-5231	0687-5232	0687-5233	0703-5352
0700-5324	0700-5325	0700-5326	0700-5327
0693-5257	0693-5258	0693-5259	0693-5260

APPENDIX A-2



EXPLANATION:

- BF89 ⊕ GROUND WATER MONITORING WELL
- BF106 ⊕ PROPOSED GROUND WATER MONITORING WELL LOCATION
- 1.05 ● SOIL GAS SURVEY POINT SHOWING TOTAL CONCENTRATION OF VOCs IN ppm (SEE APPENDIX B FOR SOIL GAS DATA SHEETS)
- SS-1 O PROPOSED SOIL/WASTE SAMPLING LOCATION
- (286) ABOVE GROUND STORAGE TANK
- BALLFIELD BOUNDARY
- FENCE
- INTERMITTENT STREAM
- ANAMOLOUS ZONE DETECTED DURING THE SOIL GAS SURVEY
- H_2O = SOIL GAS SURVEY POINT WHERE WATER WAS ENCOUNTERED JUST BELOW THE GROUND SURFACE, THEREFORE, NO SAMPLE COULD BE COLLECTED
- T1 = TEST TRENCH CONDUCTED DURING 1989 BALLFIELDS INVESTIGATION
- NA = SAMPLE WAS NOT ANALYZED
- NS = NO SAMPLE COLLECTED
- HEAVY VEGETATION
- 1959 = BUILDING WITH YEAR OF CORRESPONDING AIR PHOTO

NOTE:

1. LOCATION, SIZE, AND SHAPE OF ALL ITEMS ARE APPROXIMATE.
2. GRID SPACING EQUALS APPROXIMATELY 50 FEET.
3. SOIL GAS SURVEY POINT LOCATIONS ARE APPROXIMATE.

0 50 100 150 FEET

GRAPHIC SCALE (APPROXIMATE)

TITLE	SAMPLING LOCATIONS BALLFIELDS		
PROJECT	CHEVRON REFINERY PHILADELPHIA, PENNSYLVANIA		
	Dames & Moore WILLOW GROVE, PENNSYLVANIA		
SCALE AS NOTED	DWN. BY R.G.B.	JOB NO. 16000-188	
DATE 7-14-89	APPR. BY D.J.W.	FIG. NO. 2	

APPENDIX B

APPENDIX B

SAMPLING PROCEDURES

APPENDIX B

FIELD PROCEDURES AND QUALITY CONTROL

The field program was under the overall direction of the Dames & Moore Field Program Manager. Detailed supervision of the field work was the responsibility of a Dames & Moore Geologist. In particular, the Dames & Moore Geologist had the following responsibilities:

- supervision of all sampling, drilling, and well construction;
- maintenance of the boring logs for each boring;
- collection, labeling and identification of samples;
- performance of the water sampling program;
- maintenance of pertinent notes in the field notebook, and on daily field memos regarding:
  - weather
  - work performed daily
  - supplies consumed daily
  - time for developing wells
  - approximate flow rate during the development process
  - problems in performing the field work
  - as-built sketches of well construction
  - information on water samples including any difficulties encountered in obtaining samples, physical appearance of samples (turbidity, color, odor), etc.

1.0 SOIL SAMPLING

Soil samples were collected from the locations shown in Figure 2. Samples collected from test pits were scooped from the sidewalls of the excavation using stainless steel "scoopulas." Samples collected from borings were collected using stainless steel split spoons. Upon retrieval, samples were immediately transferred to the appropriate laboratory-supplied container.

After sample collection, sample containers were labeled appropriately and placed in a laboratory sample shuttle containing ice.

2.1 DECONTAMINATION OF SOIL SAMPLING EQUIPMENT

All equipment used in the collection of soil samples was decontaminated prior to each use according to the following procedure:

a. Wash with a non-phosphate detergent.

b. Tap water rinse.

c. Rinse with 10 percent nitric acid solution.

d. Deionized water rinse.

e. Methanol rinse.

f. Deioni ed water rinse.

g. Air dry.

3.0 DRILLING PROCEDURES

General Procedures

Method of Drilling:	Hollow-stem auger.
Formation Sampling:	The driller used 2-inch diameter split spoon soil samplers. Soil sampling in the borings was performed continuously to define the actual site stratigraphy. After obtaining each soil sample, the sampler was cleaned by the procedures presented in Section 2.1 of this appendix.
Diameter of Boring:	Eight to ten inches.
Decontamination Requirements:	A controlled decontamination area was selected for rig cleaning, in the main plant area at a steam cleaning station. All drilling tools, including drill rods, bits, etc. were steam cleaned at the decontamination area before initiating drilling. This procedure was repeated between each boring, and at the conclusion of the drilling program. Detergent and

steam cleaning rinse water was discharged to the ground surface at the decontamination area, ensuring that water was diverted from surface water drainage.

4.0 WELL CONSTRUCTION PROCEDURES

Specifications and Procedures

Casing and Well Screen:	Four-inch, I.D. Schedule 40 PVC, with flush screw joints.
Screen slot size:	0.010 inch, machine slotted.
Storage of casing and screen:	The casing and screen lengths were not stored directly on the ground. The well string was prepared on a clean plastic sheet spread out over level ground.
Cleaning of casing screen:	Casing and screen was steam-cleaned with a heavy-duty, non-phosphate laundry detergent (approximately one cup to 10 gallons of town water), and rinsed with town water before being installed in the boring.
Bottom cap and blank casing:	A length of blank casing of about two feet complete with a bottom cap was installed below the well screen in wells BF-104 and BF-107.
Gravel Pack:	The gravel pack material was 90 percent by weight larger than 0.020 inch, and had a uniformity coefficient of 2.5 or less.
Placement of the sand pack:	The gravel pack was emplaced so that it extended to three feet above the top of the well screen. This was confirmed by measuring down the annular space with a weighted tape. The volume of gravel pack material emplaced was compared with the volume computed as required, based on the screen diameter and length. The gravel pack was poured directly down the annular space.

Bentonite seal:	A bentonite seal (minimum 12 inches thick) was placed in the annular space above the gravel pack in each well by emplacing 1/4-inch diameter volclay pellets in the annular space.
Well Development:	Each well was developed after completion of its installation for about one hour using a centrifugal pump. A new length of tubing was used at each well location. The discharge rate during development was estimated by using a five-gallon bucket and a stop watch.
Grouting Annular Space:	A bentonite-cement grout (5 lbs. bentonite and one bag of cement to 8 to 10 gallons of water) was pumped into the annular space to fill the space from the top of the volclay bentonite seal to the ground surface. This was completed as soon as the well had been developed.
Protective Casing:	A length of six-inch I.D. steel casing was placed over the four-inch well casing in each case to protect it. It was set about two feet into the bentonite-cement grout in the annular space, and sticks up above the ground surface about two to three feet. A lockable cap was affixed to the protective casing. Two sets of keys were provided (one each to Dames & Moore and the client).
Well Labeling:	The full number of each sampling well was painted on the protective casing or cap.
Surveying:	An elevation survey was performed in which the elevation of the top of the PVC well casing (not the surrounding steel protective casing) of each well was determined to $\pm$0.01 ft., and the reference point marked.

5.0 WATER SAMPLING PROCEDURES

The selected analytical laboratory, provided all the sample containers together with the shipping containers (shuttles). The preservation chemicals added to the containers were in accordance with EPA-600/4-79-20 (Methods for Chemical Analysis of Water and Wastes).

Sampling Procedures

1. The static water level in each well was measured and recorded to the nearest 0.01 ft. with an electric water-level indicator. The indicator probe was rinsed off with distilled water after each use, to avoid cross contamination.

2. The sample-bottle container from the laboratory was opened and the bottles inspected to ensure that all the required bottles were present and labeled.

3. Dedicated polyethylene flexible suction pipe was attached to a centrifugal pump for each well. It was then lowered into the well so that the foot valve was approximately opposite the middle of the well screen. In some cases, a dedicated stainless steel bailer was lowered into the well so that it was opposite the middle of the well screen.

4. A minimum of three well volumes was pumped out of each well. In cases where a bailer was used, water was evacuated by repeatedly lowering the bailer into the well and emptying its contents at the surface. To compute the well volume, the total static water column in the well in feet was multiplied by 0.65 gallons/foot (for four-inch I.D. wells.

5. The purged water was discharged to the ground but diverted from surface drainage.

6. A dedicated pre-cleaned stainless steel bailer with its own attached dedicated length of polypropylene line was used for each well.

7. The bailer and line was slowly lowered into the well until it was approximately opposite the well screen.

8. For each well sampled, the bailer was handled with a new pair of disposable plastic surgical gloves. Water samples were carefully transferred from the bailer to the sample bottles to minimize the potential for aeration of the sample, especially those designated for volatile organics analyses (VOA). No head space in the VOA sample was allowed.

9. All sample bottle caps were secured snugly.

10. All sample bottles were labeled and included the date, the owner, the site name, and sample designation.

11. The sample bottles were packed in a cooler with ice.

12. The Chain of Custody form from the laboratory was completed and signed and placed in the sample shuttle.

13. The cooler was sealed.

14. The cooler was stored in a secure location for temporary storage before transport.

15. The shuttle was delivered to the laboratory via courier within 7 hours after the samples were collected.

Field and Trip Sample Blanks

One field blank sample was taken for each round of sampling. The field blank consisted of pouring pure ("zero") water provided by the laboratory into the bailer from which the water was poured into the appropriate sample bottles. A trip blank sample, consisting of 40 ml vial containing pure ("zero") water as provided by the laboratory, accompanied each sample shuttle. The trip blank vial was not opened until its return to the laboratory upon analysis.

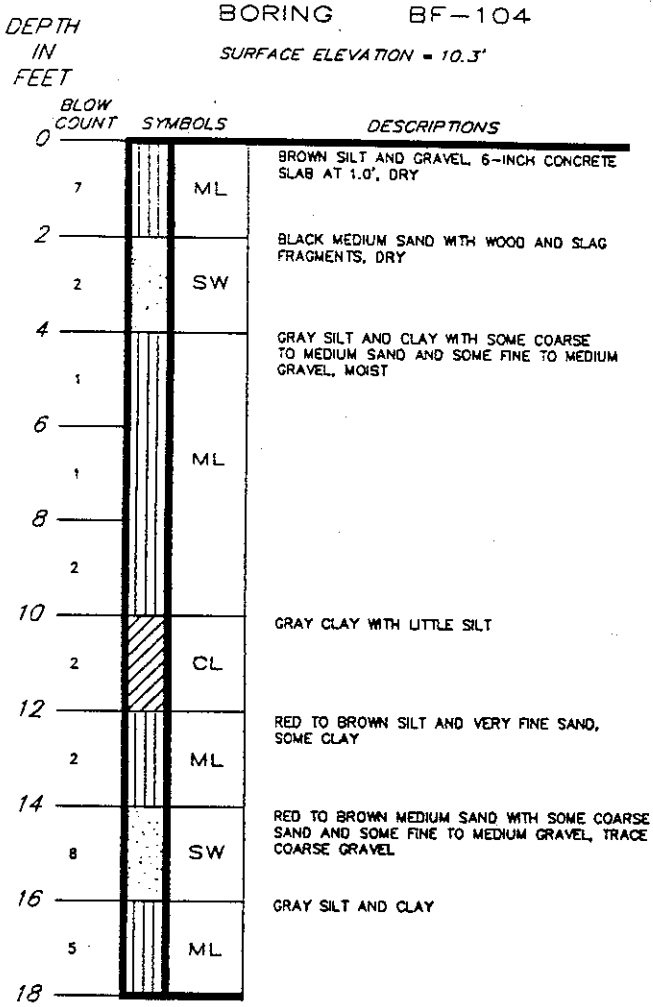
AAW0086D

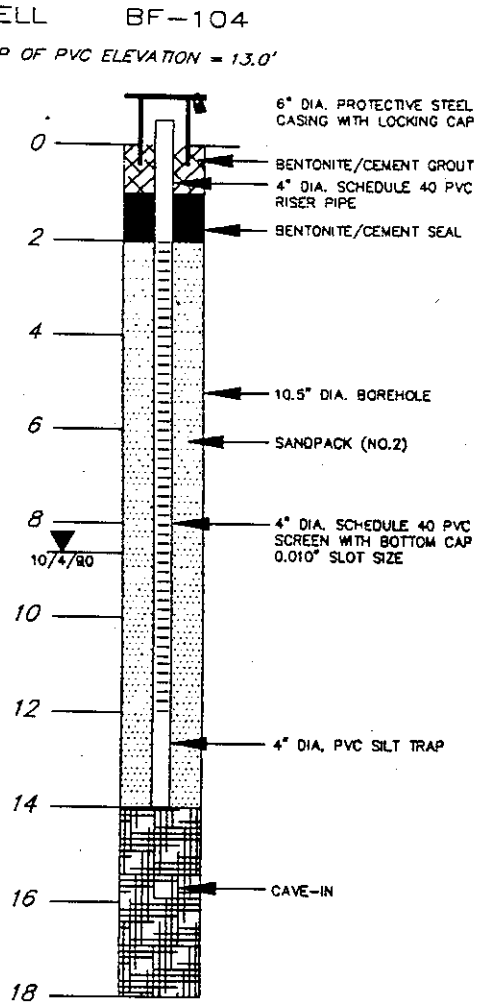
APPENDIX C

APPENDIX C

BOREHOLE, WELL, AND TEST PIT LOGS

APPENDIX C-1





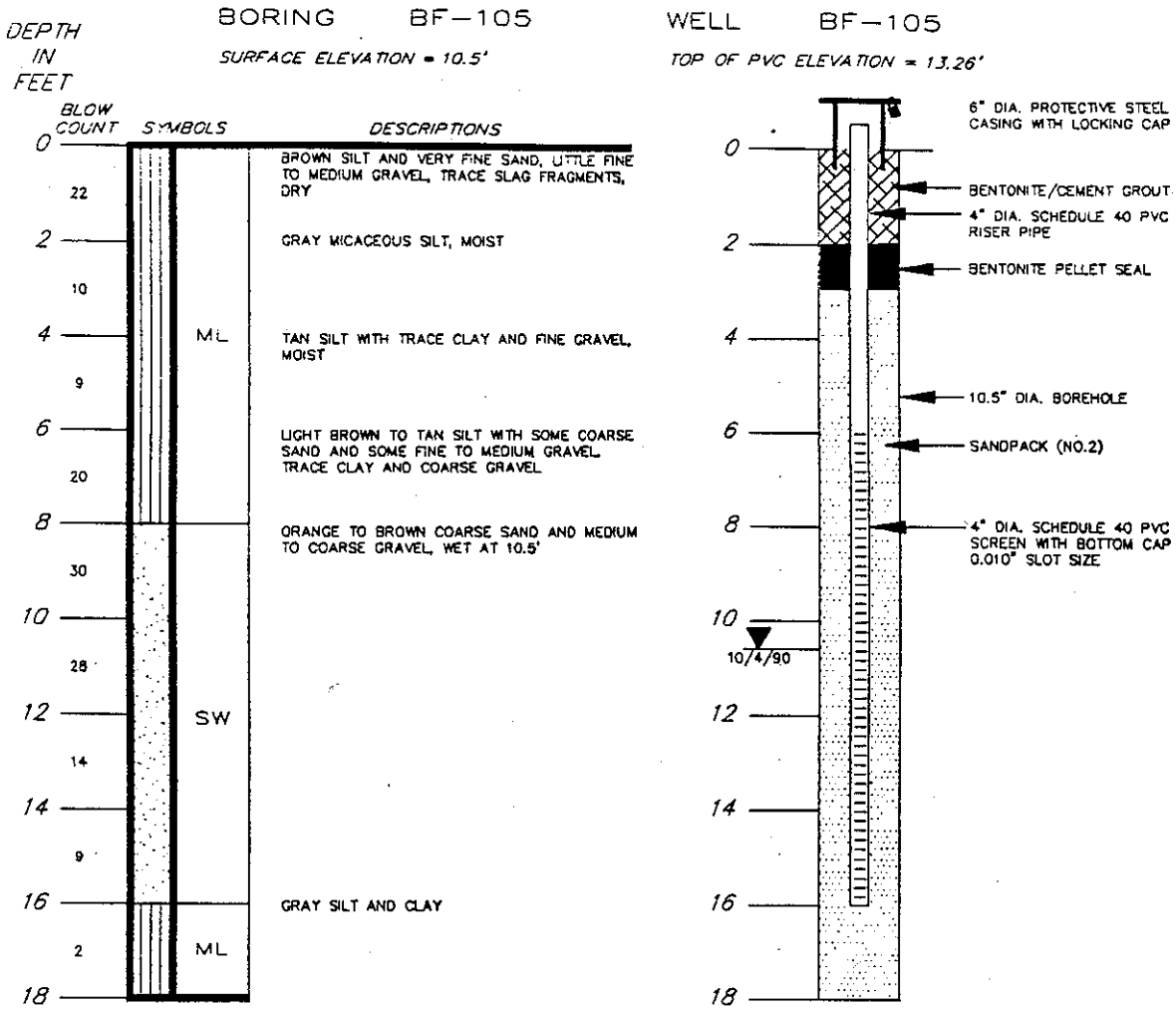
LOG OF SOIL BORING AND MONITORING WELL DETAIL CHEVRON PHILADELPHIA REFINERY

NOTES:

1. BORING SAMPLED AND COMPLETED TO A DEPTH OF 18.0 FEET AND MONITORING WELL SET AT A DEPTH OF 14.0 FEET ON 9/4/90.
2. GROUND WATER RECORDED AT A DEPTH OF 11.42 FEET ON 10/4/90 FROM TOP OF PVC CASING. WATER LEVEL ELEVATION = 8.72'.
3. MONITORING WELL DEVELOPED BY BAILER, APPROXIMATELY 10 WELL VOLUMES REMOVED.
4. ELEVATION ARE IN FEET ABOVE MEAN SEA LEVEL

CHEVRON\CR-BF104 (4)

DAMES & MOORE



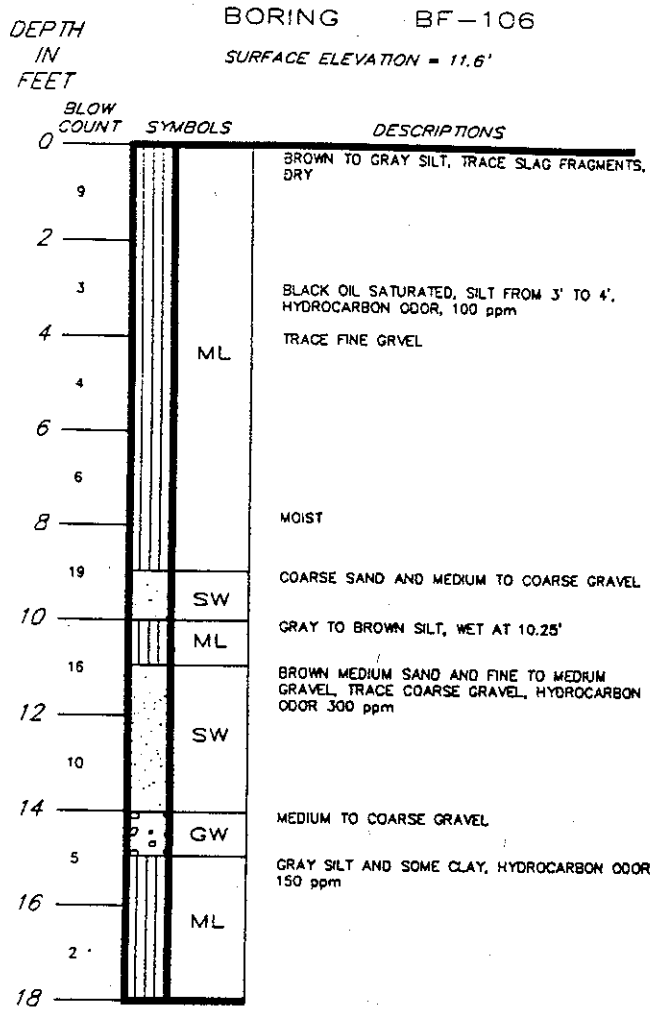
LOG OF SOIL BORING AND MONITORING WELL DETAIL CHEVRON PHILADELPHIA REFINERY

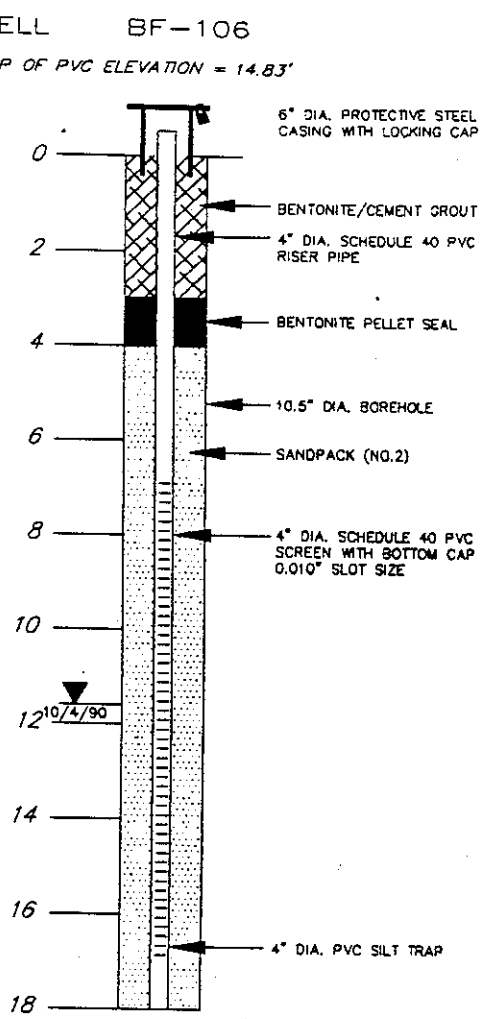
NOTES:

1. BORING SAMPLED AND COMPLETED TO A DEPTH OF 18.0 FEET AND MONITORING WELL SET AT A DEPTH OF 16 FEET ON 8/29/90.
2. GROUND WATER RECORDED AT A DEPTH OF 13.39 FEET ON 10/4/90 FROM TOP OF PVC CASING. WATER LEVEL ELEVATION=10.63'.
3. MONITORING WELL DEVELOPED BY BAILER, APPROXIMATELY 10 WELL VOLUMES REMOVED.
4. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL.

CHEVRON\CR-BF105 (4)

DAMES & MOORE





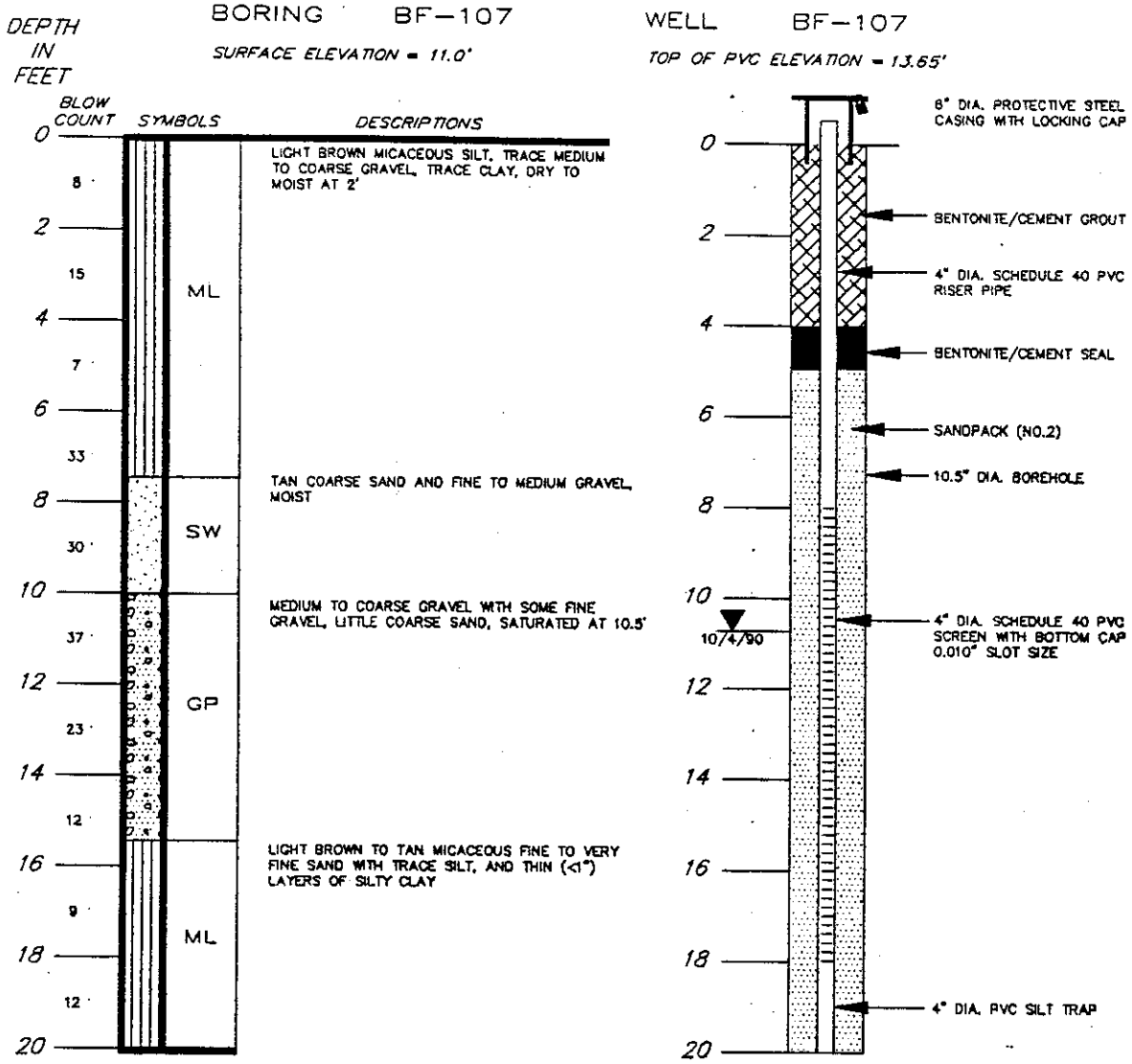
LOG OF SOIL BORING AND MONITORING WELL DETAIL BALLFIELDS CHEVRON/PHILADELPHIA REFINERY

NOTES:

1. BORING SAMPLED AND COMPLETED TO A DEPTH OF 18.0 FEET AND MONITORING WELL SET AT A DEPTH OF 17.0 FEET ON 8/29/90.
2. GROUND WATER RECORDED AT A DEPTH OF 14.95 FEET ON 10/4/90 FROM TOP OF PVC CASING.
3. MONITORING WELL DEVELOPED BY BAILER, APPROXIMATELY 10 WELL VOLUMES REMOVED.
4. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL.

CHEVRON\CR-BF106 (5)

DAMES & MOORE



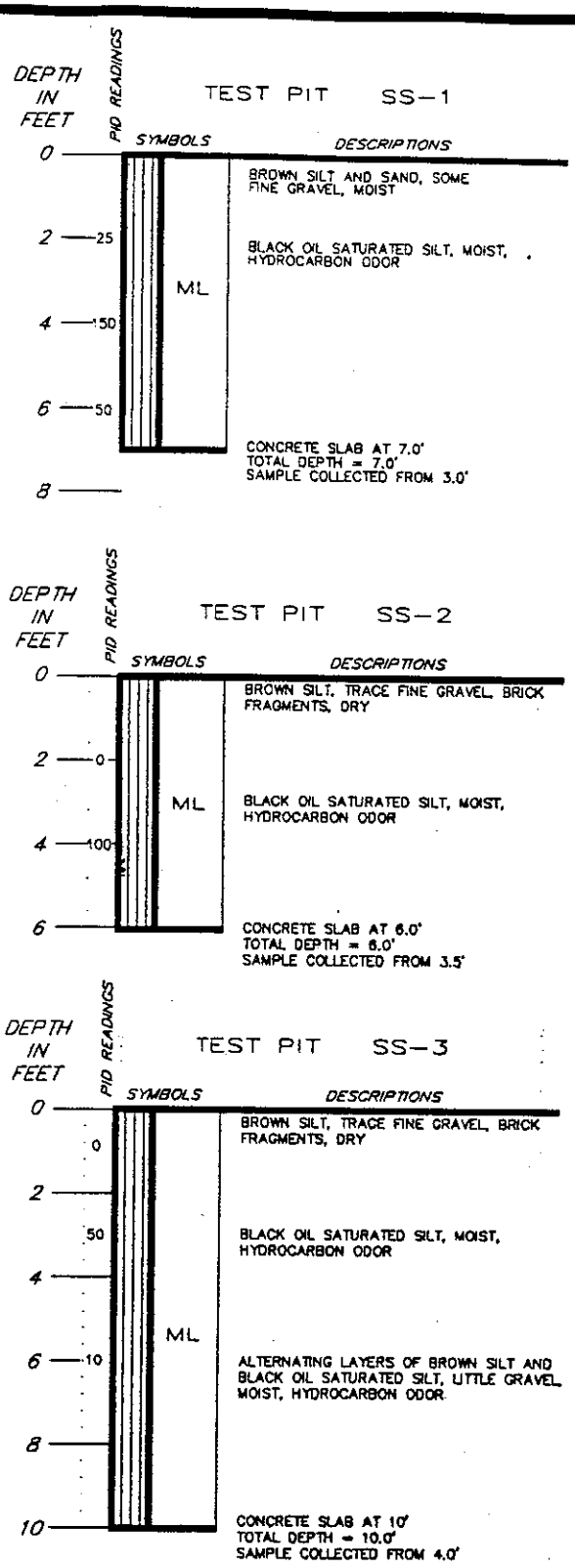
LOG OF SOIL BORING AND MONITORING WELL DETAIL CHEVRON PHILADELPHIA REFINERY

NOTES:

1. BORING SAMPLED AND COMPLETED TO A DEPTH OF 20.0 FEET AND MONITORING WELL SET AT A DEPTH OF 20.0 FEET ON 8/29/90.
2. GROUND WATER RECORDED AT A DEPTH OF 13.57 FEET ON 10/4/90 FROM TOP OF PVC CASING.
3. MONITORING WELL DEVELOPED BY BAILER, APPROXIMATELY 10 WELL VOLUMES REMOVED.
4. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL.

CHEVRON\CR-BF107 (5)

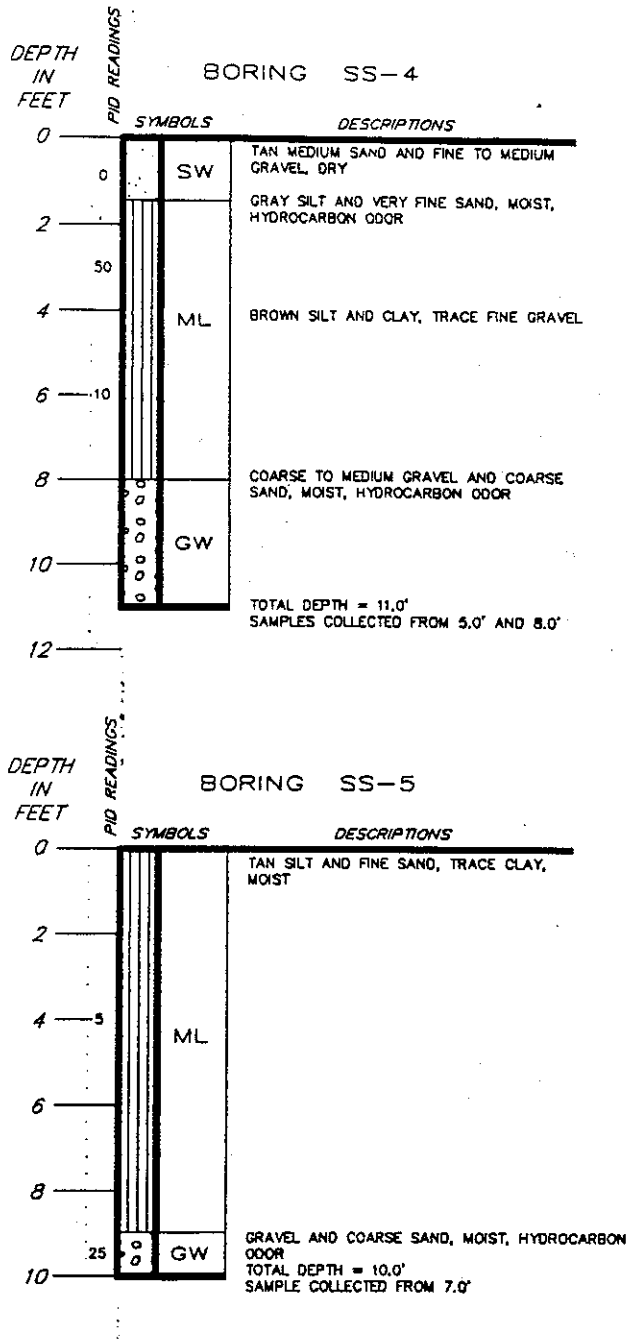
DAMES & MOORE



TEST PIT LOG
BALLFIELDS
CHEVRON/PHILADELPHIA REFINERY

CHEVRON\TP-123 (3)

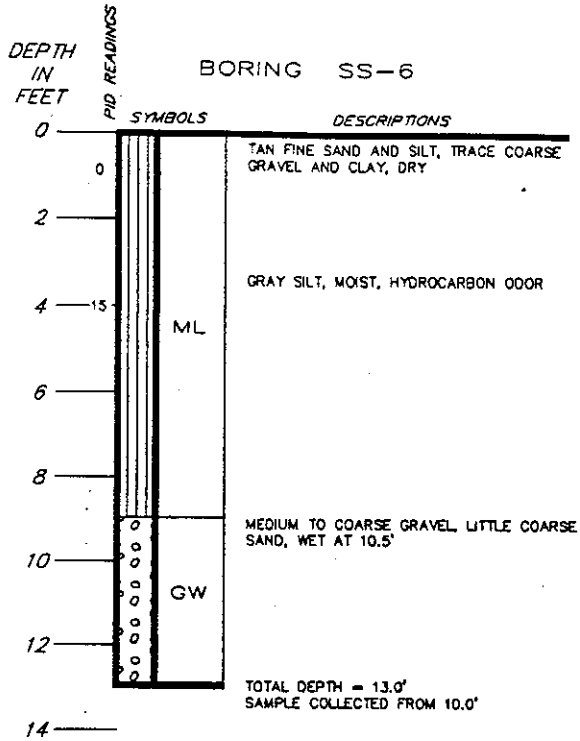
DAMES & MOORE

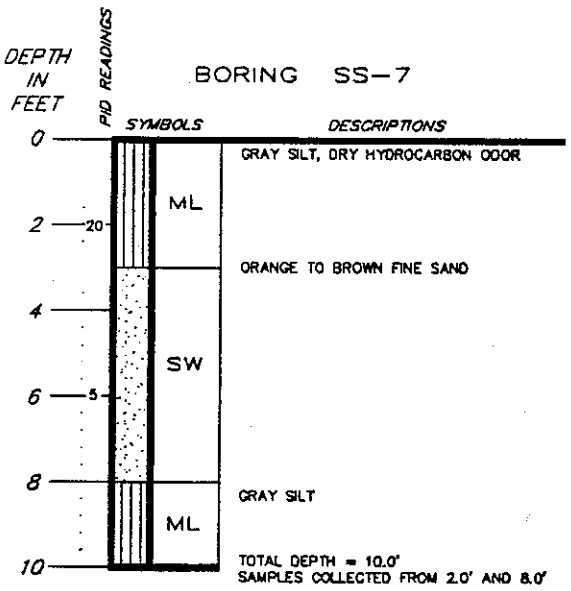


LOG OF SOIL BORING
BALLFIELDS
CHEVRON/PHILADELPHIA REFINERY

CHEVRON\BL-55 (5)

DAMES & MOORE





LOG OF SOIL BORING
BALLFIELDS
CHEVRON/PHILADELPHIA REFINERY

CHEVRON\BL-67 (5)

DAMES & MOORE

Unified Soil Classification System

Major Divisions			Graph Symbol	Letter Symbol	Typical Descriptions
Coarse Grained Soils	Gravel and Gravelly Soils	Clean Gravels (Little or no fines)		GW	Well graded gravels, gravel - sand mixtures, little or no fine
				GP	Poorly graded gravels, gravel - sand mixtures, little or no fine
	More than 50% of coarse fraction RETAINED on No.4 sieve	Gravels with Fines (Appreciable amount of fines)		GM	Silty gravels, gravel - sand - silt mixtures
				GC	Clayey gravels, gravel - sand - clay mixtures
More than 50% of material is LARGER than No.200 sieve size	Sand and Sandy Soils	Clean Sand (Little or no fines)		SW	Well - graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
	More than 50% of coarse fraction PASSING No.4 sieve	Sands with Fines (Appreciable amount of fines)		SM	Silty sands, sand - silt mixtures
				SC	Clayey sands, sand - clay mixtures
Fine Grained Soils	Silts and Clays	Liquid limit LESS than 50		ML	Inorganic silts and very fine sands or clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity
				OL	Organic silts and organic silty clays of low plasticity
More than 50% of material is SMALLER than No.200 sieve size	Silts and Clays	Liquid limit GREATER than 50		MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
Highly Organic Soils				PT	Peat, humus, swamp soils with high organic contents

Notes:

1. Dual symbols are used to indicate borderline classifications.
2. When shown on the boring logs, the following terms are used to describe the consistancy of cohesive soils and the relative compactness of cohesionless soils.

Cohesive Soils

	(approximate shearing strength in KSF)
very soft	less than 0.25
soft	0.25 to 0.5
medium stiff	0.5 to 1.0
stiff	1.0 to 2.0
very stiff	2.0 to 4.0
hard	greater than 4.0

Cohesionless Soils

very loose loose medium dense dense very dense	These are usually based on an examination of soil samples, penetration resistance, and soil density data.

Dames & Moore

APPENDIX C-2

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-909-032

Date M.W. completed 2/27/86

Supervising D & M Engineer/Geologist Ralph T. Golia

Boring/Well No. -A19

Location -	Chevron Refinery
Driller -	Warren George
Drilling Completed -	2/27/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

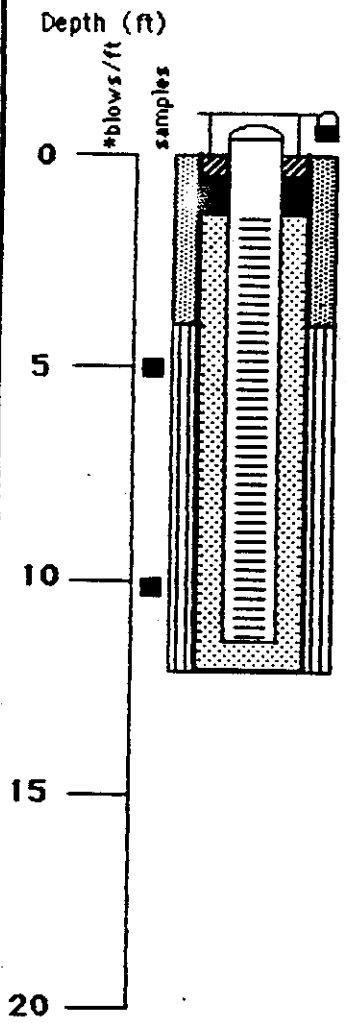
Borehole Diam. -	10"
Borehole Depth -	12'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	11'6"
Screen Setting -	1'6" - 11'6"
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Cement/Bentonite

MEASUREMENTS (NGVD)

Top of Casing Elevation -	9.52'
Static Water Level Elevation -	5.77'
Date Measured -	1/13/87
Surface Elevation -	9.28'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	



Description

Asphalt
Silty sand with some gravel and trace clay, medium brown, damp, medium dense;(fill).

change to blackish-brown, slight petroleum odor

Clayey silt with trace sand, blackish-brown, wet to saturated, soft; petroleum oder

wood debris; resistance

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack

Bentonite Seal

Cement Grout

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-950-032

Date M.W. completed 10/30/86

Supervising D & M Geologist David Wagner

Boring/Well No. - A19D

Location - Chevron Refinery

Driller - Lambert, Inc.

Drilling Completed - 10/30/86

Type of Rig - Hollow Stem Auger

CONSTRUCTION DATA

Borehole Diam. - 10"

Borehole Depth - 60'

Casing/Screen Type - PVC

Casing Diam. - 4"

Casing Depth - 60'

Screen Setting - 50' - 60'

Slot Width - 0.02"

Type of Seal - Bentonite

Type of Filterpack - #2 Sand

Type of Grout - Bentonite

MEASUREMENTS(NGVD)

Top of Casing Elevation - 11.69'

Static Water Level Elevation - -1.71'

Date Measured - 12/22/86

Surface Elevation - 8.69'

TEST DATA

Pump Type -

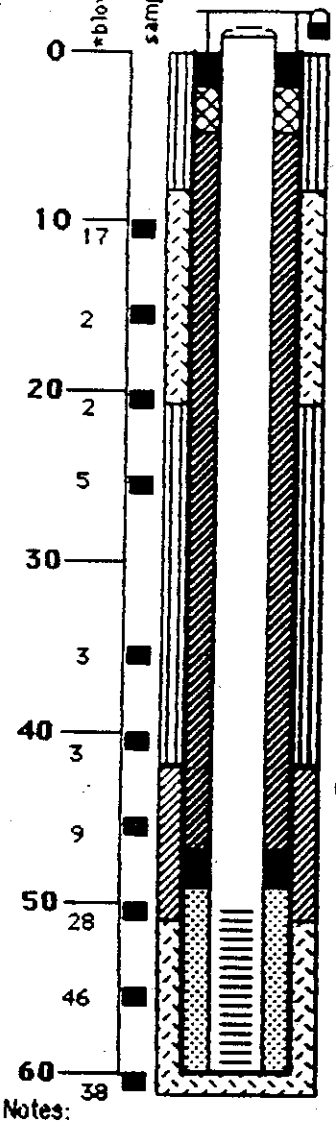
Depth to Intake (ft) -

Satic Water Level (ft) -

Pumping Water Level (ft) -

Drawdown (ft) -

Length of Test (Hrs) -



	Description
ML	Silt with some fine to coarse sand, trace clay, brown, soft, moist; petroleum odor
	Grading to very dark gray, saturated
SW	Fine to coarse sand with some fine gravel, little silt, blackish-gray, medium dense, saturated; resistance encountered - wood
ML	Silt with some clay, dark gray, soft, moist; organics; micaceous; weak petroleum odor
	SHELBY TUBE taken from 30' to 31.5'
	Increasing clay; silt and clay
CL	Clay with some silt and little fine sand, reddish-brown, soft, saturated, micaceous
SW	Fine to coarse sand with some fine gravel, reddish-brown, medium dense, saturated
	Grading to brownish-gray
	Increasing density : dense
	Increasing gravel: fine gravel and sand

WELL CONSTRUCTION KEY

- FILTER PACK
- BENTONITE SEAL
- BENTONITE GROUT
- CAVE IN MATERIAL
- CONCRETE

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-909-032

Date M.W. completed 2/21/86

Supervising D & M Engineer/Geologist Mark Robertson

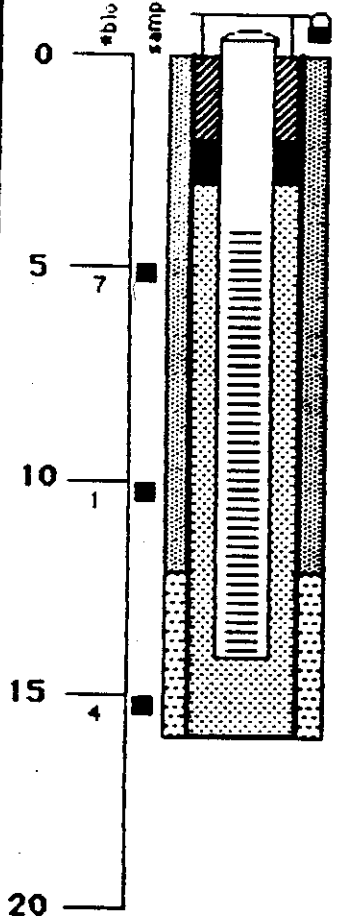
Boring/Well No. - B48

Location - Chevron Refinery

Driller - Warren George

Drilling Completed - 2/21/86

Type of Rig - Hollow Stem Auger



Description

SM Silty sand with trace gravel, brown, petroleum odor
grades to dark grey

trace gravel and clay

very soft

OH/PT Silty sand and fibrous peat

CONSTRUCTION DATA

Borehole Diam. -	10"
Borehole Depth -	16'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	14'
Screen Setting -	4' - 14'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Cement/Bentonite

MEASUREMENTS (NGVD)

Top of Casing Elevation -	8.90'
Static Water Level Elevation -	8.35'
Date Measured -	1/13/87
Surface Elevation -	8.90'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	

WELL CONSTRUCTION KEY

Filter Pack

Bentonite Seal

Cement Grout

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

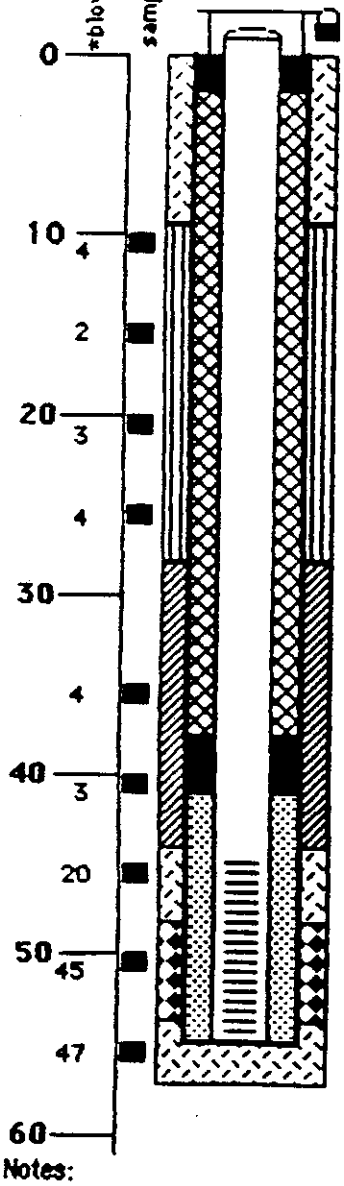
Project : Chevron/Philadelphia Refinery

Boring/Well No. - B48D

Project No. 113-950-032

Date M.W. completed 11/6/86

Supervising D & M Geologist David Wagner



		Description
0	SW	Fine to coarse sand with little to some fine gravel, little clay and silt, very dark brown, soft, saturated; strong petroleum odor
10	ML	Silt with little clay, very dark brown, soft, very moist; micaceous; strong petroleum odor
20		Increasing clay; some clay with abundant organics
		Increasing clay; silt and clay
30		Decreasing clay; some clay and trace fine sand; organics; weak petroleum odor
	CL	Clay with some silt, dark gray, soft, very moist; organics; very weak petroleum odor SHELBY TUBE taken from 30' to 31.5'
40	SW	Fine to coarse sand with some fine gravel, trace silt, reddish-brown, medium dense, saturated
50	GP	Fine gravel with little to some fine to coarse sand, trace silt and clay, dark reddish-brown, dense, saturated; micaceous
	SW	Fine to coarse sand with some fine gravel, light reddish-brown to light reddish-gray, dense, saturated
60		

Notes:
* Blows taken using a 140 lb hammer falling 30 inches.
** All soils classified by visual inspection.

DAMES & MOORE

Location - Chevron Refinery

Driller - Lambert, Inc.

Drilling Completed - 11/6/86

Type of Rig - Hollow Stem Auger

CONSTRUCTION DATA

Borehole Diam. - 10"

Borehole Depth - 55'

Casing/Screen Type - PVC

Casing Diam. - 4"

Casing Depth - 55'

Screen Setting - 45' - 55'

Slot Width - 0.02"

Type of Seal - Bentonite

Type of Filterpack - #2 Sand

Type of Grout -

MEASUREMENTS(NGVD)

Top of Casing Elevation - 9.82'

Static Water Level Elevation - -2.17'

Date Measured - 12/22/86

Surface Elevation - 8.90'

TEST DATA

Pump Type -

Depth to Intake (ft) -

Satic Water Level (ft) -

Pumping Water Level (ft) -

Drawdown (ft) -

Length of Test (Hrs) -

WELL CONSTRUCTION KEY

FILTER PACK

BENTONITE SEAL

BENTONITE GROUT

CAVE IN MATERIAL

CONCRETE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project :Chevron/Philadelphia Refinery

Project No. 113-909-032

Date M.W. completed 2/22/86

Supervising D & M Engineer/Geologist T. Helgason

Boring/Well No. - C49

Location - Chevron Refinery

Driller - Drill Consult

Drilling Completed - 2/22/86

Type of Rig - Hollow Stem Auger

CONSTRUCTION DATA

Borehole Diam. - 7"

Borehole Depth - 20'

Casing/Screen Type - PVC

Casing Diam. - 4"

Casing Depth - 18'

Screen Setting - 8' - 18'

Slot Width - 0.02"

Type of Seal - Bentonite

Type of Filterpack - #2 Sand

Type of Grout - Cement/Bentonite

MEASUREMENTS (NGVD)

Top of Casing Elevation - 12.16'

Static Water Level Elevation - 5.94'

Date Measured - 1/13/87

Surface Elevation - 10.92'

TEST DATA

Pump Type -

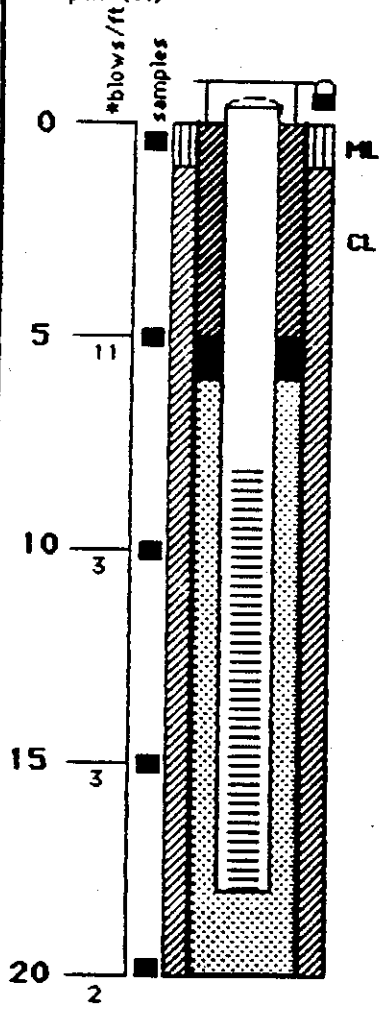
Depth to Intake (ft) -

Satic Water Level (ft) -

Pumping Water Level (ft) -

Drawdown (ft) -

Length of Test (Hrs) -



Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack

Bentonite Seal

Cement Grout

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project :Chevron/Philadelphia Refinery

Project No. 113-909-032

Date M.W. completed 2/22/86

Supervising D & M Engineer/Geologist E.J. Fillo

Boring/Well No. - C50

Location -	Chevron Refinery
Driller -	Drill Consult
Drilling Completed -	2/22/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

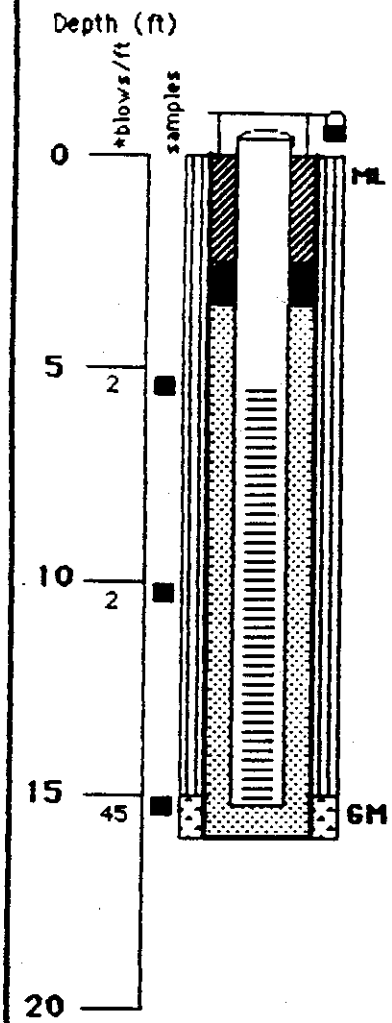
Borehole Diam. -	7"
Borehole Depth -	16'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	15' 6"
Screen Setting -	5' 6" - 15' 6"
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Cement/Bentonite

MEASUREMENTS (NGVD)

Top of Casing Elevation -	15.35'
Static Water Level Elevation-	4.71'
Date Measured -	1/13/87
Surface Elevation -	11.14'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	



Description

Clayey silt; (fill)

Clayey silt, black, wet, very soft; (oily)

trace organics

Sandy gravel, with trace silt, wet, very dense

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack

Bentonite Seal

Cement Grout

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-950-032

Date M.W. completed 11/4/86

Supervising D & M Geologist David Wagner

Boring/Well No. - C50D

Location -	Chevron Refinery
Driller -	Lambert, Inc.
Drilling Completed -	11/4/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

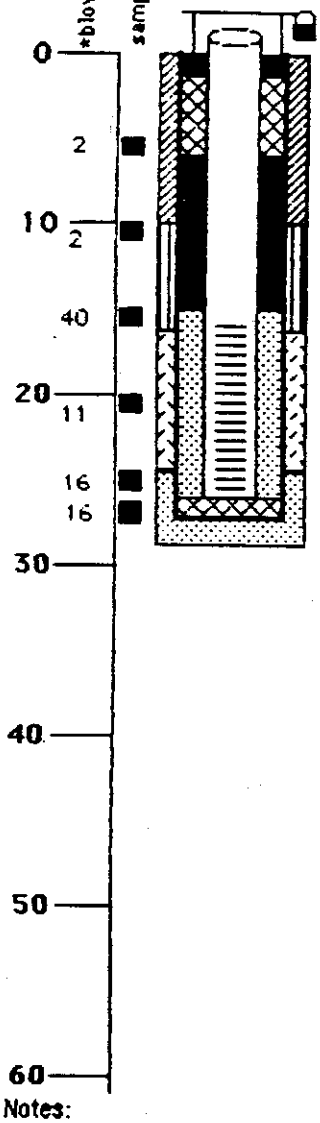
Borehole Diam. -	10"
Borehole Depth -	27'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	26'
Screen Setting -	16' - 26'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	

MEASUREMENTS(NGVD)

Top of Casing Elevation -	13.76'
Static Water Level Elevation -	1.43'
Date Measured -	12/22/86
Surface Elevation -	10.97'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	



	Description
CL	Clay with some silt, blackish-gray, very soft, saturated; micaceous; organics; petroleum odor SHELBY TUBE taken from 7' to 9'
ML	Increased silt; silt with some clay; strong petroleum odor
	Little to some fine sand
SW	Fine to coarse sand with some fine gravel, medium brown, dense, saturated
	Increasing gravel; sand and gravel, trace silt and clay
SP	Decreased fine gravel; fine to medium sand with trace to little gravel; petroleum odor

WELL CONSTRUCTION KEY

- FILTER PACK
- BENTONITE SEAL
- BENTONITE GROUT
- CAVE IN MATERIAL
- CONCRETE

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Boring/Well No. - C95

Project No. 113-950-032

Date M.W. completed 10/22/86

Supervising D & M Geologist David Wagner

Location -	Chevron Refinery
Driller -	Lambert, Inc.
Drilling Completed -	10/22/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

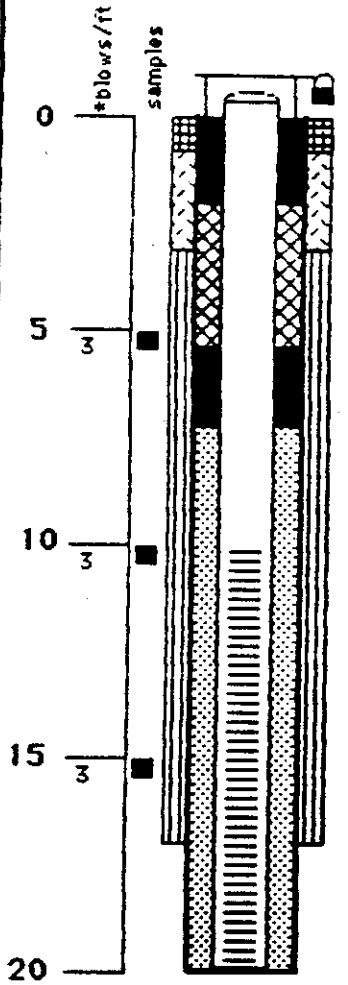
Borehole Diam. -	10"
Borehole Depth -	20'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	20'
Screen Setting -	10' - 20'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	

MEASUREMENTS(NGVD)

Top of Casing Elevation -	14.84'
Static Water Level Elevation -	8.71'
Date Measured -	1/14/87
Surface Elevation -	12.38'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	



	Description
	Macadam underlain by gravel
SW	Fine to coarse sand with some fine gravel, little silt, black, dry; brick fragments
ML	Silt with little to some clay, dark - gray, soft, moist; organics; micaceous; weak petroleum odor
	Increasing moisture; saturated

WELL CONSTRUCTION KEY

- FILTER PACK
- BENTONITE SEAL
- CONCRETE
- CAVE IN MATERIAL

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-909-032

Date M.W. completed 2/26/86

Supervising D & M Engineer/Geologist Dave Wagner

Boring/Well No. -BF88

Location - Chevron Refinery

Driller - Drill Consult

Drilling Completed - 2/26/86

Type of Rig - Hollow Stem Auger

CONSTRUCTION DATA

Borehole Diam. - 7"

Borehole Depth - 14' 6"

Casing/Screen Type - PVC

Casing Diam. - 4"

Casing Depth - 14' 6"

Screen Setting - 4'6" - 14' 6"

Slot Width - 0.02"

Type of Seal - Bentonite

Type of Filterpack - #2 Sand

Type of Grout - Cement/Bentonite

MEASUREMENTS (NGVD)

Top of Casing Elevation - 12.93'

Static Water Level Elevation - 2.46'

Date Measured - 1/9/87

Surface Elevation - 9.78'

TEST DATA

Pump Type -

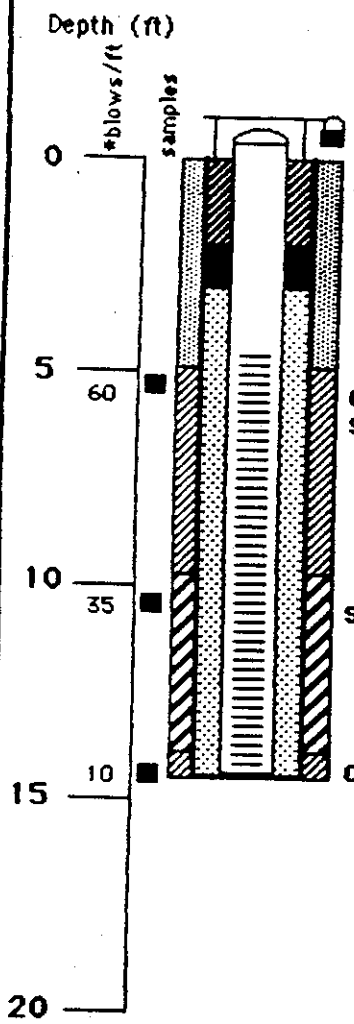
Depth to Intake (ft) -

Satic Water Level (ft) -

Pumping Water Level (ft) -

Drawdown (ft) -

Length of Test (Hrs) -



Description

SM — Silty sand with trace gravel, brown-black, moist, hard

CL/SC — Clayey silt with trace sand, brown, moist

SC — Gravelly medium sand with some silt and clay

CL — Silty clay, gray-brown, moist

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack

Bentonite Seal

Cement Grout

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-909-032

Date M.W. completed 2/19/86

Supervising D & M Engineer/Geologist T. Helgason

Boring/Well No. - BF89

Location -	Chevron Refinery
Driller -	Drill Consult
Drilling Completed -	2/19/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

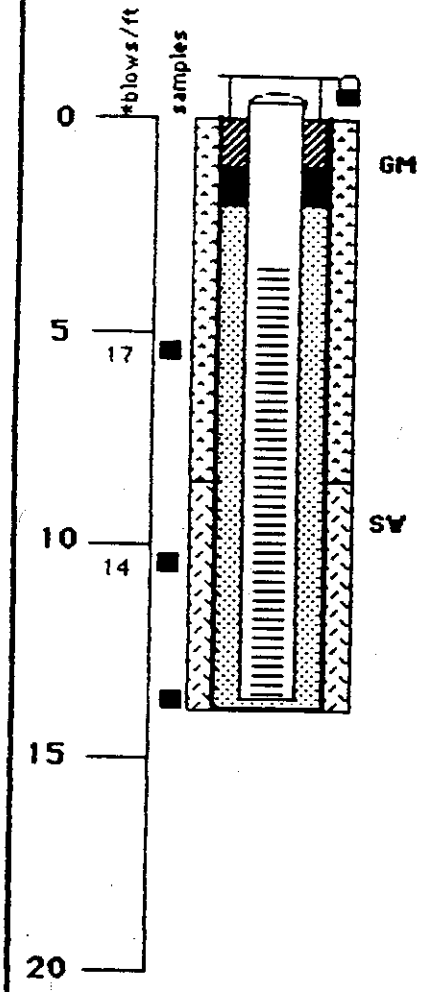
Borehole Diam. -	7"
Borehole Depth -	13.5'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	13.5'
Screen Setting -	3.5' - 13.5'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Cement/Bentonite

MEASUREMENTS (NGVD)

Top of Casing Elevation -	11.81'
Static Water Level Elevation -	2.61'
Date Measured -	1/9/87
Surface Elevation -	11.57'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	



Description

Gravel to crushed stone, light brown

GM Silty gravel with some course sand, dark brown

Gravel with some white gravel with greenish deposits, reddish brown

SW Fine to coarse sand with some cobbles, dark brown

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack

Bentonite Seal

Cement Grout

DAMES & MOORE

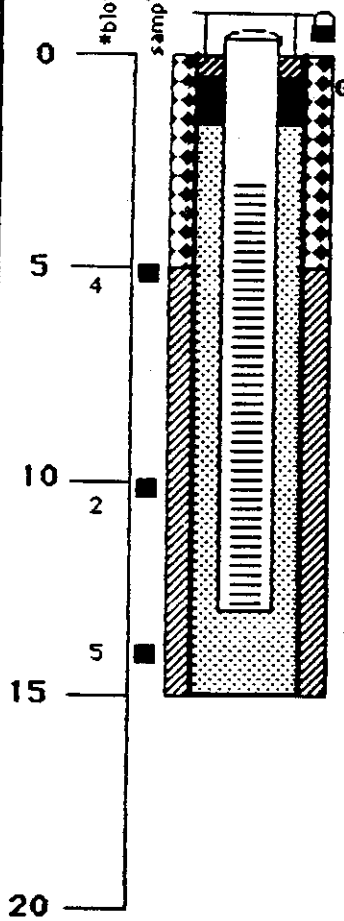
LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-909-032

Date M.W. completed 2/19/86

Supervising D & M Engineer/Geologist E. J. Fillo



Description

Black oily fill (crushed stone)

Black oily fill

Silty clay with trace fine sand, light brown, wet, soft

Silty clay with plant fragments, brownish gray, wet, very soft

Silty clay with plant fragments, gray, wet, medium stiff

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Boring/Well No. - BF90

Location -	Chevron Refinery
Driller -	Drill Consult
Drilling Completed -	2/19/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

Borehole Diam. -	7"
Borehole Depth -	15'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	13'
Screen Setting -	3' - 13'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Cement/Bentonite

MEASUREMENTS (NGVD)

Top of Casing Elevation -	9.68'
Static Water Level Elevation -	8.33'
Date Measured -	1/9/87
Surface Elevation -	9.44'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	

WELL CONSTRUCTION KEY

Filter Pack

Bentonite Seal

Cement Grout

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-950-032

Date M.W completed 10/21/86

Supervising D & M Geologist David Wagner

Boring/Well No. - BF99

Location -	Chevron Refinery
Driller -	Lambert, Inc.
Drilling Completed -	10/21/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

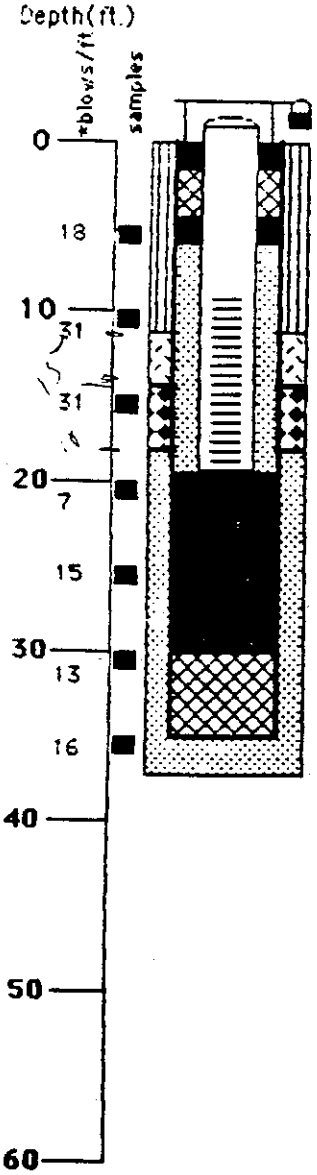
Borehole Diam. -	10"
Borehole Depth -	35'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	19.5'
Screen Setting -	9.5' - 19.5'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	

MEASUREMENTS(NGVD)

Top of Casing Elevation -	13.37'
Static Water Level Elevation -	2.28'
Date Measured -	1/14/87
Surface Elevation -	12.62'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	



Description

Silt with little to some fine sand, trace clay, medium brown, medium dense, moist; organics

Fine to coarse sand with little fine gravel, medium brown, dense, moist; strong petroleum odor

Fine gravel with little fine to coarse sand, trace silt, medium brown, dense, saturated; strong petroleum odor

Fine to medium sand with trace silt, light brown, loose, saturated

Grading to orange-brown

Trace to little clay and gravel; weak petroleum odor

Fine to coarse sand with trace fine gravel, trace silt, orange-brown, medium dense, saturated

WELL CONSTRUCTION KEY

- FILTER PACK
- BENTONITE SEAL
- BENTONITE GROUT
- CAVE IN MATERIAL
- CONCRETE

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-950-032

Date M.W. completed 10/17/86

Supervising D & M Geologist David Wagner

Boring/Well No. - BF100

Location -	Chevron Refinery
Driller -	Lamcert, Inc.
Drilling Completed -	10/17/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

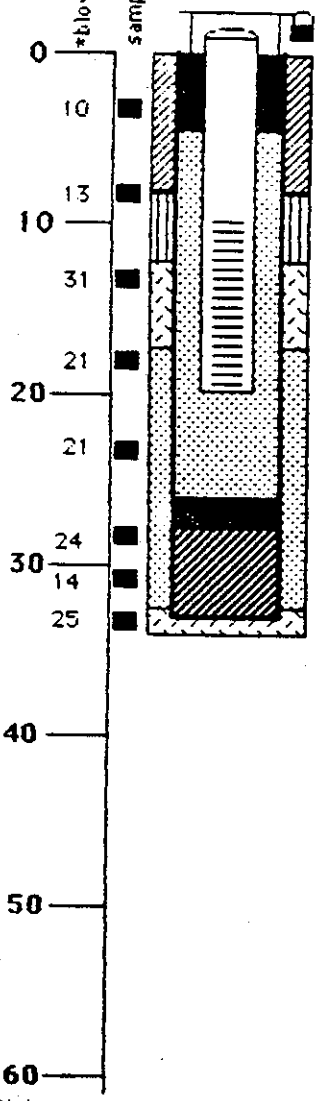
Borehole Diam. -	10"
Borehole Depth -	33'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	19.5'
Screen Setting -	9.5' - 19.5'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Bentonite

MEASUREMENTS(NGVD)

Top of Casing Elevation -	14.62'
Static Water Level Elevation -	1.79'
Date Measured -	1/14/87
Surface Elevation -	11.46'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	



	Description
CL	Clay with some silt, trace fine sand, light brown, stiff, moist
ML	Silt and clay, trace gravel, medium brown, stiff, moist
	Increasing silt; silt with little to some clay
SW	Fine to coarse sand with some fine gravel, yellowish-brown, dense, saturated
SP	Fine sand with little clay, little silt, light yellowish- brown, medium dense, saturated
	Fine to medum sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated
	1' clay lense from 29' to 30';
SW	clay with some silt, gray, moist
	Decreasing clay; trace clay
	Fine to coarse sand with trace to little fine gravel, trace silt, orangish-brown, medium dense, saturated

WELL CONSTRUCTION KEY

- FILTER PACK
- BENTONITE SEAL
- BENTONITE GROUT
- CAVE IN MATERIAL
- CONCRETE

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-950-032

Date M.W. completed 10/15/86

Supervising D & M Geologist David Wagner

Boring/Well No. - BF101

Location -	Chevron Refinery
Driller -	Lambert, Inc.
Drilling Completed -	10/15/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

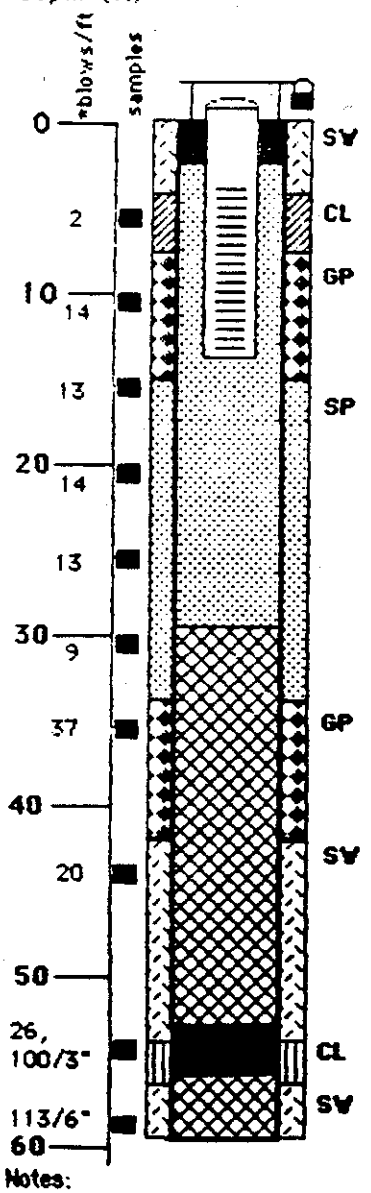
Borehole Diam. -	10"
Borehole Depth -	59'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	13'
Screen Setting -	3' - 13'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	

MEASUREMENTS(NGVD)

Top of Casing Elevation -	9.03'
Static Water Level Elevation -	2.19'
Date Measured -	1/14/87
Surface Elevation -	6.12'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	



Description

Fine to coarse sand, little to some silt, trace fine gravel, blackish-brown, loose, very moist

Clay with little to some silt, grayish-brown, soft, moist; abundant organics

Fine gravel with little to some fine to coarse sand, trace silt, very dense, saturated

Fine to medium sand with trace silt, light brown, medium dense, saturated

Grading to fine sand with little to some silt, trace clay

Grading to fine to coarse sand with little to some silt

Fine gravel with little to some fine to coarse sand, trace silt, brown, dense, saturated

Fine to coarse sand with little to some fine gravel, trace silt, light brown, medium dense, saturated

Increasing gravel; some fine gravel

Clay with little to some silt, light reddish-brown, very stiff, moist

Fine to coarse sand with little fine gravel, brown, very dense, saturated

WELL CONSTRUCTION KEY

- FILTER PACK
- BENTONITE SEAL
- BENTONITE GROUT
- CAVE IN MATERIAL
- CONCRETE

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-950-032

Date M.W. completed 10/10/86

Supervising D & M Geologist David Wagner

Boring/Well No. - BF102

Location -	Chevron Refinery
Driller -	Lambert, Inc.
Drilling Completed -	10/10/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

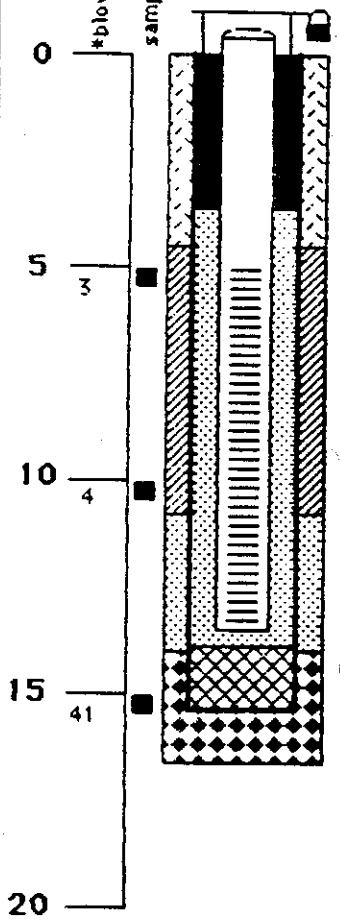
Borehole Diam. -	10"
Borehole Depth -	15'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	13'
Screen Setting -	3' - 13'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	

MEASUREMENTS(NGVD)

Top of Casing Elevation -	8.40'
Static Water Level Elevation -	4.95'
Date Measured -	1/14/87
Surface Elevation -	5.40'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	



	Description
SW	Fine to coarse sand with little silt, blackish - brown, loose, saturated
CL	Clay with little to trace silt, gray, soft, very moist
	Clay with some silt, trace fine sand, very dark brown, soft, very moist to saturated
	Increased fine sand and silt
SP	Fine sand with little silt and little clay, brown and gray, loose, saturated
GP	Fine gravel with little fine to coarse sand, trace silt, brown and gray, dense, saturated

WELL CONSTRUCTION KEY

- FILTER PACK
- BENTONITE SEAL
- CONCRETE
- CAVE IN MATERIAL

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project : Chevron/Philadelphia Refinery

Project No. 113-950-032

Date M.W. completed 10/8/86

Supervising D & M Geologist David Wagner

Boring/Well No. - BF103

Location -	Chevron Refinery
Driller -	Lambert, Inc.
Drilling Completed -	10/8/86
Type of Rig -	Hollow Stem Auger

CONSTRUCTION DATA

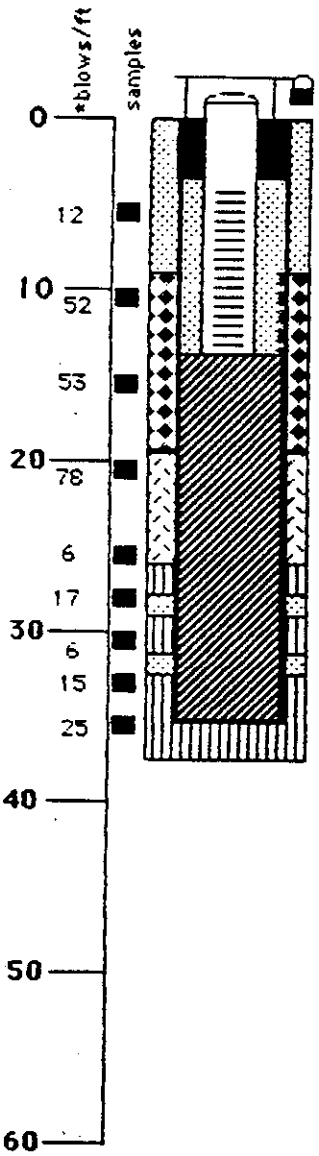
Borehole Diam. -	10"
Borehole Depth -	35'
Casing/Screen Type -	PVC
Casing Diam. -	4"
Casing Depth -	14'
Screen Setting -	4' - 14'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Bentonite

MEASUREMENTS(NGVD)

Top of Casing Elevation -	16.73'
Static Water Level Elevation -	2.09'
Date Measured -	1/14/87
Surface Elevation -	13.88'

TEST DATA

Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	



Description

SP	Fine to medium sand, some silt, little fine gravel, brownish-black; medium dense, saturated; brick fragments
GP	Fine gravel with little to some fine to coarse sand, trace silt, light brown, very dense, moist
SW	Fine to coarse sand with trace to little silt, little fine gravel, light brown, very dense, saturated
ML	26'-28' Silt with little fine to medium sand, little clay, gray, grading to reddish-brown toward bottom of spoon, medium stiff, saturated; wood fragments
SP	
ML	
SP	28'-29' Fine to medium sand with trace to little silt, little clay, trace coarse sand, light brown, medium dense, saturated
ML	29'-31' Silt with little fine to medium sand, trace clay, brownish-gray, medium stiff, saturated
	31'-32' Fine to medium sand with trace to little silt, little clay, trace coarse sand, light brown, loose, saturated
	32'-37' Silt with little clay, trace to little fine sand, gray, soft, saturated

WELL CONSTRUCTION KEY

- FILTER PACK
- BENTONITE SEAL
- BENTONITE GROUT
- CAVE IN MATERIAL
- CONCRETE

Notes:

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** All soils classified by visual inspection.

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Unified Soil Classification System

Major Divisions			Graph Symbol	Letter Symbol	Typical Descriptions
Coarse Grained Soils	Gravel and Gravelly Soils	Clean Gravels (Little or no fines)		GW	Well graded gravels, gravel - sand mixtures, little or no fines
				GP	Poorly graded gravels, gravel - sand mixtures, little or no fines
	More than 50% of coarse fraction RETAINED on No.4 sieve	Gravels with Fines (Appreciable amount of fines)		GM	Silty gravels, gravel - sand - silt mixtures
				GC	Clayey gravels, gravel - sand - clay mixtures
More than 50% of material is LARGER than No.200 sieve size	Sand and Sandy Soils	Clean Sand (Little or no fines)		SW	Well - graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
	More than 50% of coarse fraction PASSING No.4 sieve	Sands with Fines (Appreciable amount of fines)		SM	Silty sands, sand - silt mixtures
				SC	Clayey sands, sand - clay mixtures
Fine Grained Soils	Silts and Clays	Liquid limit LESS than 50		ML	Inorganic silts and very fine sands or clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity
				OL	Organic silts and organic silty clays of low plasticity
More than 50% of material is SMALLER than No.200 sieve size	Silts and Clays	Liquid limit GREATER than 50		MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
Highly Organic Soils				PT	Peat, humus, swamp soils with high organic contents

Notes:

1. Dual symbols are used to indicate borderline classifications.
2. When shown on the boring logs, the following terms are used to describe the consistancy of cohesive soils and the relative compactness of cohesionless soils.

Cohesive Soils

	(approximate shearing strength in KSF)
very soft	less than 0.25
soft	0.25 to 0.5
medium stiff	0.5 to 1.0
stiff	1.0 to 2.0
very stiff	2.0 to 4.0
hard	greater than 4.0

Cohesionless Soils

very loose	These are usually based on an examination of soil samples, penetration resistance, and soil density data.
loose	
medium dense	
dense	
very dense	

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