

**GW - 001**

**GENERAL  
CORRESPONDENCE**

**2007 - 1982**

**7 of 11**











Attachment 3

Groundwater Remediation

**REPORT ON SOIL VAPOR SURVEY,  
WELL INSTALLATION, AND  
HYDROCARBON RECOVERY SYSTEM  
BLOOMFIELD REFINING COMPANY**

*February 24, 1989*

*Prepared for:*

**CHRIS HAWLEY  
BLOOMFIELD REFINING COMPANY  
P.O. Box 159  
Bloomfield, New Mexico 87413**

*Prepared by:*

**GEOSCIENCE CONSULTANTS, LTD.**

**HEADQUARTERS  
500 Copper Avenue, NW  
Suite 200  
Albuquerque, New Mexico 87102  
(505) 842-0001  
FAX (505) 842-0595**

**WEST COAST REGIONAL OFFICE  
1400 Quail Street  
Suite 140  
Newport Beach, CA 92660  
(714) 724-0536  
FAX (714) 724-0538**

**EASTERN REGIONAL OFFICE  
1109 Spring Street  
Suite 706  
Silver Spring, Maryland 20910  
(301) 587-2088  
FAX (301) 587-3625**

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## 1.0 EXECUTIVE SUMMARY

A soil vapor survey was conducted during the week of July 18, 1988 on U.S. Bureau of Land Management (BLM) property south of the Bloomfield Refining Company (BRC) facility in order to determine if solvents were present in ground water and to assess the extent of dissolved or floating petroleum product migration in the subsurface. Survey results suggest that a buried stream channel in the underlying Nacimiento Formation controls movement of volatile organic compounds (VOCs) in ground water beneath BLM land. Based on this information, installation of recovery wells on Bloomfield Refining Company property was expected to be sufficient to capture most of the dissolved and immiscible hydrocarbons in perched ground water beneath the refinery and some hydrocarbons from beneath BLM property.

Two recovery wells were installed on BRC property between August 29 and September 2, 1988. These wells, in addition to existing well MW-10, comprised the hydrocarbon recovery system. Based on a numerical ground-water flow model, these three wells were considered to be sufficient to capture hydrocarbons from beneath refinery property. Four piezometers were also installed to assess the hydraulic impacts of recovery operations on the perched alluvial aquifer. After 42 days of recovery, significant hydraulic capture of ground water and hydrocarbons was evident. Operation of the recovery system over longer periods of time is expected to further increase the extent and rate of hydraulic capture in the alluvial aquifer.

## 2.0 SOIL VAPOR SAMPLING

### 2.1 GOALS AND OBJECTIVES

A soil vapor survey was conducted during the week of July 18, 1988 on U.S. Bureau of Land Management (BLM) property in order to determine if halogenated hydrocarbons were present in ground water and to assess the extent of dissolved or floating petroleum product migration in the subsurface from beneath Bloomfield Refining Company (BRC) property. Soil vapor surveys have proven effective in identifying the extent of volatile organic compounds (VOCs) in ground water. The purpose of the survey was to assist in the identification of the source of hydrocarbons observed in ground water south of the refining facility and to better define the areal extent of these hydrocarbons. Results of the survey were also used to assist in determining the location of on-site ground water recovery wells.

### 2.2 TECHNICAL APPROACH

The survey was not conducted on refinery property due to significant chemical interference from normal refinery operations. However, soil vapor samples were collected at monitor well locations where concentrations of organic constituents in ground water were known. A grid initially constructed on 300-foot centers was used to perform the soil vapor survey on BLM property. The large distance between grid centers was chosen in order to avoid small-scale heterogeneities influencing vapor migration in the subsurface. The original grid, which extended southward from Sullivan Road and westward from the edge of the terminal area, was oriented parallel and perpendicular to the general direction of westward ground water flow. The grid spacing was continuously redefined on the basis of the vapor concentration observed at the most recently sampled grid point. A total of 25 points included 3 vapor samples collected on BRC property and 22 vapor samples collected on BLM land. Locations of the soil vapor sample points are shown in Figure 2-1.

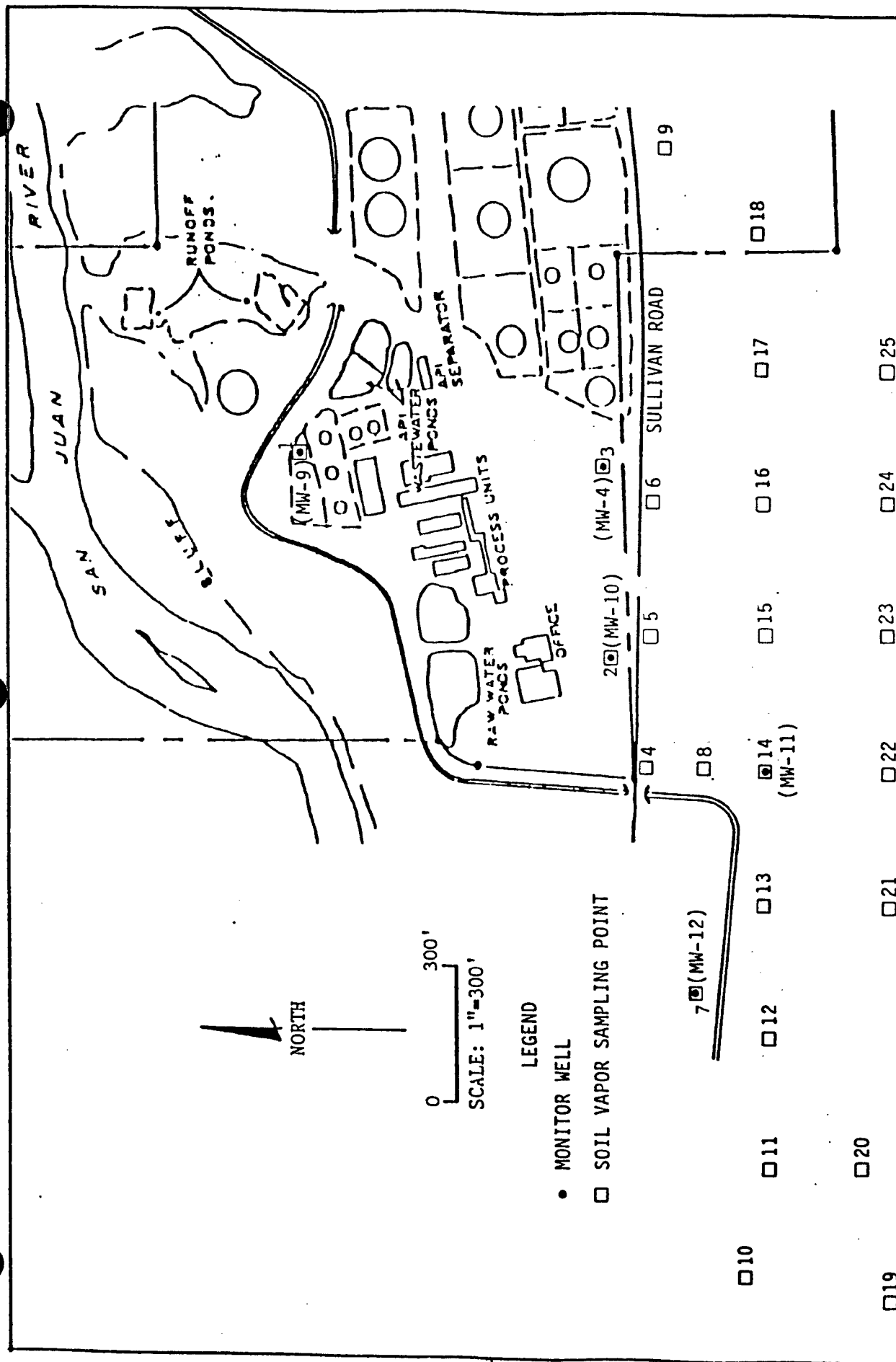


FIGURE 2-1  
LOCATIONS OF SOIL VAPOR SAMPLING POINTS



Soil vapor sampling was performed pursuant to guidelines presented in the GCL Standard Operating Procedures for Soil Vapor Sampling and Analysis (Appendix A). Prior to sampling on the grid, soil vapor samples were obtained near monitor wells at which concentrations of VOCs were known. This permitted estimation of the degree of correlation between soil vapor concentrations and observed concentrations of VOCs in ground water.

The sampling system employed driven 3/4-inch diameter hollow steel probes and a Photovac 10S50 gas chromatograph (GC). Analysis of soil vapor grab samples extracted from the shallow subsurface at depths of 5 feet helped to identify the presence of VOCs in the soil and underlying ground water. Analyses made at each sample point consisted of:

- Benzene
- Toluene
- Ethylbenzene
- Xylenes
- Trichloroethylene (TCE)
- Tetrachloroethylene (PCE)

Table 2-1 lists the physical properties of these volatile organic compounds. All VOCs sampled during the soil vapor survey were characterized by Henry's law constants in excess of  $5 \times 10^{-4}$  atm·m<sup>3</sup>/mole and vapor pressures of at least 1 mmHg, and were therefore considered suitable for soil-vapor sampling (Marrin, 1988). Quality control of the analyses included daily calibrations, air blanks, equipment blanks, and retention time checks for all constituents of interest. Calibration standards, analyzed to  $\pm 2\%$ , were supplied by Scotty Specialty Gases. Based upon analysis of concentrations of "background" VOCs located 800 feet from the refinery, a significant level of aromatic or halogenated hydrocarbons was considered to exist if:

TABLE 2-1

PHYSICAL PROPERTIES OF VOLATILE ORGANIC  
CONSTITUENTS OBSERVED AT BLOOMFIELD REFINING COMPANY

	Solubility in Water (20-25°C) (mg/l)	Vapor Pressure (14-32°C) (mmHg)	Henry's Law Constant (atm·m <sup>3</sup> /mole)	Log of Octanol/ Water Partition Coefficient
Benzene	1780-1800	95.2	$5.55 \times 10^{-3}$	2.13
Toluene	535	28.7	$5.93 \times 10^{-3}$	2.69
Ethylbenzene	206	7	$6.44 \times 10^{-3}$	3.15
Xylenes	insoluble	10(O-Xylene)	$6.12 \times 10^{-3}$	----
Tetrachloro- ethylene (PCE)	150	14	$28.7 \times 10^{-3}$	2.88
Trichloroeth- ylene (TCE)	1100	57.9	$11.7 \times 10^{-3}$	2.29
1,2-Dichloro- ethane (DCA)	6300-8300	61-200	$(1.10-5.32) \times 10^{-3}$	1.48
Phenol	67000	insignificant	$1.3 \times 10^{-6}$	1.46

Source: U.S. EPA, 1981, Treatability Manual, Volume I. Treatability Data, Office of Research and Development, Washington, D.C.

- Total hydrocarbons in soil vapor were found to exceed 50,000  $\mu\text{g/l}$  (50 ppm)
- Either benzene or toluene in soil vapor was found to exceed 1500  $\mu\text{g/l}$  (1.5 ppm)
- The concentration of PCE in soil vapor exceeded 10,000  $\mu\text{g/l}$  (10 ppm).

### 2.3 RESULTS

Interpretation of soil vapor survey results should account for source location, soil moisture content, organic carbon content, and volatility and solubility of the VOC under investigation. The primary transport mechanism for VOCs in unsaturated soil is by upward diffusion from the underlying saturated zone through air- and gas-filled voids. The presence of soil moisture tends to inhibit transport of vapors by reducing the volume of open voids through which volatile organic vapors can diffuse, but has less influence on highly-volatile VOCs than on compounds characterized by low volatility. The presence of organic matter may also inhibit diffusion through physical sorption of VOCs. Silka (1988) has shown that sorption in soils containing as little as 0.1% organic carbon can act as a significant sink for VOC vapors. Since soil moisture and organic matter act as sinks for VOC vapors and inhibit free movement of vapors from the ground water to the overlying soil, use of soil vapor concentrations to define the extent of hydrocarbons dissolved in underlying ground water is especially well-suited to coarse-grained, freely-draining deposits that do not contain significant amounts of organic material.

As indicated by lithologic logs of boreholes recently drilled in the area, the upper 10 to 20 feet of deposits underlying the site are comprised of silt and clay. These fine-grained deposits tend to trap infiltrating moisture and thereby inhibit upward diffusion of organic vapor that partitions out of the underlying ground water. The deposits might include minor amounts of organic matter that can easily adsorb organic vapors. Since the shallow clay layer appears to extend continuously across the site north of Sullivan Road, the diffusion-

inhibiting effects of the clay would be expected to be uniform across refinery property. Thus, it can be assumed that soil vapor concentrations observed north of Sullivan Road are reliable indicators of the extent of dissolved hydrocarbon plumes in the underlying ground water, especially when overall trends in the soil vapor plumes for a number of constituents are consistent. The relative concentrations of soil vapors are also useful for identifying source areas where hydrocarbons are likely to have been released into the subsurface. Since the shallow clay layer appears to be absent from at least a portion of BLM property, soil vapor concentrations would be expected to be higher beneath BLM land for a given ground water concentration.

Concentrations of benzene, toluene, ethylbenzene, total xylenes, tetrachloroethylene (PCE) and trichloroethylene (TCE) observed in the vapor samples are listed in Table 2-2. Plots of vapor concentrations and the logarithms of concentrations are shown in Figures 2-2 through 2-13. The distribution of log concentration is useful when vapor concentrations vary over several orders of magnitude because the logged concentration data are less subject to averaging during machine contouring than raw concentration data. The Golden Software "Surfer" graphics package was used to perform kriging of the data over a 1000-foot search radius, a procedure that tended to smooth the data with respect to space. X- and y-coordinates used for plotting were referenced to monitor well MW-11. Locations of the monitoring wells relative to the vapor sample points are approximate and can be more accurately defined by means of a topographic survey of well head locations.

The largest concentrations of benzene, toluene, total xylenes, and PCE were observed at sample point 1 (well MW-9). Although the area near well MW-9 is not considered to be the sole source of hydrocarbons, it appears to have been the site of significant hydrocarbon release during the history of the refinery. An air blank analysis was performed at point 1 because of the strong odor evident at this sample point. Results of the

**BLOOMFIELD REFINING COMPANY  
SOIL VAPOR SURVEY RESULTS**

ND = not detected  
a approximate distance east from well MW-11  
b approximate distance north from well MW-11

**ND = not detected**

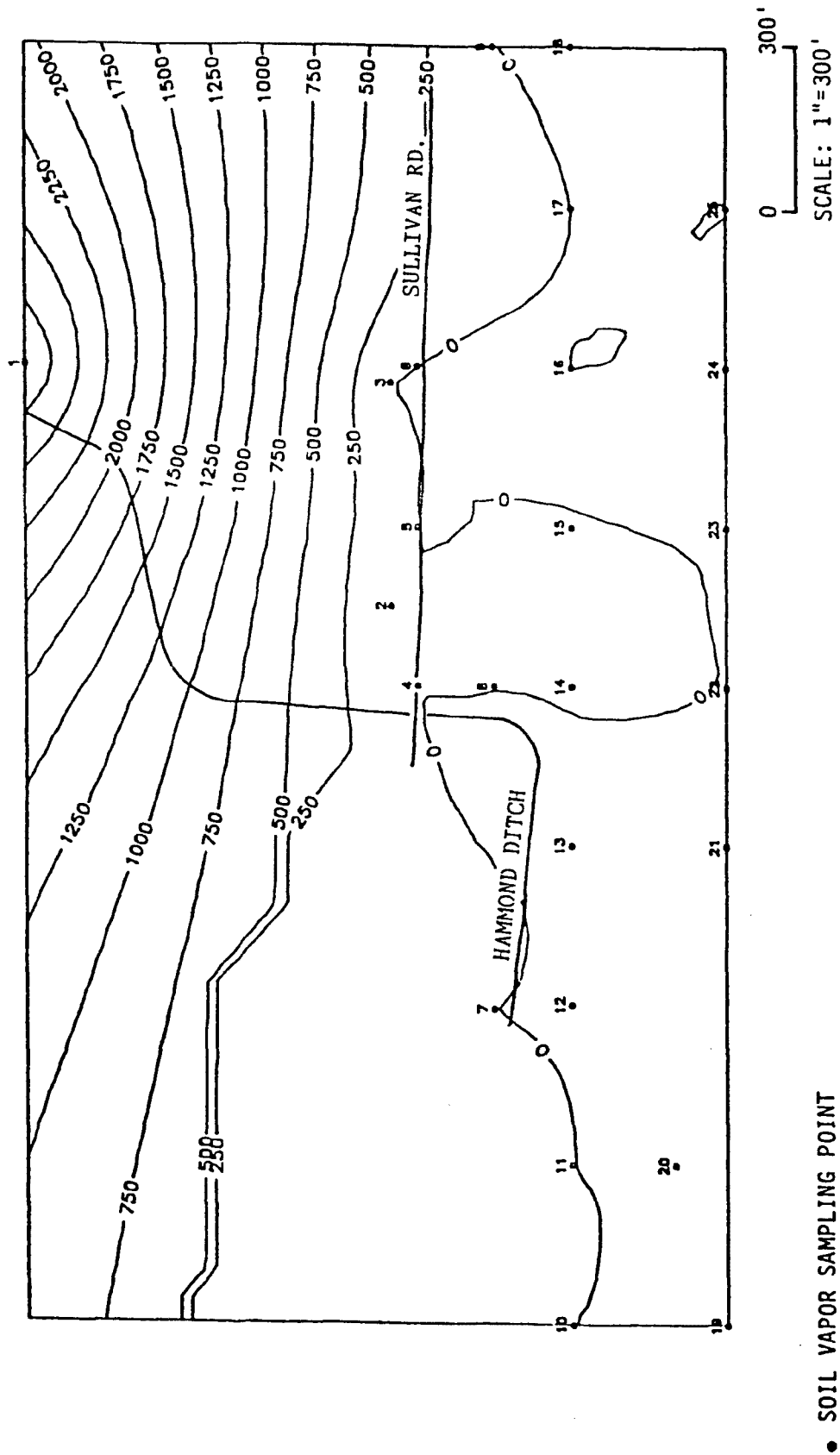


FIGURE 2-2  
BENZENE VAPOR CONCENTRATION (ppm)

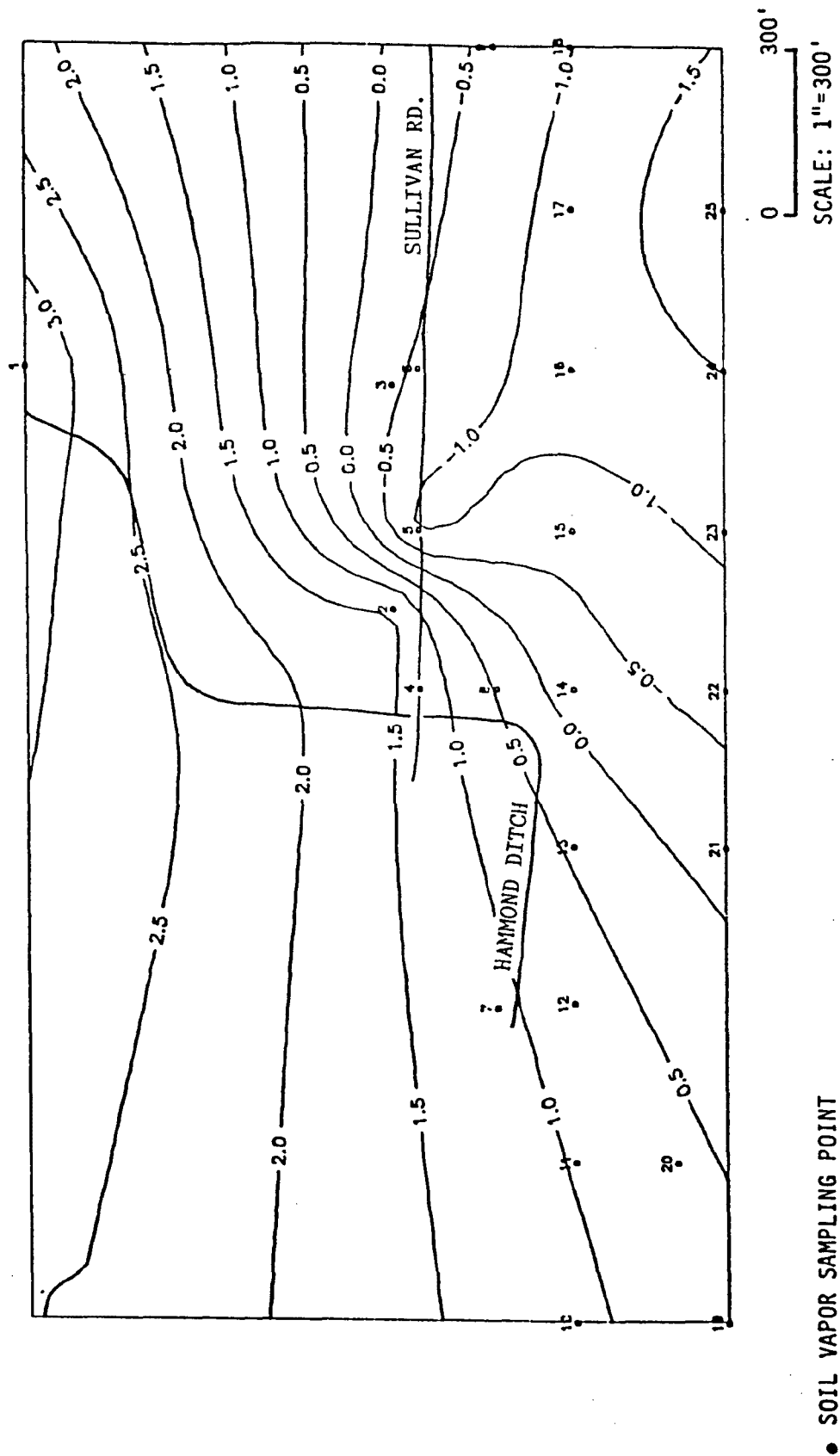


FIGURE 2-3  
BENZENE VAPOR LOG CONCENTRATION (LOG ppm)

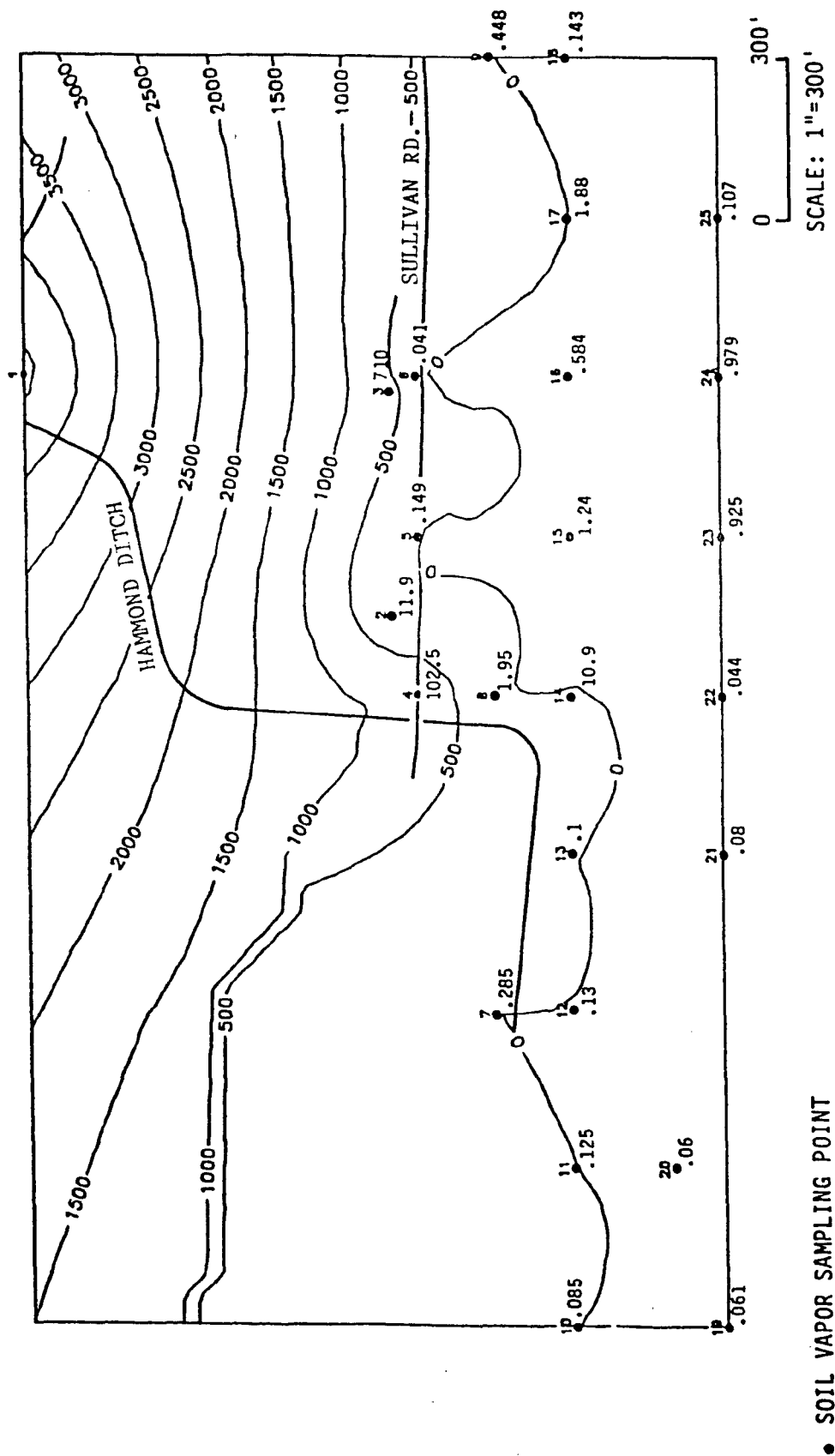


FIGURE 2-4  
TOLUENE VAPOR CONCENTRATION (ppm)



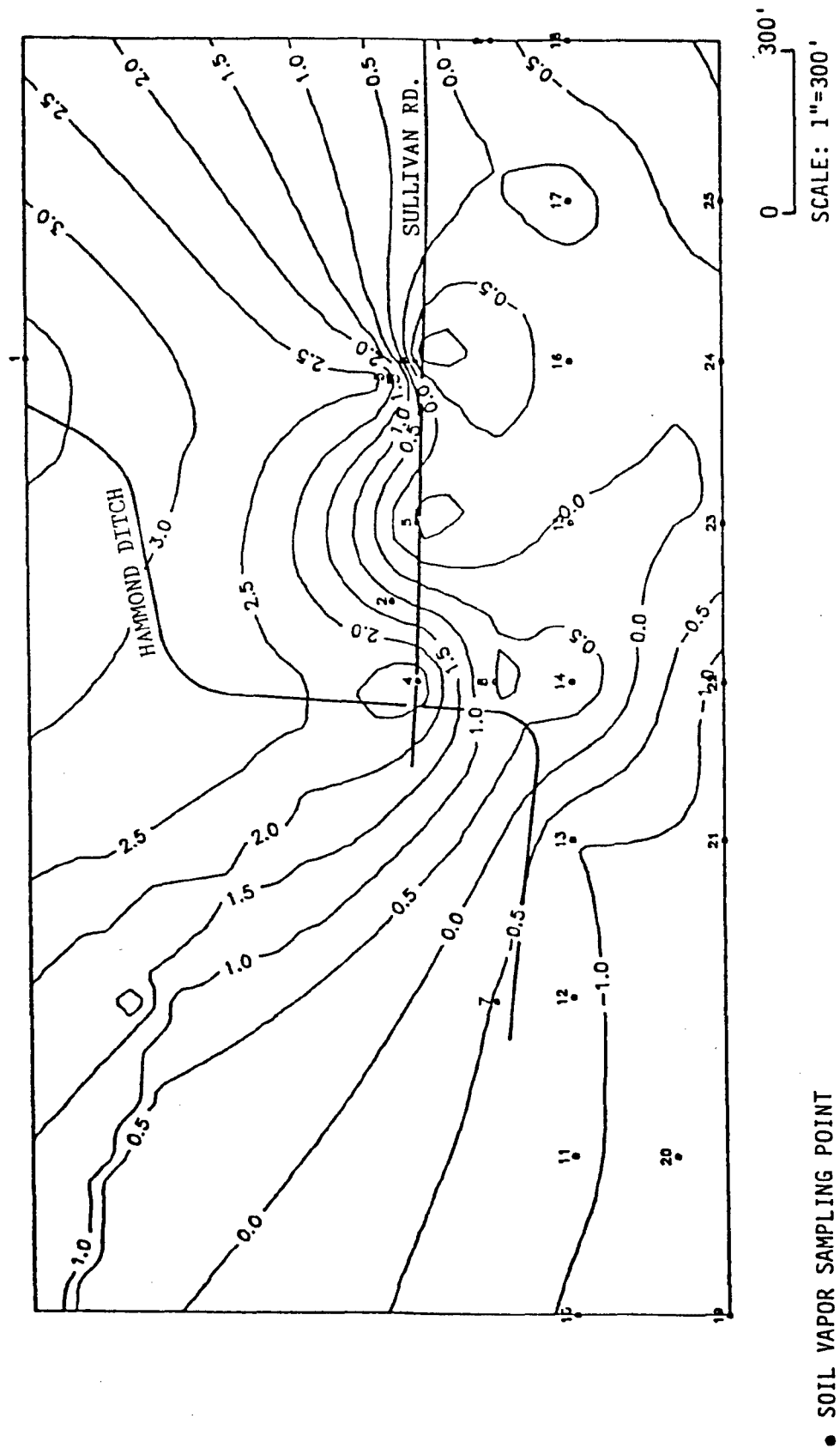


FIGURE 2-5  
 TOLUENE VAPOR LOG CONCENTRATION (LOG ppm)

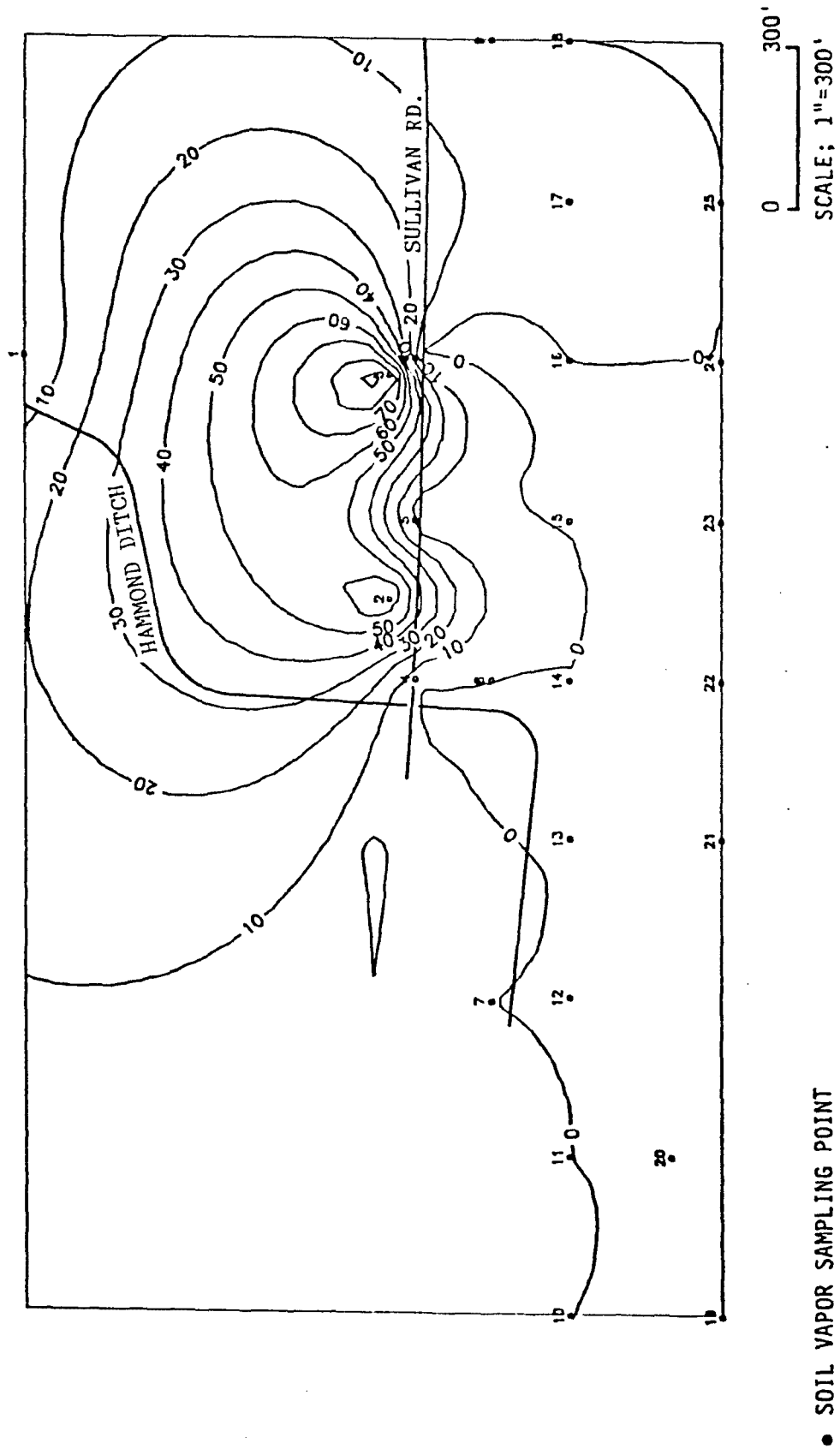


FIGURE 2-6  
ETHYLBENZENE VAPOR CONCENTRATION (ppm)

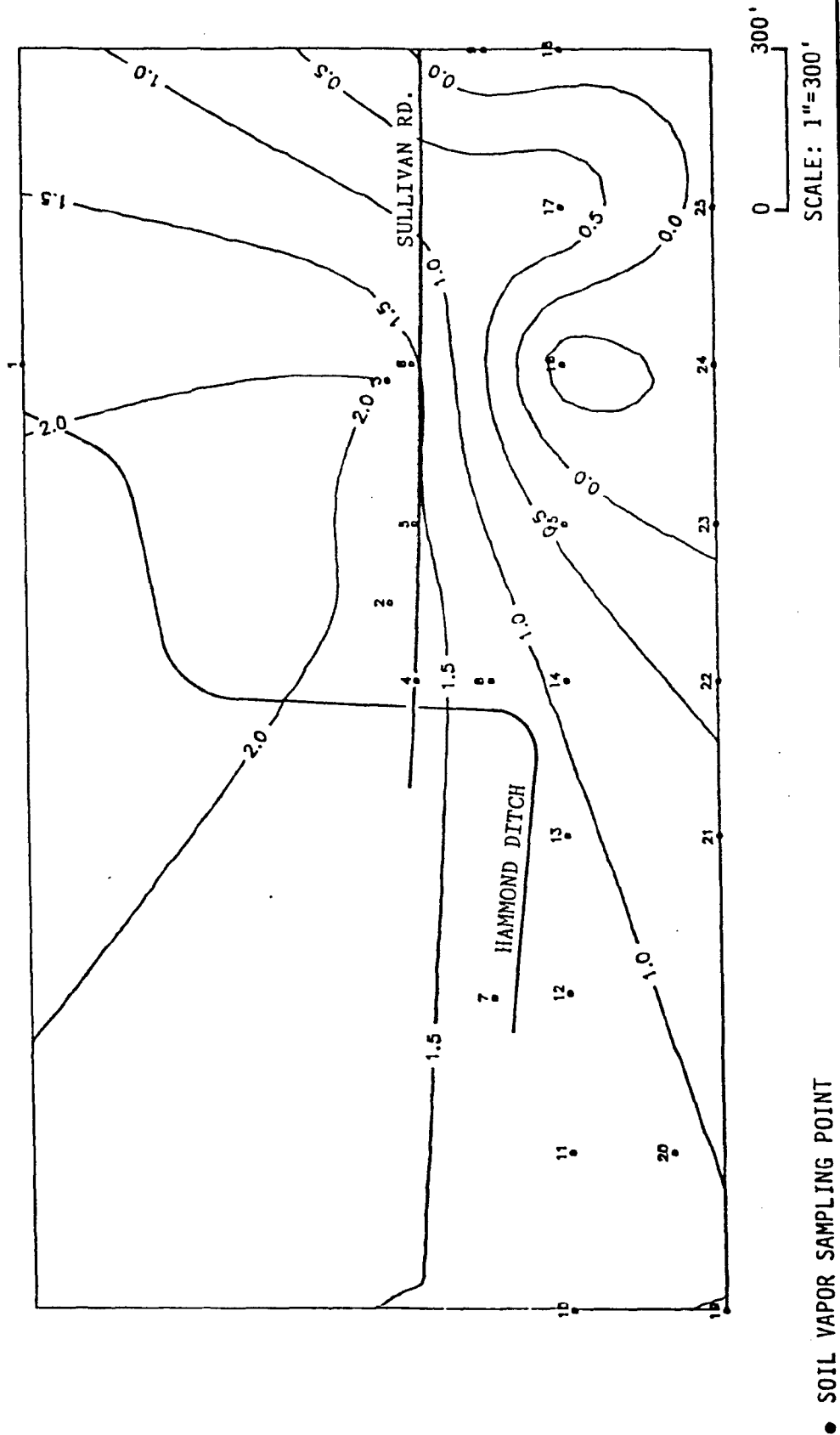


FIGURE 2-7  
ETHYLBENZENE VAPOR LOG CONCENTRATION (LOG ppm)

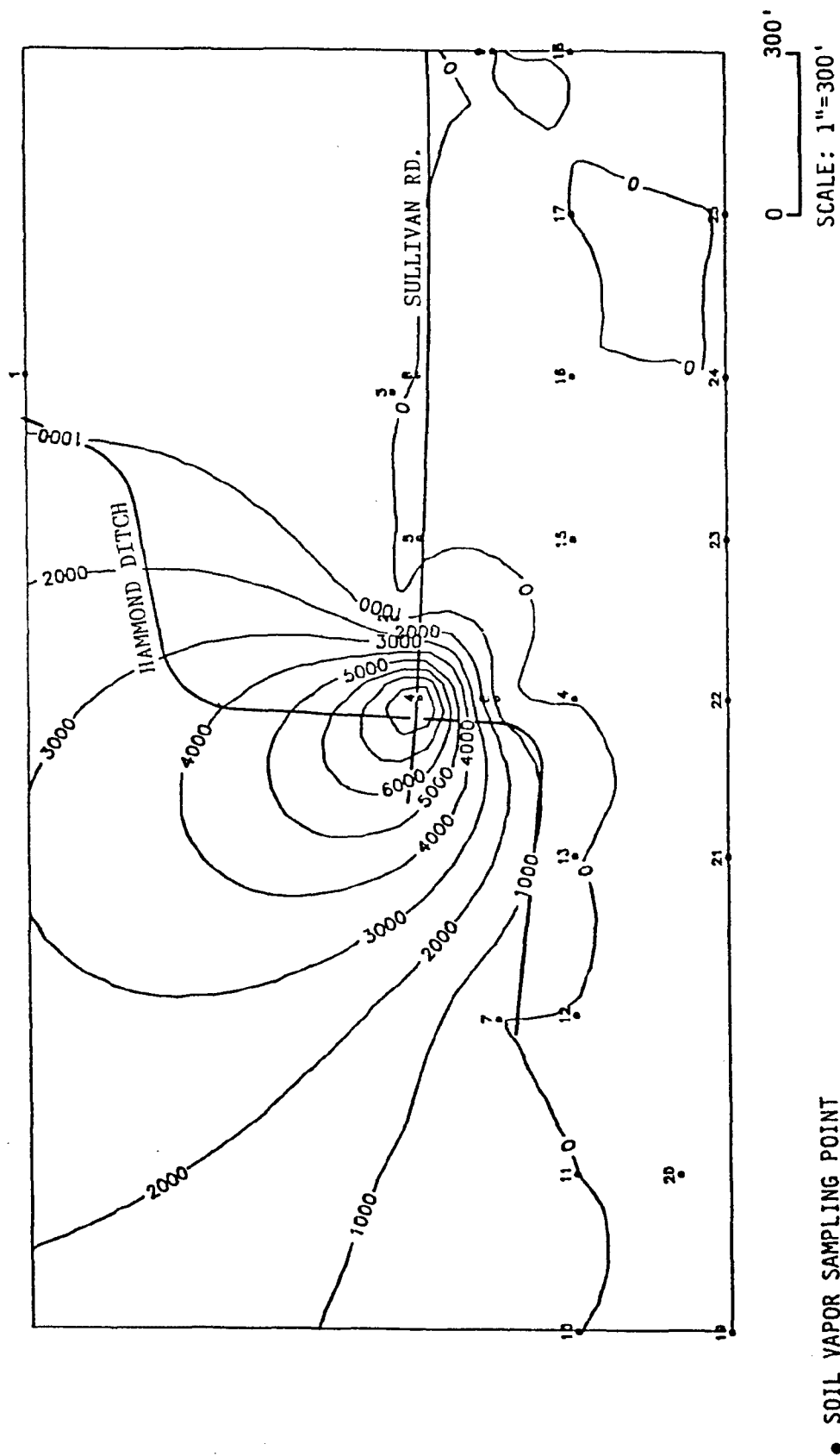


FIGURE 2-8  
XYLENE VAPOR CONCENTRATION (ppm)

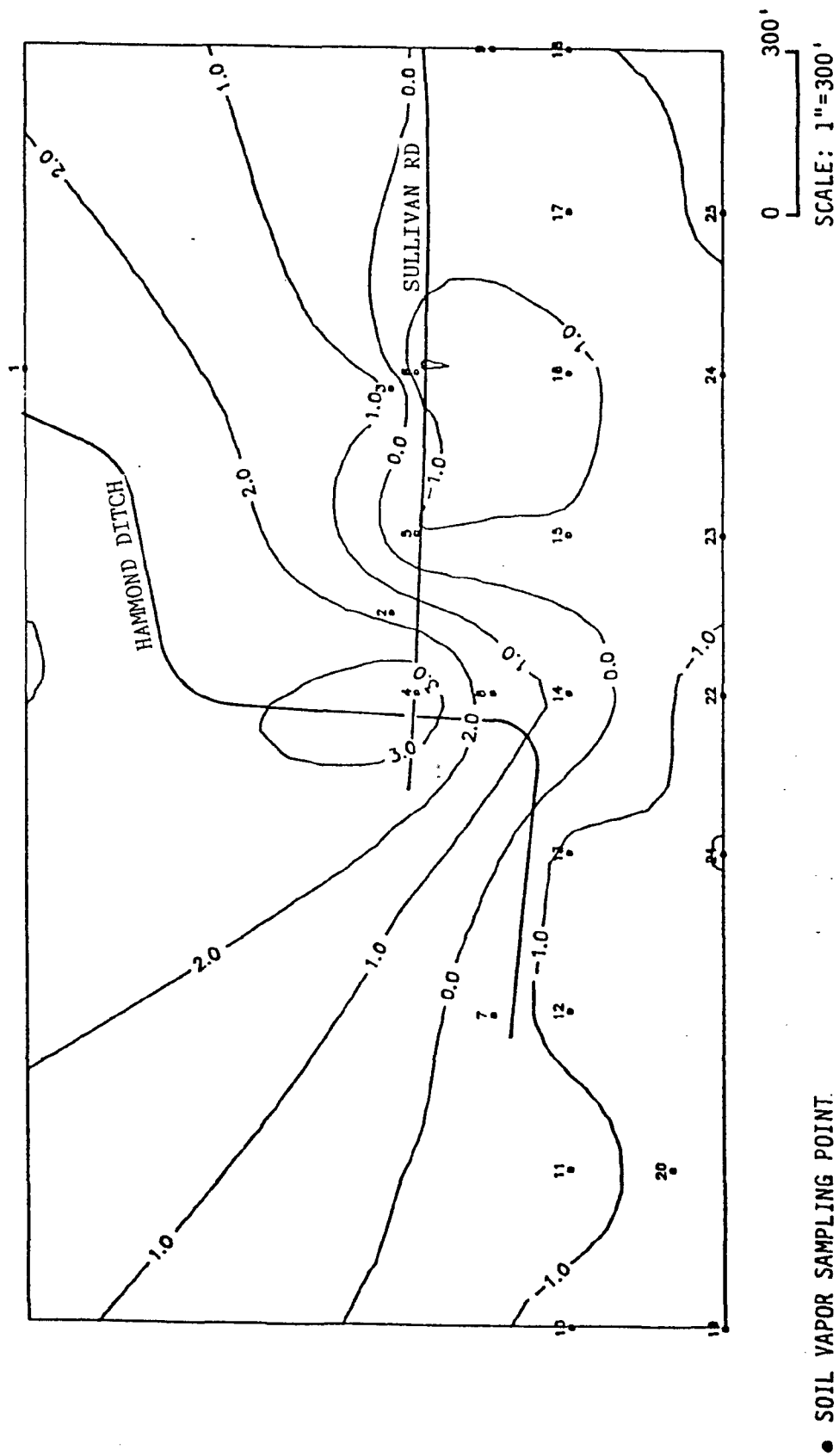


FIGURE 2-9  
XYLENE VAPOR LOG CONCENTRATION (LOG ppm)



# PCE VAPOR CONCENTRATION (PPM)

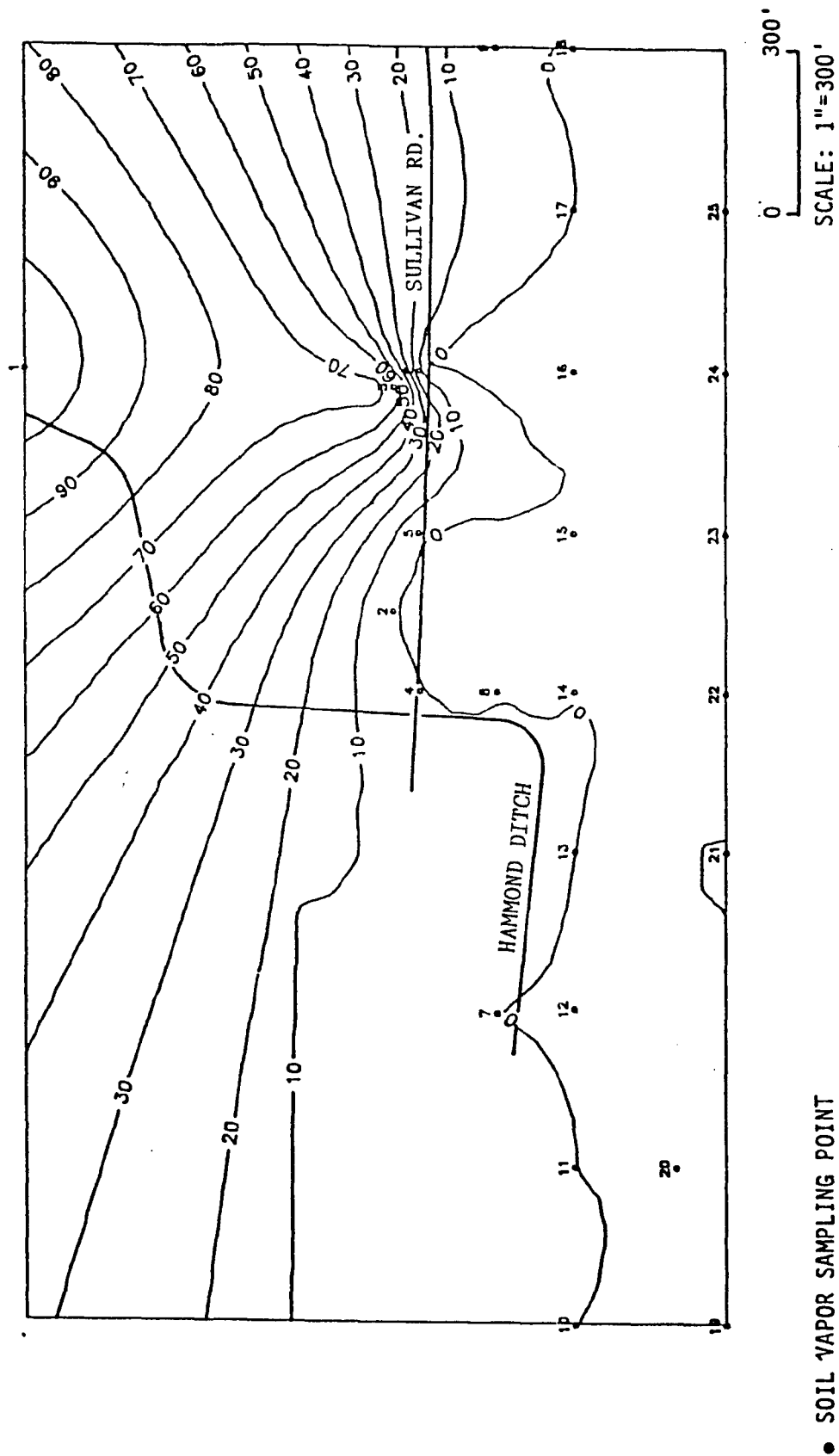


FIGURE 2-10  
PCE VAPOR CONCENTRATION (ppm)

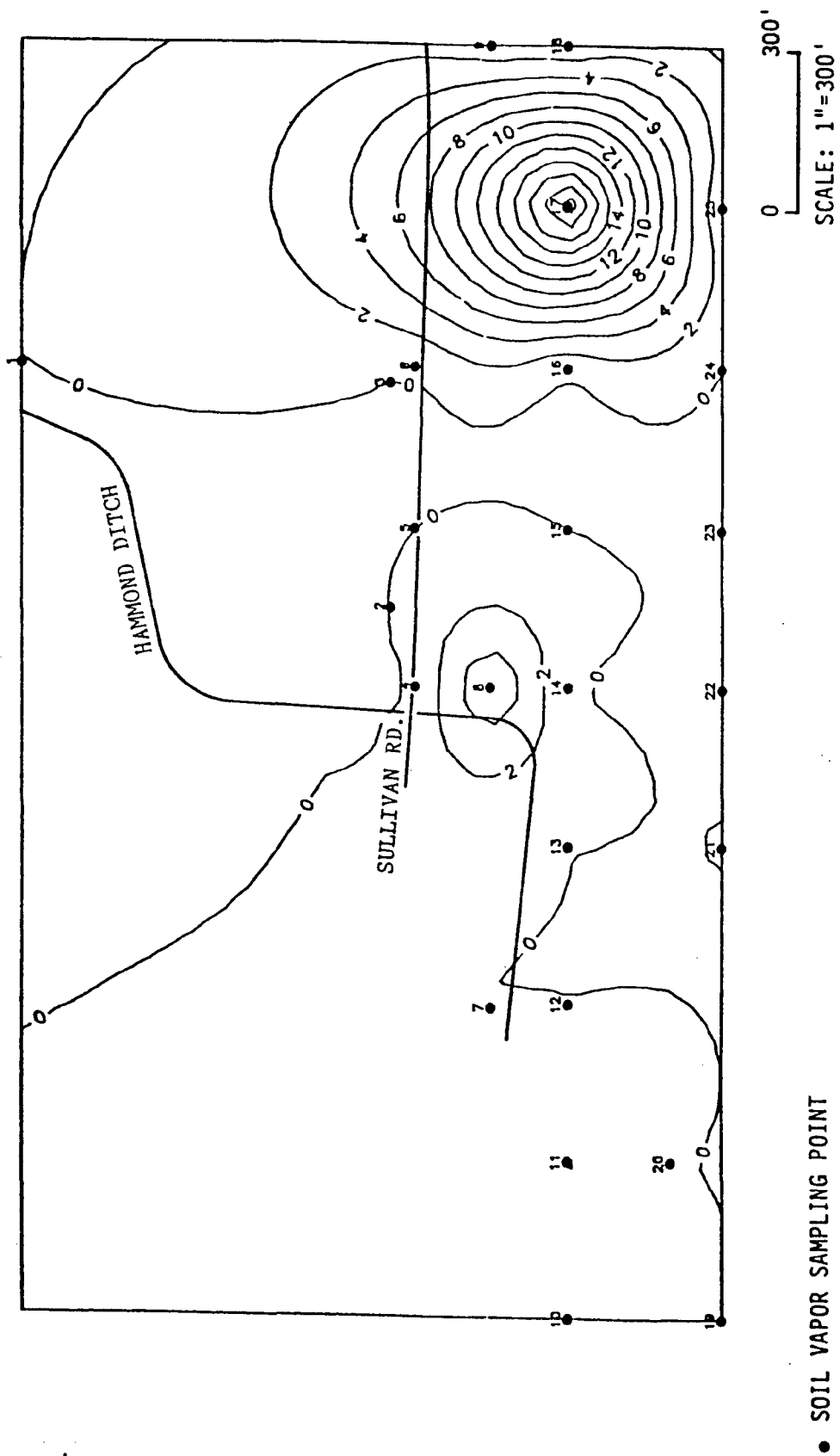


FIGURE 2-12  
TCE VAPOR CONCENTRATION (ppm)





air blank analysis, which are presented in Table 2-2, indicate the presence of toluene, ethylbenzene, total xylenes, and TCE in the ambient air. However, the observed air concentrations are not sufficient to explain the high subsurface concentrations of these constituents beneath the site. It was assumed that the source of high vapor concentrations of these VOCs is hydrocarbons in ground water beneath the site or in the unsaturated zone overlying the water table.

Analysis of a soil blank sample collected on BLM land at a point 700 feet west and 600 feet south of well MW-11 indicated the presence of benzene, toluene, and xylenes at elevated concentrations in the subsurface (see Table 2-2). The location of the soil blank was outside of the area of hydraulic influence associated with the perched system underlying the site. Background concentrations of 0.02 ppm, 0.55 ppm, and 0.36 ppm for benzene, toluene, and xylenes were defined on the basis of these soil blank concentrations. The occurrence of elevated concentrations of VOCs outside of the area potentially impacted by BRC operations is attributed to the large amount of oil-field activity in the area and to the presence of a natural gas pipeline east and hydraulically-upgradient of the soil-blank sampling point.

## 2.4 DISCUSSION

Concentrations of VOCs in soil vapor depend on local geology, moisture conditions, the pH-redox environment in the subsurface, and the unique physical characteristics of the organic compound. The concentration distributions presented in Figures 2-2 to 2-13 suggest that hydrocarbons in the subsurface occur primarily beneath the site and do not extend more than a few hundred feet south of the refinery beneath BLM property. The tendency for vapor concentrations to decrease from north to south is related to the large concentrations observed at sample point 1 (MW-9) and the absence of data in an east-west direction through the center of the site, where samples were not collected because of chemical interference from normal refinery operations. In general, concentrations less than or of the same order of magnitude as background were observed west and south of well MW-11 and east of the sample point located 300 feet east of well

MW-11. In the case of toluene, the sample collected at MW-11 was roughly equal to background. The consistent tendency for VOCs in soil vapor to rapidly decrease to background levels west and south of MW-11 and east of the sample point located 300 feet east of MW-11 may be evidence that geologic controls influence the presence of soil vapor beneath BLM property.

Volatile organic vapor and ground water concentrations at locations where both sets of data were available between July and September, 1988 are listed in Table 2-3. Only toluene vapor concentrations exhibited a systematic relation to toluene ground water concentrations. Soil vapor and ground water concentrations of toluene showed strong correlation when the order of magnitude of the concentrations was considered. Toluene ground water concentrations in milligrams per liter of water were, with the exception of the concentration at MW-13, two orders of magnitude smaller than vapor concentrations in microliters of gas per liter of air, suggesting that a general correlation exists between toluene dissolved in the ground water and toluene vapor in the overlying unsaturated zone. The distribution of toluene concentrations observed in ground water during September of 1988, in fact, shows peak concentrations at approximately the same locations as peak vapor concentrations previously observed during July of that year.

Given that toluene appears to act more like a conservative tracer than other aromatic hydrocarbons, the distribution of toluene vapor is probably representative of the distribution of dissolved toluene in the ground water and can be used to approximate the extent of dissolved aromatic hydrocarbons in the saturated subsurface in areas where ground water concentrations are not known. Assuming that this is true, the toluene soil vapor log distribution shown in Figure 2-5 suggests that local aromatic hydrocarbon concentration peaks occur near wells RW-3 (MW-10) and RW-2, the locations of which are shown in Plate 1. High ground-water concentrations of aromatic hydrocarbons have actually been observed in the vicinity of RW-2 and RW-3 and have also been observed near RW-1, immediately south of RW-3 in piezometer P-3, and near monitor well MW-11.

TABLE 2-3

CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS IN  
GROUND WATER AND SOIL VAPOR AT MONITOR WELL LOCATIONS

Soil Vapor Point(s)	Well I.D.	Benzene Concentration		Toluene Concentration		Ethylbenzene Concentration	
		Water (mg/l)	Vapor (ppm)	Water (mg/l)	Vapor (ppm)	Water (mg/l)	Vapor (ppm)
2	RW-3	12	38.2	0.062	11.9	0.00286	74.5
3	MW-4, P-2, RW-2 (average)	8.23	ND	4.19	710	1.27	102
5	P-3	19.4	0.062	0.00435	0.149	ND	ND
14	MW-11	44.4	0.56	0.840	10.9	0.063	ND
18	MW-13	0.00023	ND	0.00024	0.143	0.00029	ND

(See Plate 1 for locations of RW and P wells)

Since there are no source areas at these locations, it is likely that these hydrocarbons originated near the process units or storage tanks and migrated west and southwest under the hydraulic gradients that prevail in the perched alluvial aquifer. Assuming an average hydraulic gradient of 0.003, a hydraulic conductivity of  $1.8 \times 10^{-4}$  ft/sec from slug and pump tests performed near RW-3, and an effective porosity of between 0.10 to 0.20, the average linear ground water velocity could range from 2.7 to  $5.4 \times 10^{-6}$  ft/sec. If dissolved aromatic hydrocarbons move primarily under advective transport mechanisms, hydrocarbons originating in the storage area and currently observed near RW-3 (MW-10) would have migrated through the western edge of the storage area under a predominantly westward flow direction between 4½ and 9 years ago. Similarly, a release that is presently evident at RW-2 as a peak concentration may have originated from the western edge of the tank storage area between 2 and 4 years ago. Peak concentrations of aromatic hydrocarbons presently evident at RW-3 and P-3, as well as aromatic hydrocarbons observed near RW-1 and P-1, may have originated in the process area and migrated southwestward along a curvilinear flow path caused by southward flow from the northern reaches of Hammond Ditch. If this is the case, and if the hydraulic gradient increases to 0.04 under the influence of Ditch recharge, hydrocarbons currently arriving at RW-1 could have been released 4 to 8 years ago. Hydrocarbons presently at RW-3 and P-3 may have been released from the process area 5 to 10 years ago.

The absence of elevated concentrations of volatile organic constituents at soil vapor sample points located along Hammond Ditch, including a point at MW-12 where no organic constituents have previously been observed in the perched ground water, suggests that either flow in the Ditch is very effective in flushing out organic compounds that may have migrated through the alluvial ground water system beneath BLM land or that lateral recharge from the Ditch to the alluvial deposits is inhibiting the upward diffusion of vapor. The occurrence of below-detection levels of tetrachloroethylene (PCE) and trichloroethylene (TCE) at the soil blank location and the presence of large concentrations of these compounds near MW-4 and west of the terminal area is an indication

that PCE and TCE are limited to the subsurface directly beneath the site or near the site boundary. PCE and TCE were presumably released from solvents used for degreasing equipment in the terminal area or, perhaps, at off-site locations.

Given the limited extent of organic compounds in soil vapor underlying BLM property, recovery wells installed north of Sullivan Road will be probably be adequate for effective capture of organic constituents in the underlying ground water. The southern extent of the capture zones induced by operation of recovery wells north of Sullivan Road will be the determining factor when deciding the need for additional recovery of ground water near well MW-11, where soil vapor and elevated ground water concentrations of benzene, toluene and xylene have been detected. Hydraulic head and water quality data observed at piezometer P-3 located south of Sullivan Road will be used to estimate the effectiveness of the proposed recovery system with respect to capture of hydrocarbons currently present beneath BLM land.

### 3.0 INSTALLATION OF RECOVERY WELLS AND PIEZOMETERS

#### 3.1 GOALS AND OBJECTIVES

The perched alluvial aquifer underlying the Bloomfield Refining Company is recharged along upstream reaches of Hammond Ditch and beneath the spray irrigation area in the southwestern part of the facility property, as evidenced by the peak water levels observed beneath the spray irrigation area and the addition of a westward ground water flow component along the Ditch. The aquifer is underlain by the Nacimiento Formation, which acts as a barrier to significant downward movement of ground water and dissolved hydrocarbons. Perched ground water containing hydrocarbons is, however, migrating laterally from the spray irrigation area and from the areas adjacent to upstream reaches of the Ditch towards BLM property and downstream western reaches of Hammond Ditch. A recovery strategy has been formulated to intercept ground water containing hydrocarbons that would otherwise migrate into the downstream reaches of the Ditch or beneath BLM property.

Due to the moderately-large hydraulic conductivity and 8-foot average saturated thickness of the alluvial aquifer, it was expected that broad, shallow cones of depression would develop during hydrocarbon recovery operations. Because of the anticipated shallow capture zones, at least two recovery wells, in addition to existing recovery well RW-3 (MW-10), were believed to be needed to ensure capture of all hydrocarbons originating from the site. A recovery well was installed near existing well MW-4, which was constructed with torch-slotted casing and was not considered suitable as a recovery well. Recent observations of hydrocarbon seepage into Hammond Ditch west of the process units suggest that a recovery well would be needed west of the office building and southwest of the raw water ponds. An additional recovery well was therefore installed east of Hammond Ditch and west of the office building to capture ground water that was not expected to be intercepted by up-gradient recovery well RW-3. The location of this well was selected based upon results of the numerical flow model previously developed to define a remedial-action strategy, and modified to reflect conditions during non-irrigation seasons when water from Hammond Ditch would not be

available to contain ground water on BRC property. A third well was installed west of the terminal area within the facility boundary to determine if aromatic or halogenated hydrocarbons observed under BLM land could have migrated from this area as a consequence of refinery pigging operations.

Simulated steady-state hydraulic head during recovery at the three recovery wells, shown in Plate 2, indicates that long-term recovery of 3, 1.5, and 1.5 gpm at wells RW-1, RW-2, and RW-3, respectively, should be sufficient to capture on-site hydrocarbons and a portion of hydrocarbons present on BLM property. In order to demonstrate that the recovery system is effectively capturing flow from the refinery, several piezometers were also installed. The locations of these piezometers were selected to provide hydraulic head data critical for assessing the hydraulic impacts of recovery well operation. A minimum of three piezometers was considered necessary to assess the effectiveness of the proposed recovery system north of Sullivan Road.

One piezometer was located between existing well RW-3 and the RW-2 well replacing well MW-4 in order to assess the well losses associated with recovery well operation. Since this piezometer is sufficiently far from recovery wells to not be significantly influenced by well losses, it should give a true indication of the depth of the hydraulic "trough" induced by pumping at the line of recovery wells north of Sullivan Road. A second piezometer, located south of Sullivan Road, was used to measure how effective the recovery system north of the Road is in capturing ground water from or preventing migration of ground water towards BLM land. A third piezometer was placed immediately west of the RW-1 recovery well located east of Hammond Ditch and west of the office building. Water level measurements obtained from this piezometer were used to determine whether the recovery well located between the Ditch and the office building is effective in capturing westward-moving ground water during non-irrigation periods when there is no water in the Ditch to help contain hydrocarbons on BRC property. Locations of all existing and new wells and piezometers are shown in Plate 1.



Installation of monitor/recovery wells and piezometers, in addition to supplying a means of remediating the ground water beneath the refinery, also made it possible to further assess the extent and magnitude of hydrocarbons in the perched alluvial aquifer underlying the site. Samples of ground water collected from the alluvial wells and piezometers were used to define the extent of the hydrocarbon plume in the alluvial aquifer and will also be critical for tracing changes in hydrocarbon concentrations induced by remedial clean-up operations. These samples, along with measurements of hydraulic head observed in the wells and piezometers, will make it possible to determine the need for additional recovery wells and to evaluate the effectiveness of the recovery strategy.

### 3.2 TECHNICAL APPROACH

Two monitor/recovery wells and four piezometers were drilled and installed by Beeman Brothers Drilling Company between August 20 and September 2, 1988 using an air-rotary casing-driver drill rig. The depth of the boreholes were selected by GCL's on-site geologist based on the depth to water observed in each borehole during drilling. A conventional rotary drill bit was advanced while cuttings were simultaneously blown upward and out of the borehole with compressed air. An in-line air filter ensured that hydrocarbons were not introduced into the borehole from the compressor during drilling operations. After a selected depth was reached with the rotary drill bit, 8-inch diameter steel casing was hammered into the borehole around the drill rods to the same depth as the drill bit using a hydraulic casing driver attached to the drill rig. This process was repeated until the target depth of each borehole was reached. Samples of the drill cuttings were collected at approximately 5 foot intervals and logged by the on-site geologist.

After the target depth of each borehole was attained and the temporary casing advanced to the total depth of the borehole, recovery of ground water was monitored until a static level could be estimated and a total depth for the well casing selected. Four-inch screen and well casing was then installed in the borehole through the temporary steel casing. The

top of the screen was set 5 feet above the static water level and the well. The filter pack and bentonite seal were inserted into the borehole through the annulus of the temporary casing as it was retrieved from the borehole. The borehole was grouted above the bentonite seal using a neat cement slurry with 5% bentonite. After the grouting was completed, a concrete pad was constructed, complete with locking guard pipe. Recovery-well completion diagrams are shown in Appendix B, Figures B-1 to B-3. The monitor/recovery wells were constructed with polyvinyl chloride (PVC) and stainless steel components, with the parts of the well casing that were in contact with ground water composed of stainless steel. Piezometers were similarly constructed using 4-inch PVC casing, with piezometer completion diagrams shown in Figures B-4 to B-7.

After the grout in the borehole cured, the wells were developed utilizing a 4-inch submersible pump. Wells with stainless steel screens were bailed prior to installation of the submersible pump. The wells were pumped until produced water was clear and free of sand. The developed water was stored in 55-gallon drums at each well head. After the water level in each well had recovered to static conditions, a water sample was collected and analyzed in the field for pH in order to identify potential invasion of the filter pack by emplaced grout.

Following installation and development of the recovery wells and piezometers, all wells and piezometers were sampled by Bloomfield Refinery Company personnel for New Mexico WQCC parameters.

### 3.3 RESULTS

#### 3.3.1 Lithology

Based on lithologic logs of the boreholes shown in Figures B-8 to B-14 (Appendix B), the subsurface geology is dominated by three lithologies: an uppermost clayey silt, a sandy gravel unit and the underlying Nacimiento shale of Early Tertiary age. As indicated in the stratigraphic sections presented in Figures B-15 and B-16 of Appendix B, the uppermost clayey silt is present throughout the site except between holes P-3 and MW-11, where this unit has probably been removed by erosion.

This unit ranges in thickness from 0 feet in P-3 and MW-11 to 27 feet in P-4. In boreholes located on refinery property, this unit is at least partly composed of fill dirt.

Underlying the uppermost silt are coarse-grained gravel and sand deposits of the ancestral San Juan River. This unit is poorly sorted; the gravel is moderately rounded and is up to two inches in diameter. In all boreholes drilled, the lowermost portion of the gravel unit was water-saturated and under unconfined conditions. The unit appeared to be lithologically homogeneous over the site and ranged in thickness from 14 feet to 18.5 feet. However, borehole P-4 showed some variation from the typical lithology of this unit. In this borehole, a distinctive, relatively well-sorted three-foot thick orange sand overlies the gravel unit. Additionally, a two-foot thick clay horizon was encountered near the base of gravel unit; this clay unit is underlain by typical San Juan gravels. Clay units were not encountered in other boreholes and are presumably restricted to the southeastern portion of the site.

The lowermost unit encountered in the boreholes was the Nacimiento Shale of Paleocene age. This unit consists primarily of a fine-grained dusky yellow to olive-gray shale, and acts as an aquitard beneath the facility. Boreholes were drilled into this unit to accommodate the silt trap at the base of each well. Once again, borehole P-4 showed variation from the typical Nacimiento Formation in the project area. In this borehole, the Nacimiento consisted of weathered bluish well-sorted, fine-grained clayey sand. This sand unit was not encountered in other boreholes and is presumed to be of limited areal extent.

Plate 3 shows the structural contours of the Nacimiento Formation obtained from data collected by Engineering-Science (1986) and GCL. The contour map shows an overall decrease in the elevation of bedrock from southeast to northwest toward the San Juan River. There is some evidence that a buried stream channel, oriented N30°E and traversing both BRC and BLM land, occurs in the extreme southwestern part of the site. This stream channel may influence the distribution of VOCs in the subsurface

by inhibiting eastward or westward migration of organic compounds in this area, causing the observed "tongues" of soil vapor beneath BLM land evident in Figures 2-2, 2-5, 2-6, and 2-9.

### 3.3.2 Well Yield

Each well was developed following installation using a submersible pump. The largest yield was obtained from piezometer P-4, which was pumped for one hour at a rate of slightly less than 13.5 gallons/minute. Recovery wells RW-1 and RW-2 sustained rates of approximately 3 and 8 gpm, respectively. Based on a previous pump test performed at the refinery, the yield of well RW-3 was estimated to be 1.5 gpm.

### 3.3.3 Pre-Recovery Water Table and Saturated Thickness

Table 3-1 lists and Plate 4 shows the distribution of pre-recovery water levels observed at all existing and newly-installed wells on September 9, 1988. In the absence of ground water recovery, it is clear that ground water and dissolved contaminants migrate into Hammond Ditch and beneath BLM property. The three recovery wells are located in an area where up to 10 feet of initial saturated thickness was available for propagating recovery stresses into adjacent portions of the aquifer.

### 3.3.4 Water Quality

Table 3-2 lists the results of the BRC sampling effort. Neither TCE or PCE were above detection limits in any of the ground water samples. These VOCs have likely degraded to daughter-product DCE, a biological transformation can be completed within a matter of a few years (Vogel, 1987). Figures 3-1 to 3-9 show the areal distributions of aromatic and halogenated hydrocarbons in September, 1988. In general, the shape of each plume can be explained on the basis of hydrogeological conditions and physical properties of the associated VOC.

All contaminant plumes show a longitudinal axis oriented in a northeast-southwest direction parallel to the direction of ground-water flow, as indicated by water-table contours observed on September 9, 1988 and shown

TABLE 3-1  
WATER LEVEL AND PRODUCT THICKNESS AT  
RECOVERY WELLS AND PIEZOMETERS (FEET)

<u>Well or Piezometer</u>	<u>Pre-Recovery (Sept. 9, 1988)</u>		<u>12-Day Recovery (Jan. 16, 1989)</u>		<u>42-Day Recovery (Feb. 15, 1989)</u>	
	<u>Water Level</u>	<u>Product Thickness</u>	<u>Water Level</u>	<u>Product Thickness</u>	<u>Water Level</u>	<u>Product Thickness</u>
RW-1	5499.23	0	5498.44	0	5497.51	0.17
RW-2	5500.11	0	5498.46	0.21	5498.39	0.042
RW-3	5499.06	0	5497.09	0	5496.51	0
P-1	5499.09	0	5498.16	0	5497.36	0.04
P-2	5500.06	0	5499.25	0	5498.41	0
P-3	5498.89	0	5498.10	0	5496.62	0
P-4 (MW-13)	5500.51	0	5500.27	0	5499.07	0
MW-11	5497.59	0	5496.84	0	5496.37	0

TABLE 3-2

BLOOMFIELD REFINING COMPANY  
GROUND WATER QUALITY

<u>Parameter</u>	<u>Units</u>	<u>Detection Limit</u>	<u>New Mexico Standards 3-103 (A)</u>	<u>6-3-88 MW-4</u>	<u>9-9-88 RW-2</u>	<u>9-9-88 P-2</u>
Benzene	mg/l	0.0002	0.01	8.9	11.000	4.80
Ethylbenzene	mg/l	0.0002	0.75	--	2.900	0.900
Toluene	mg/l	0.0002	0.75	0.93	10.200	1.430
M-Xylene	mg/l	0.0002	0.62	--	17.700	4.500
O-Xylene	mg/l	0.0002	0.62	--	4.900	1.460
P-Xylene	mg/l	0.0002	0.62	--	6.200	1.570
1,2-Dichloroethane	mg/l	0.001	0.01	--	0.0016	ND
Trans 1,2-Dichloroethene	mg/l	0.001	--	--	ND	ND
Nitrate as N	mg/l	0.01	10.0	0.14	<0.01	--
Phenol	mg/l	0.001	0.005	0.069	0.13	--
Sulfate	mg/l	1	600.	3	<1	--
TDS	mg/l	10	1000	1820	1980	--

TABLE 3-2 (Continued)

Parameter	Units	Detection Limit	New Mexico Standards 3-103 (A)	9-9-88					9-9-88	
				RW-3	P-3	RW-1	P-1	MW-11	MW-13	
Benzene	mg/l	0.0002	0.01	12.000	19.400	6.400	102.200	44.400	0.00023	
Ethylbenzene	mg/l	0.0002	0.75	0.00286	ND	0.540	0.00143	0.063	0.00029	
Toluene	mg/l	0.0002	0.75	0.062	0.00435	0.070	0.034	0.840	0.00024	
M-Xylene	mg/l	0.0002	0.62	3.500	22.800	4.800	0.483	2.600	0.00065	
O-Xylene	mg/l	0.0002	0.62	0.103	3.600	8.300	0.061	0.061	0.00056	
P-Xylene	mg/l	0.0002	0.62	1.800	8.700	1.700	0.322	0.745	0.00035	
1,2-Dichloroethane	mg/l	0.001	0.01	ND	ND	ND	ND	0.0022	0.0156	
Trans 1,2-Dichloroethene	mg/l	0.001	--	ND	ND	ND	0.0015	ND	ND	
Nitrate as N	mg/l	0.01	10.0	<0.01	--	<0.01	--	0.06	13.1	
Phenol	mg/l	0.001	0.005	0.05	--	0.34	--	0.06	0.03	
Sulfate	mg/l	1	600.	9.5	--	4.5	--	30.	728.	
TDS	mg/l	10	1000	3250	--	3130	--	1900	3220	

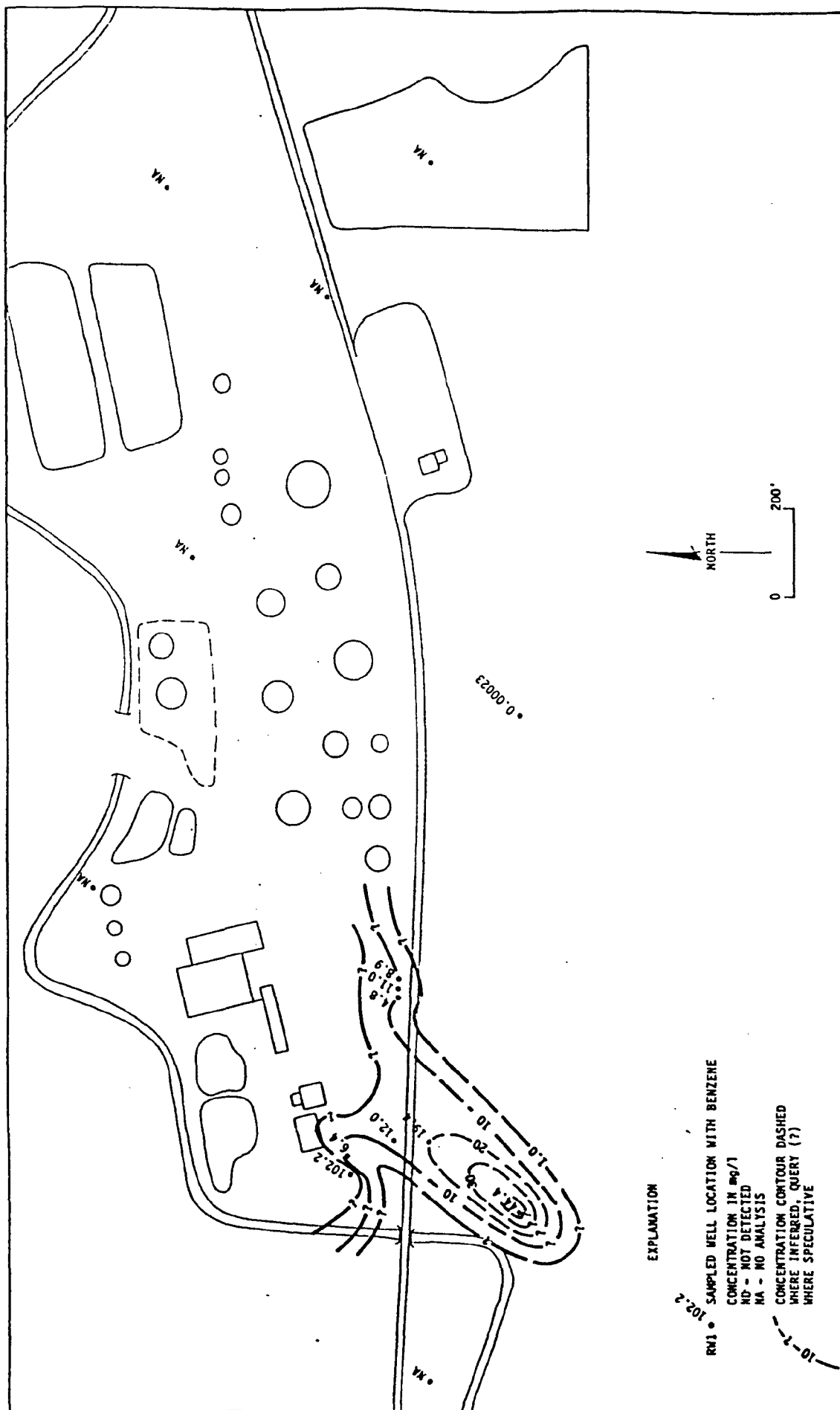


FIGURE 3-1  
BENZENE CONCENTRATION IN GROUND WATER SEPTEMBER 1988 BLOOMFIELD REFINING COMPANY



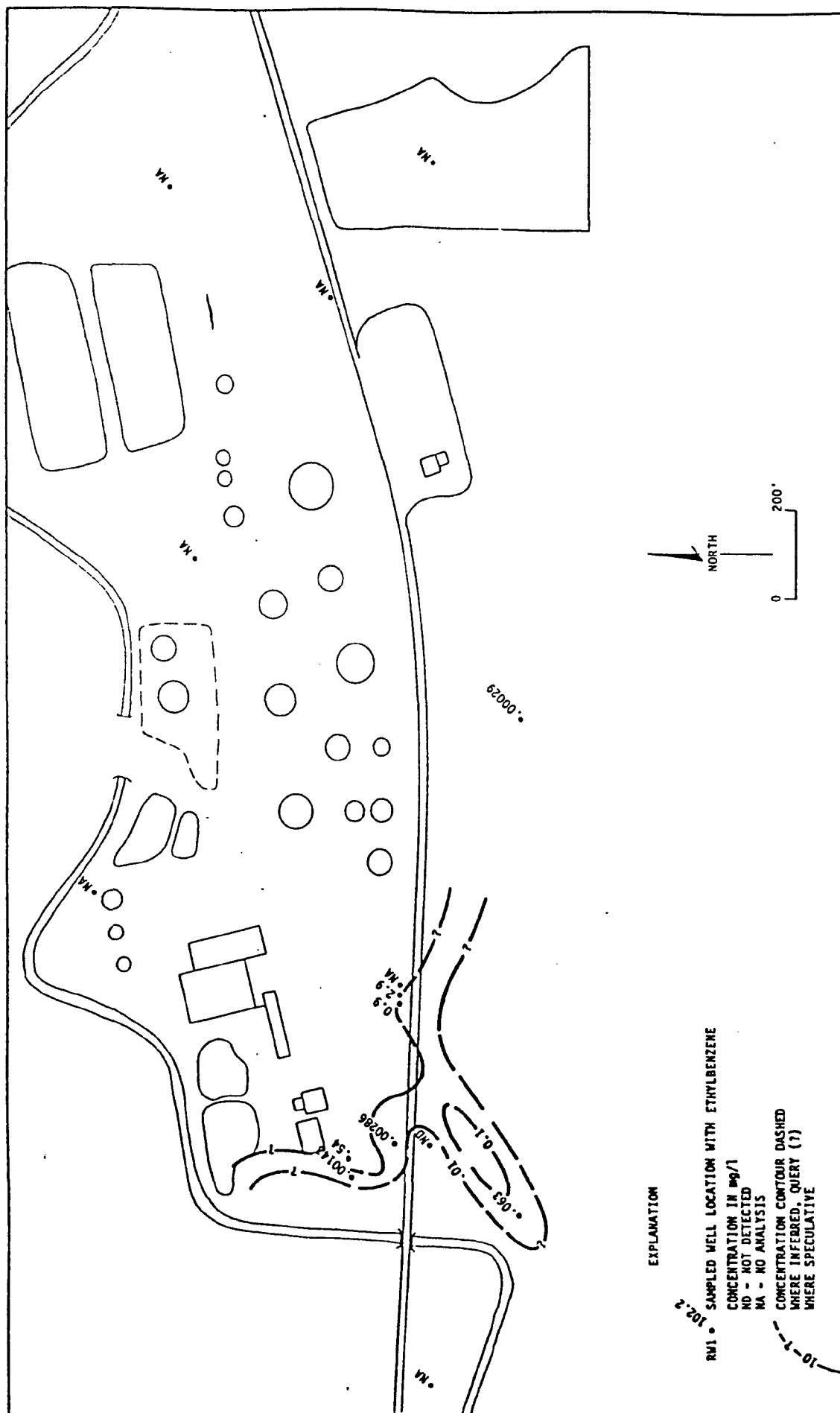


FIGURE 3-2  
ETHYLBENZENE CONCENTRATION IN GROUND WATER SEPTEMBER 1988 BLOOMFIELD REFINING COMPANY

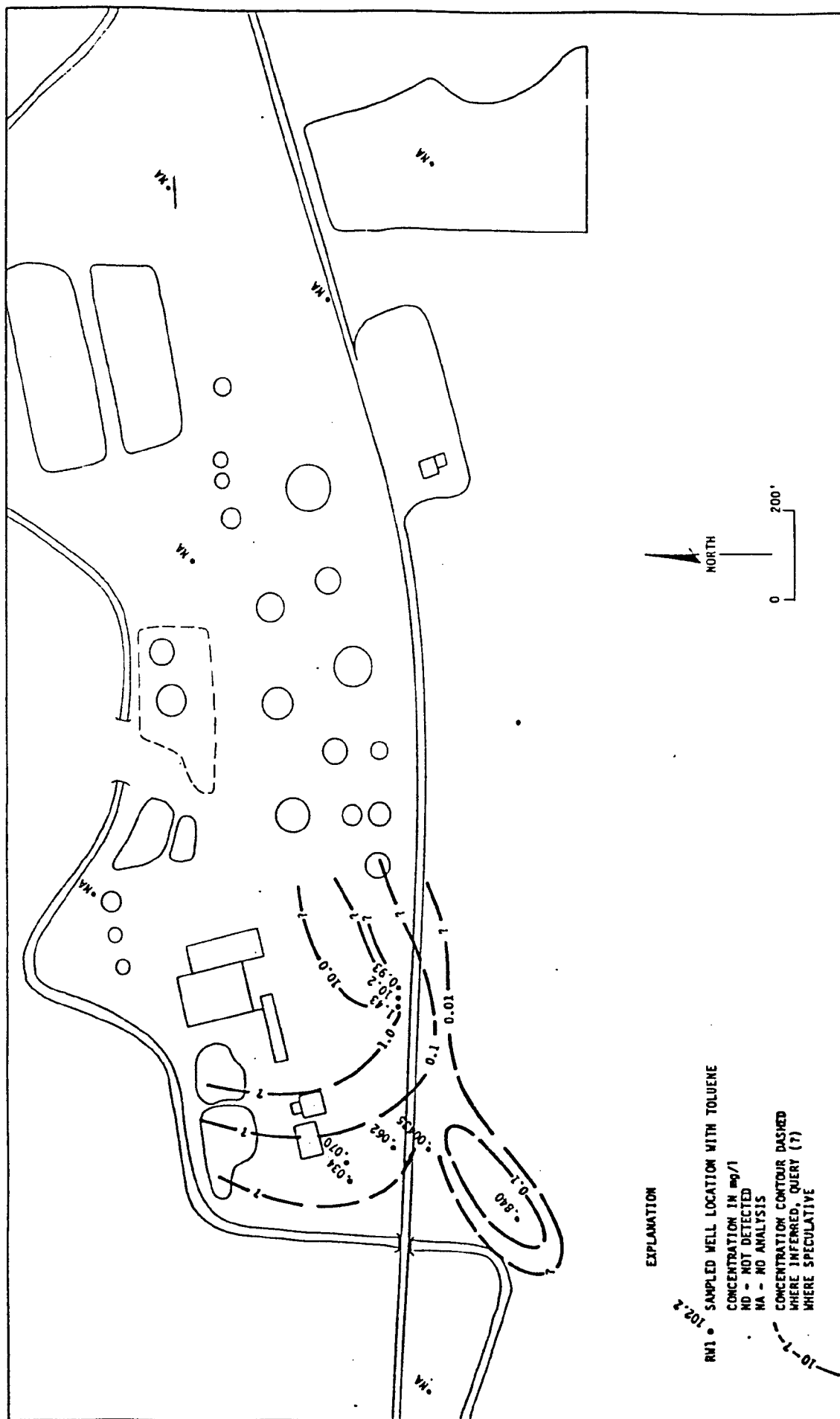


FIGURE 3-3  
TOLUENE CONCENTRATION IN GROUND WATER SEPTEMBER 1988 BLOOMFIELD REFINING COMPANY

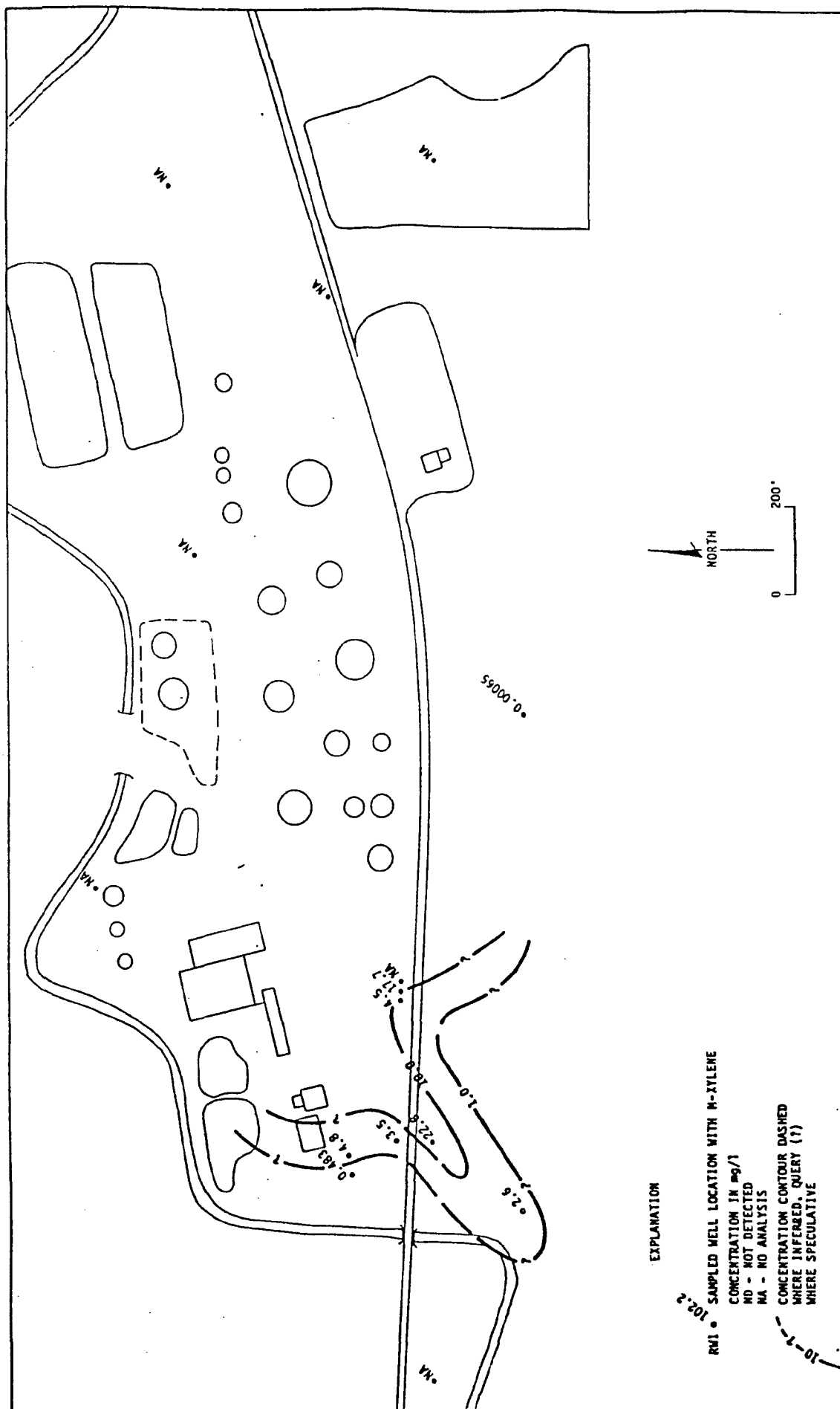


FIGURE 3-4  
M-XYLENE CONCENTRATION IN GROUND WATER SEPTEMBER 1988 BLOOMFIELD REFINING COMPANY

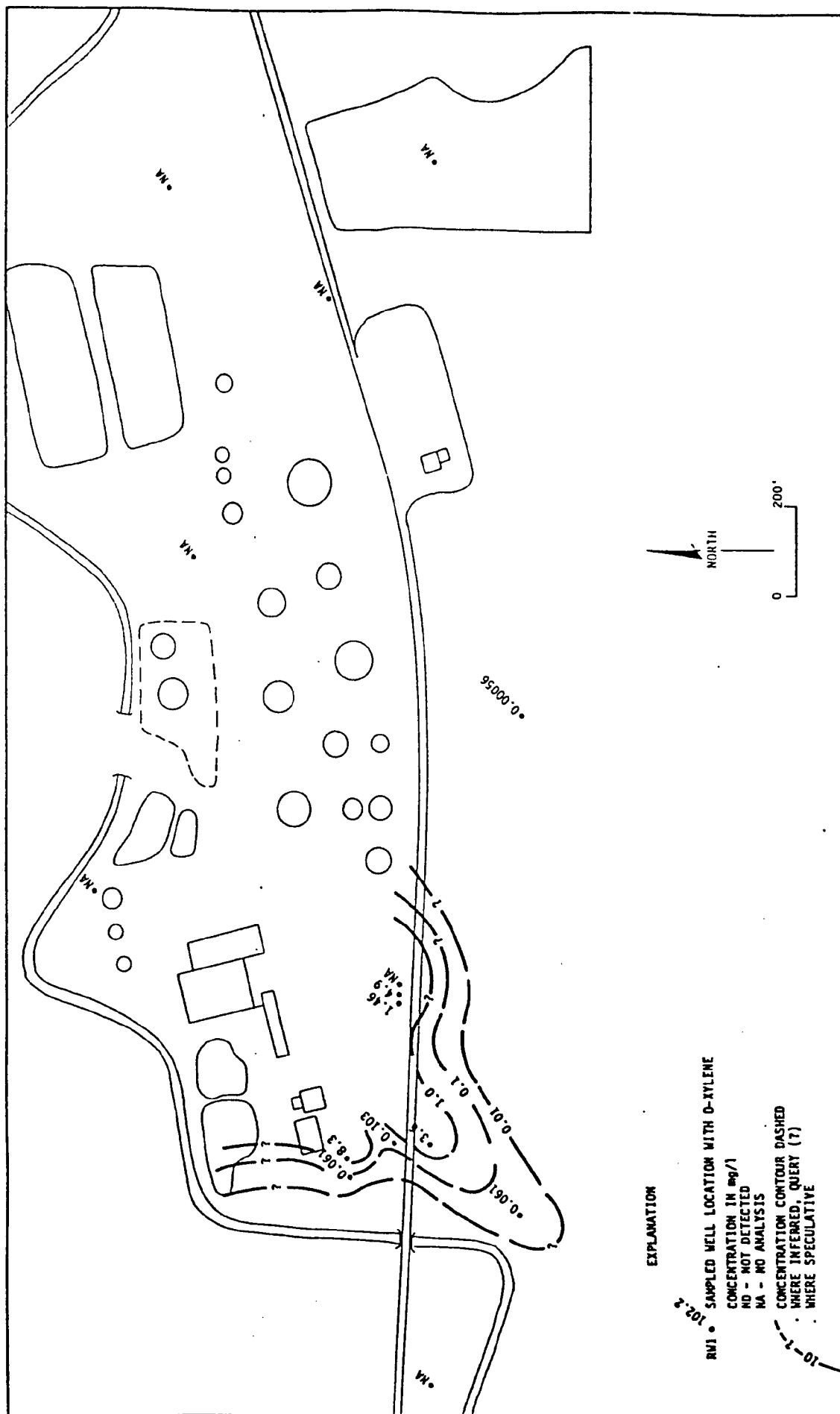


FIGURE 3-5  
O-XYLENE CONCENTRATION IN GROUND WATER SEPTEMBER 1988 BLOOMFIELD REFINING COMPANY

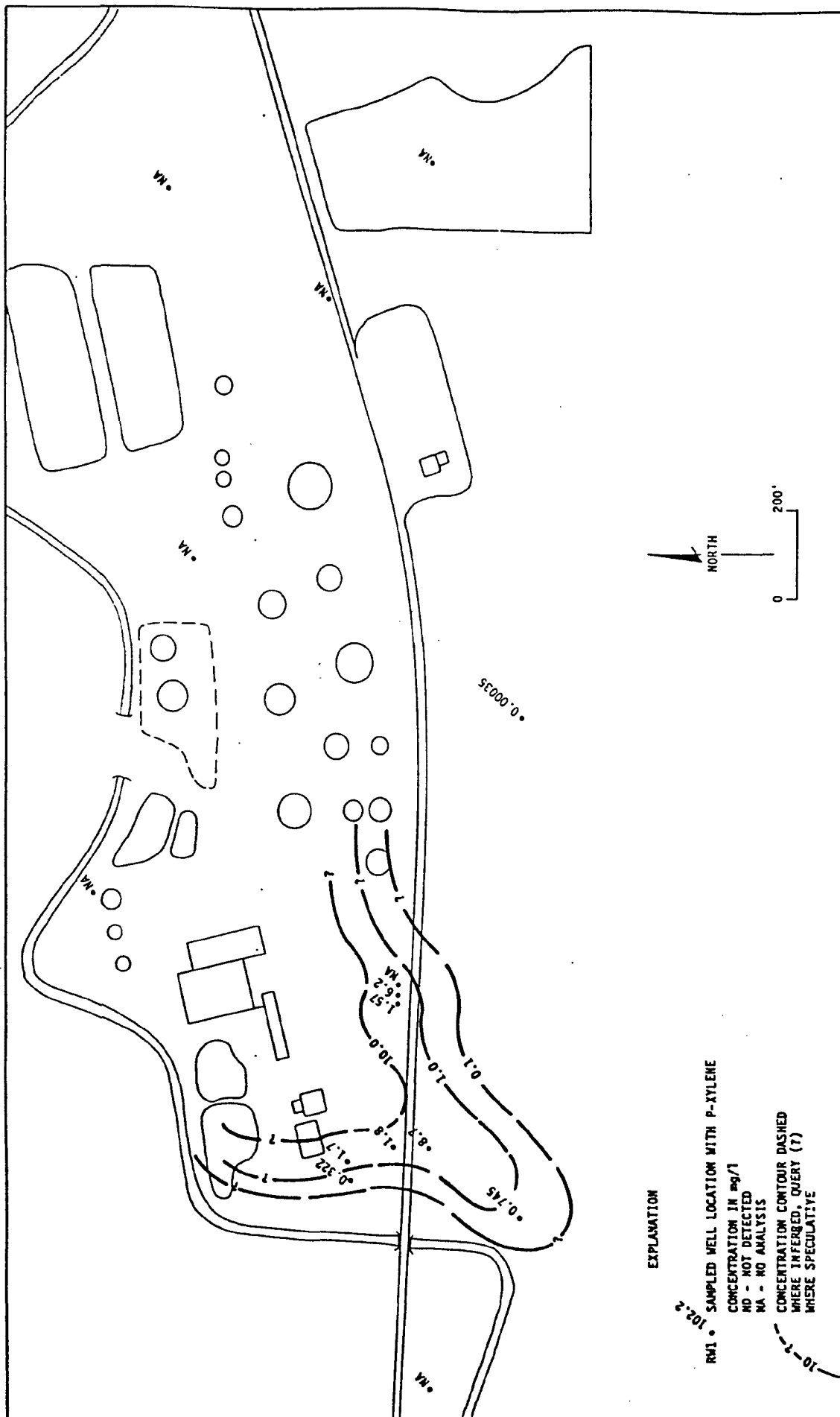
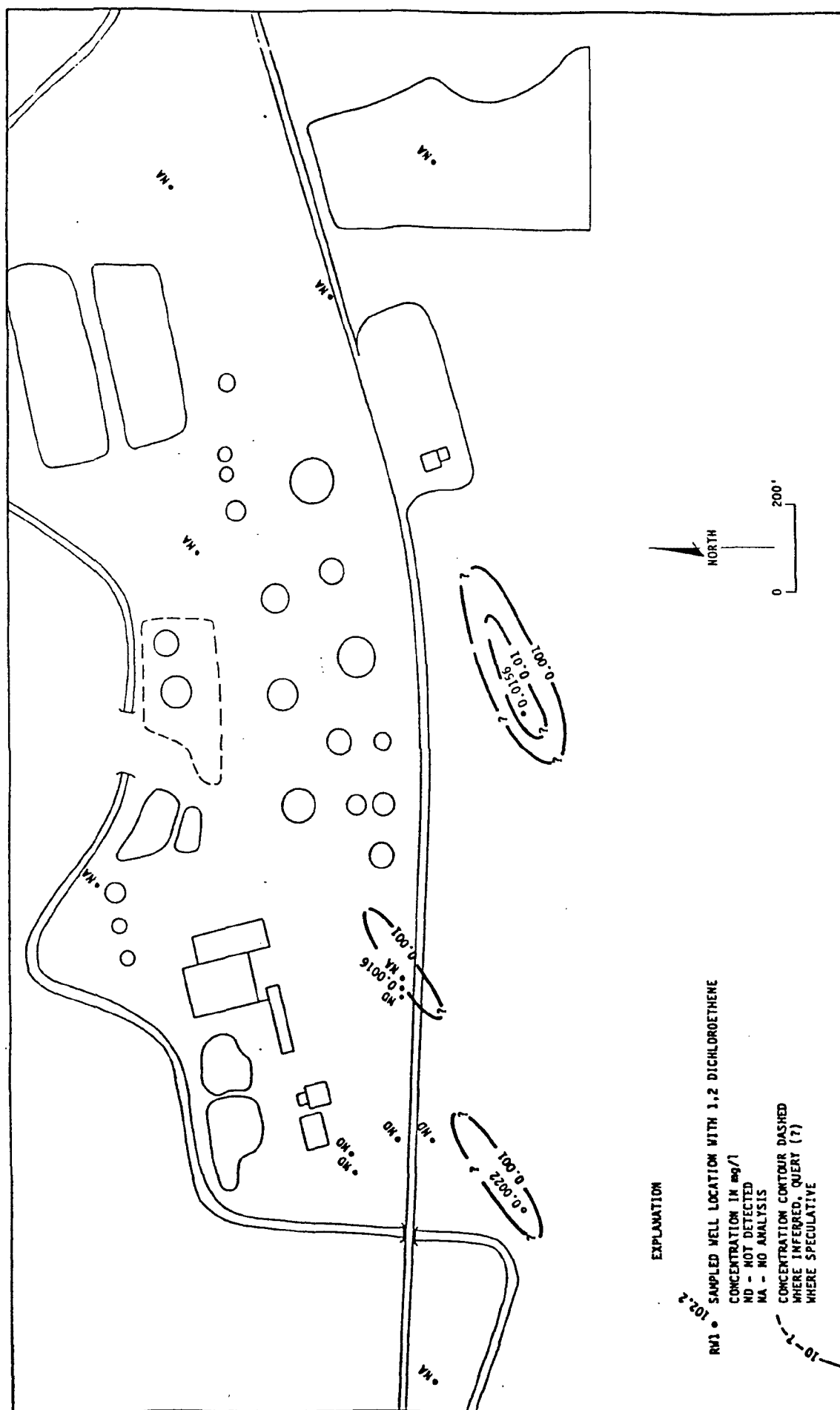


FIGURE 3-6  
P-XYLENE CONCENTRATION IN GROUND WATER SEPTEMBER 1988 BLOOMFIELD REFINING COMPANY



**FIGURE 3-7**

1,2 DICHLOROETHENE CONCENTRATION IN GROUND WATER SEPTEMBER 1988 BLOOMFIELD REFINING CO.

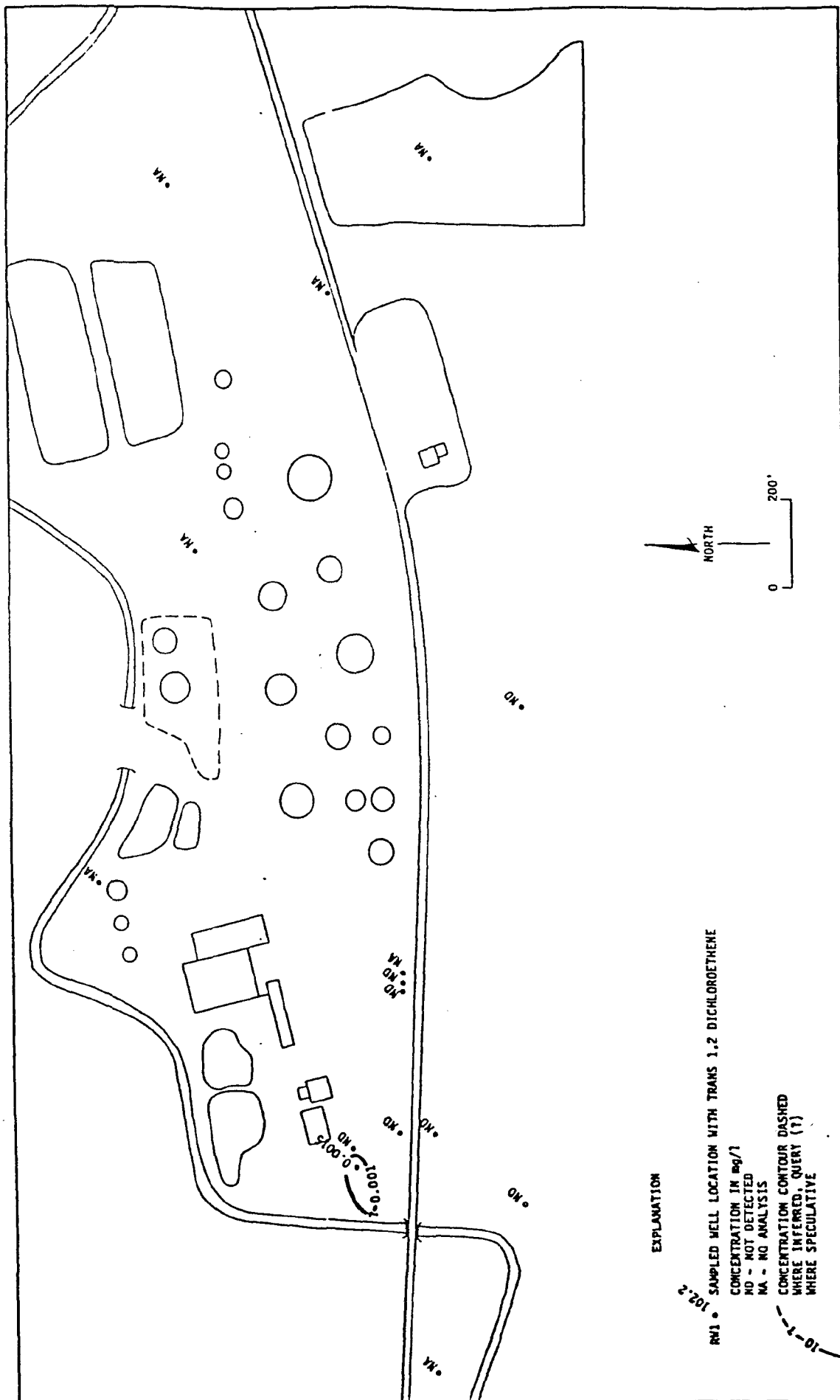


FIGURE 3-8

TRANS 1,2 DICHLOROETHENE CONCENTRATION IN GROUND WATER SEPT. 1988 BLOOMFIELD REFINING CO.

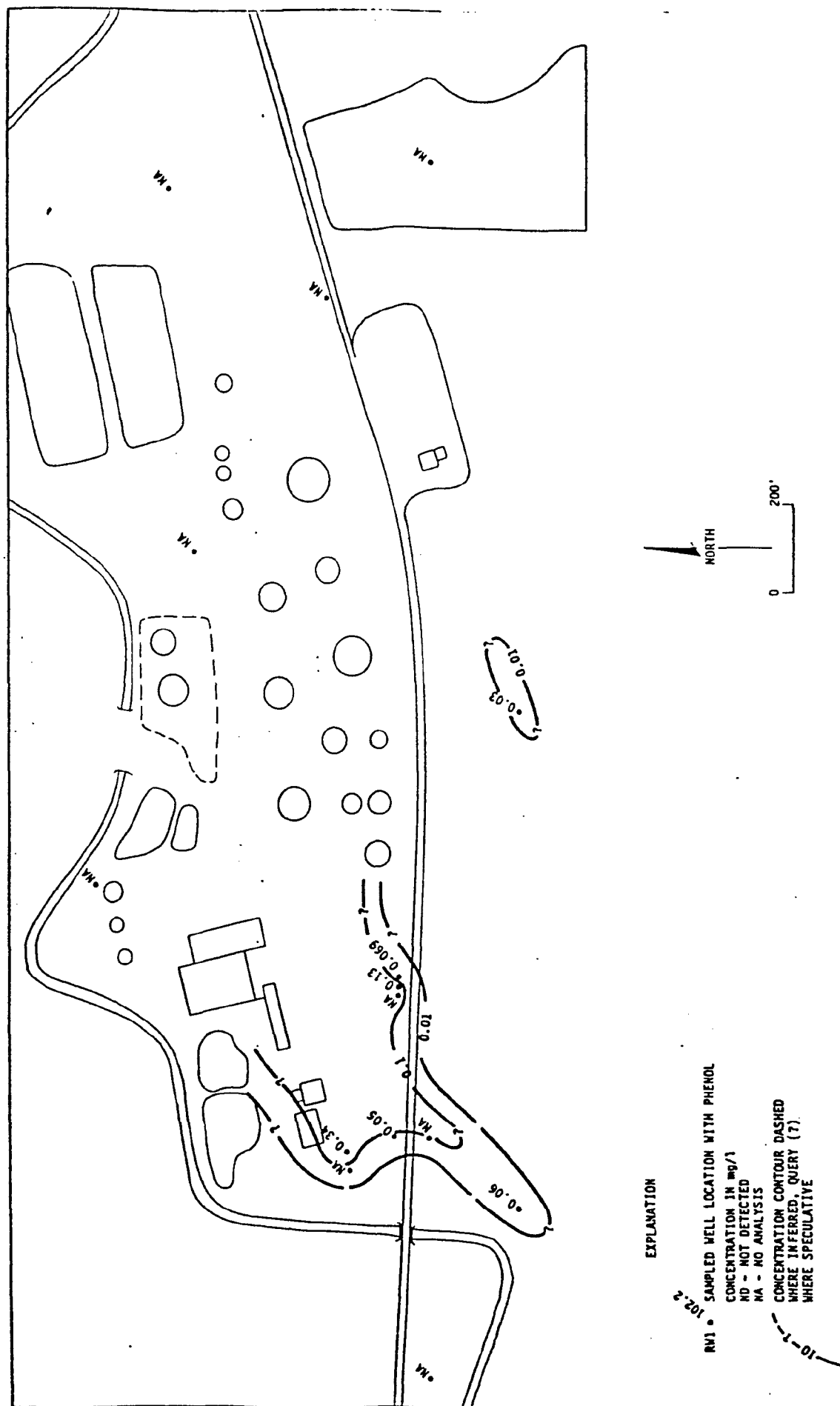


FIGURE 3-9  
PHENOL CONCENTRATION IN GROUND WATER 1988 BLOOMFIELD REFINING COMPANY



in Plate 4. In most cases, maximum VOC concentrations occur along the southern boundary of the facility in piezometer P-3, suggesting either that hydrocarbon release from the unsaturated zone is ongoing or that previous releases from the tank storage area or process units have yet to migrate completely off the site. A few peak VOC concentrations occur at monitor well MW-11. These results tend to be supported by the soil vapor survey data, which indicate that hydrocarbons are generally confined to beneath the refinery site, with some hydrocarbons evident south of Sullivan Road on BLM property. The occurrence of VOCs in ground water beneath BLM property may be controlled by a buried stream channel located south of Sullivan Road. Structural contours of the Nacimiento Formation presented in Plate 3 substantiate the existence of a local bedrock depression in this area.

Considering the small amount of precipitation that occurs in the area, it is likely that a portion of the hydrocarbons which were released several years ago have been retained in the unsaturated zone above the water table and act as an intermittent source of dissolved or immiscible hydrocarbons to the ground water during the late summer and early fall when rainfall is at a maximum. Regardless of whether the hydrocarbons have been entirely released to the saturated zone, the three-well recovery system is expected to intercept hydrocarbons that would otherwise migrate beneath off-site property.

#### 4.0 INSTALLATION AND OPERATION OF HYDROCARBON RECOVERY SYSTEM

##### 4.1 GOALS AND OBJECTIVES

The overall goal associated with operation of the hydrocarbon recovery system is capture and remediation of ground water in the perched alluvial system underlying the refinery. Remediation of ground-water quality is being implemented through operation of three hydrocarbon recovery wells and treatment of recovered water in the refinery wastewater treatment system. Wastewater treatment involves separation of immiscible petroleum product from ground water in API separator tanks, volatilization of remaining VOCs in evaporation ponds, and spray irrigation of the treated water to the land surface. This type of treatment was considered the most efficient and cost-effective method of removing dissolved and immiscible hydrocarbons from ground water. If concentrations of VOCs in treated wastewater exceed discharge plan requirements, an air-stripper may be used to further reduce levels of these volatile organic constituents.

##### 4.2 TECHNICAL APPROACH

###### 4.2.1 Installation of Hydrocarbon-Recovery Pumps

The pumps installed at the Bloomfield Refinery are air-operated skimmer pumps designed to remove floating product and ground water from the upper portion of the aquifer. Each pump is made primarily of stainless steel and is 3 feet long, with an outside diameter of 2-3/8 inches. It fills from the top by gravity in order to provide the skimming action. When a pump becomes full of liquid, a float switch inside the pump activates the pumping cycle and compressed air is applied to the pump, forcing the liquid to the surface. The pump then rests until it becomes full again and the pumping cycle repeated. In this manner, the pump can be set near the water surface to skim off hydrocarbons while withdrawing a relatively small amount of clean water.

The pump intakes were set several feet below the water table. Control boxes were installed on supports close to each well head. An air-supply hose of 1/4 inch inside diameter and a product return hose of 3/8 inch inside diameter were used to connect each pump to its control box and to

the main discharge line. Both of these hoses are made of oil-resistant rubber. A check valve was included in the product line to prevent liquid from flowing back into the well and a flow indicator was provided for visual inspection of the operation.

Air is supplied to the recovery system from the refinery's central compressed-air system. An air filter was installed at each control box, which maintains air pressure at approximately 50 psi. Pumped liquids are discharged into a 10,000-gallon above-ground intermediate storage tank which can discharge to the refinery's wastewater treatment system at appropriate times. Air lines, product lines and electrical cable serving each control box are buried in a single trench approximately 2 feet deep. Both air lines and product lines were wrapped with electrical heat tape and insulated wherever they are exposed in order to protect the lines from freezing.

A cycle counter was installed inside each control box for the purpose of determining the quantity of liquid pumped at each location. Each cycle produces approximately 1/2 gpm. Therefore, the number of gallons pumped equals 1/2 the number of cycles indicated on the counter. Operation of recovery pumps began on January 4, 1989.

#### 4.2.2 Operation and Maintenance of Hydrocarbon-Recovery Pumps

The output per cycle from each pump should be measured periodically to verify the cycle capacity. The pump cycle is determined by the timer module located in the control box. The cycle is initiated by the float switch inside the pump and its duration is determined by the setting of the timer dial. The optimal setting is determined by gradually increasing the time until all liquid is ejected from the pump followed by a burst of air. It is recommended that air be allowed to follow the water in order to completely flush particulates through the discharge line. This prevents plugging of the lines with sediment and also reduces the potential for freezing of the lines.

The pumps should be inspected weekly and a log should be kept of weekly counter readings and other observations. The flow indicator should be inspected to make sure that liquid is flowing in only one direction. If liquid appears to flow back toward the well, the check valve at the well head must be cleaned or replaced.

#### 4.3 RESULTS

Table 3-1 lists water levels observed at the recovery wells and piezometers prior to the onset of recovery and following 12 and 42 days of recovery-well operation. Although no floating petroleum product was encountered in any of the wells or piezometers prior to recovery, operation of the recovery pumps caused development of depressions in the water table that tended to accumulate low-density product over time. In cases where a layer of floating petroleum product was encountered, water levels were corrected for confining pressures caused by the hydrocarbon layer by subtracting product thickness times the relative density of diesel fuel, assumed to be equal to 0.8, from measured depth to water. Only well RW-2 contained floating product after the first 12 days of recovery. The hydrocarbon recovery pump in well RW-1, which froze several days after the onset of pumping, was not operative until January 16, 1989. After 30 days of recovery at well RW-1, both well RW-1 and piezometer P-1 began to show evidence of floating product. Product thickness at well RW-2 decreased dramatically between the 12th and 42nd day of recovery, presumably due to flushing of product from the aquifer. Up to 2.6 feet of water-level decline was recorded at the recovery wells during the 42-day period ending on February 15, 1989.

Plate 5 shows the hydraulic impacts associated with operation of the hydrocarbon recovery system for 12 days. Recovery pumps in wells RW-2 and RW-3 were operating at average rates of 0.94 and 0.73 gpm, respectively, throughout this 12-day period. These rates were estimated on the basis of 32713 and 25367 recovery cycles at wells RW-2 and RW-3, with a recovery volume of 0.5 gal/cycle and a total elapsed recovery time of 17352 minutes. Comparison of the pre-recovery water table presented in Plate 4 with the 12-day recovery water table presented in Plate 5 shows

clear evidence that intermittent pumping of recovery wells RW-2 and RW-3 at average rates of 0.94 and 0.73 gpm during the first 12 days of recovery resulted in capture of some of the ground water that normally flows off-site to the west and southwest. A map of water-level decline obtained by subtracting water levels observed 12 days following recovery from water levels observed prior to recovery and shown in Plate 6 depicts the extent of hydraulic stress caused by operation of wells RW-2 and RW-3 for the 12-day period following onset of recovery.

The distribution of hydraulic head following 42 days of recovery at all three recovery wells is shown in Plate 7. Average pumping rates of 1.2, 0.50, and 0.42 gpm were estimated from a cumulative total of 103991, 60917, and 50251 cycles recorded at wells RW-1, RW-2, and RW-3 during the 60550 minutes comprising the 42-day period. Average rates of withdrawal at wells RW-2 and RW-3 during the entire 42-day recovery operation decreased relative to rates calculated for the first 12 days of recovery because residual hydraulic stresses from prior pumping help to maintain water levels at the pump intakes at lower discharge rates. Intermittent pumping of ground water at these average pumping rates throughout this period resulted in the development of an extensive capture zone around well RW-3 that obscured the localized depression near well RW-2 previously evident in Plate 5. The relatively large, deep cone of depression surrounding well RW-3 may be attributed to a small saturated thickness or hydraulic conductivity near this well. Recovery test data observed at this well suggest that hydraulic conductivity at RW-3 may be almost an order of magnitude smaller than conductivity estimated from slug tests performed at wells MW-1, MW-2, and MW-4 (GCL Site Investigation and Remedial Action Conceptual Design). The 42-day recovery water table appears to be minimally impacted by discharge at well RW-1 due to the large transmissivity near this well, as demonstrated by its large yield during development. Again, this could be due to the very broad cone of depression induced by operation of well RW-3, which tends to obscure less pronounced depressions in the water table. Plate 8 shows that water-level decline observed following 42 days of recovery is more

areally-extensive and of greater magnitude than drawdown observed after 12 days of recovery.

The drawdown caused by recovery-well pumping was much larger than would be expected on the basis of field-measured values of hydraulic conductivity and saturated thickness. Drawdown observed after 12 and 42 days at well MW-11 and piezometer P-3, which are both located approximately cross-gradient to recovery well RW-3, was analyzed according to the Theis equation using an average conductivity of  $2 \times 10^{-4}$  ft/sec and a transmissivity of  $1.14 \times 10^{-3}$  ft<sup>2</sup>/sec estimated from results of pump testing at well RW-3. The analysis indicates that estimated specific yield is much smaller than could be physically possible for the unconfined, coarse-grained aquifer. The analysis also indicates that calculated specific yield decreases dramatically over time, a highly unlikely situation for the relatively incompressible gravel comprising the aquifer. Alternatively, aquifer response can more realistically be explained by using a constant specific yield of 0.10 typical of the type of alluvial aquifer present beneath BRC property. The calculated transmissivity is smaller than the original estimate and decreases over time, suggesting that dewatering of the aquifer or the interception of lateral barriers caused by local bedrock highs, or some combination of the two conditions, may be responsible for the larger-than-anticipated hydraulic response of the aquifer. These conditions may be of particular importance south of well RW-3, where stresses propagating through the buried stream channel may be encountering adjacent bedrock as the buried channel becomes dewatered.

It appears that recovery well RW-3 will play an important role in capturing hydrocarbons from the alluvial aquifer. The extent and degree of capture at all recovery wells will continue to increase with time until steady-state conditions are attained.

## 5.0 REFERENCES

Engineering-Science, 1986, 'A Final Report on Section 3013 Administrative Order Work Elements'.

Marrin, D.L., 1988, 'Soil-Gas Sampling and Misinterpretation', Groundwater Monitoring Review, Spring, p. 51-57.

Silka, L.R., 1988, 'Simulation of Vapor Transport Through the Unsaturated Zone - Interpretation of Soil-Gas Surveys', Groundwater Monitoring Review, Spring, p. 115-123.

Vogel, T.M., C.S. Criddle and P.L. McCarty, 1987, 'Transformations of Halogenated Aliphatic Compounds', Environmental Science and Technology, v. 2, n. 8, p. 722.

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**APPENDIX A**

**GCL STANDARD OPERATING PROCEDURES FOR SOIL  
VAPOR SAMPLING AND ANALYSIS**



## PROCEDURES FOR SOIL VAPOR SAMPLING AND ANALYSIS

## 1.0 PURPOSE

To describe and illustrate the methods and procedures used in sampling and analyzing shallow subsurface soil vapor for various contamination evaluations.

## 2.0 SCOPE

A shallow soil-vapor survey is commonly a rapid and cost-effective method for roughly delineating the areal extent of a known spill involving hydrocarbons or other volatile constituents. Shallow soil-vapor investigations are also used to determine the presence or absence of specific constituents in the subsurface at sites where spills or leaks are possible but have not been identified.

## 3.0 PROCEDURES

## 3.1 EQUIPMENT AND SUPPLIES

## A. Necessary equipment at all sites will include:

- Probes (3/4" I.D. steel pipe, schedule 20 or similar)
- Drive Points
- Adapters
- Floor jack (2-ton capacity)
- Pipe clamp
- Pipe wrenches
- Pipe cutter
- Pipe reamer
- Portable gas chromatograph (GC) (Photovac), syringes and other necessary GC supplies (kit)
- Calculator
- Internal tank filling adapter
- Vacuum pump (battery operated)
- Slide hammer
- Duct tape
- Teflon tubing
- Black inert rubber hose
- Battery pack for GC
- Zero-grade air cylinders

## B. Optional equipment and supplies needed at some sites:

- Rotary hammer with bit
- Extension cords
- Generator
- Brunton compass and tape measure
- Steam cleaner
- Metal detector
- Sand and asphalt or concrete patching material

## C. Safety Equipment for Persons Driving Probes:

- Hard Hats
- Coveralls
- Gloves
- Safety Glasses
- Steel-toed Boots

- 3.2 Define the area to be surveyed. This may include an entire gas station, a large area of property, or as small as the area around a single tank.
- 3.3 Divide the survey area into a grid or other appropriate pattern, and number each location on the grid. Grid spacing may vary depending on the size of the survey area, site conditions and the level of detail required. 20 to 50 foot grid spacing is generally used for a survey at a service station. Note: One may want to number points as field work progresses, so expansion of the grid will be consistently numbered.
- 3.4 Be sure all sampling equipment, including probes, vacuum adapters, points, and slide hammer (inside and outside) is thoroughly steam cleaned prior to use.
- 3.5 Prior to soil sampling, an "air sample" of the ambient air should be analyzed with the GC. Be sure the air sample is collected a distance away from or upwind from any running vehicle or other source of hydrocarbon emissions (20-30 feet is sufficient).
- 3.6 Next, collect a "system blank" to be analyzed prior to sampling. The vacuum pump should be attached to a clean probe with point attached, via an adapter, and a sample collected. This will provide background data of ambient air passing through a probe.
- 3.7 If it is necessary to drill through concrete or asphalt, start the generator (make sure it is positioned downwind of probes) or plug an extension cord into an available electrical outlet. Locate the rotary hammer over the hole and drill through the concrete or asphalt to underlying soil. Remove drill.
- 3.8 Insert the drive point into base of probe. Tape point loosely with duct tape to probe (so it won't fall out during insertion into hole).
- 3.9 Remove lift plate (white) from floor jack, and place hole in lifting arm of the jack over the drilled hole.
- 3.10 Insert the probe through the hole in the jack's lifting arm, and into the drilled hole or the soil surface.
- 3.11 Place slide hammer over the top of the probe and drive to the target depth. Generally, a target depth of 5 feet is used, except for vertical profiles. Remove the slide hammer.
- 3.12 Promptly after driving the probe, place an adapter over it and connect it to the vacuum pump.
- 3.13 Place pipe clamp around probe at the lifting arm of the jack. Tighten clamp. Turn jack handle clockwise to activate hydraulics. Use jack to retract probe 1-3 inches immediately before sampling.

- 3.14 When the chemist is ready to take the sample, activate the vacuum pump. It is necessary to evacuate approximately 5 probe volumes of soil vapor prior to sampling. This can be approximated by the vacuum reading on the pump.

<u>VACUUM PUMP GAGE READING (Inches Hg)</u>	<u>EVACUATION TIME (Seconds)</u>
2 - 5	30
5 - 10	45
10 - 15	60
15 - 17	90

Note: Vacuum pressures above 17 in. Hg. suggest either a clogged probe, a very tight formation, or water. If there is a possibility of shallow ground water, be sure water is not evacuated and passed into the vacuum pump. Above 17 in. Hg. the pump will not collect a good soil vapor sample and the problem should be investigated.

- 3.15 After the evacuation time is satisfied, insert a clean syringe (equipped with a mini-enert valve) through the flexible latex (self-sealing) tubing at the top of the adapter. Flush the syringe 3 times with the soil vapor while the evacuation pump is running. Turn the evacuation pump off and immediately withdraw a 2cc sample and close the mini-enert valve on the syringe.
- 3.16 Analyze the sample by gas chromatography. This task will be performed by a person experienced in GC operations.
- 3.17 With the pipe clamp still tightened around the probe, extract the probe. The jack can be reset by turning the handle counterclockwise. This will allow the lifting arm to drop, and the pipe clamp can be loosened and lowered.
- 3.18 After extraction, the used probe and adaptor should be set aside in a designated area so as to prevent confusion with clean probes or adapters.
- 3.19 For each soil vapor point, record in log book the following items:

<u>SITE LOCATION WEATHER</u>		<u>JOB #</u>			
<u>TIME</u>	<u>POINT #</u>	<u>DEPTH</u>	<u>VACUUM</u>	<u>EVAC TIME</u>	<u>REMARKS</u>
<u>Example</u> 10:00	# 5	5'	3" Hg	30 Sec.	Probe clogged removed, cleaned redrove to 6'
10:30	# 7	5'	18" Hg	-	

3.20 Steam clean all probes and adapters prior to re-use.

3.21 After QA/QC of field data, results should be submitted to Data Management for processing and mapping.

Prepared By: \_\_\_\_\_

Reviewed By: *[Signature]* \_\_\_\_\_

SOP\SOILGAS.SNS

**APPENDIX B**  
**LITHOLOGIC LOGS AND STRATIGRAPHIC SECTIONS**

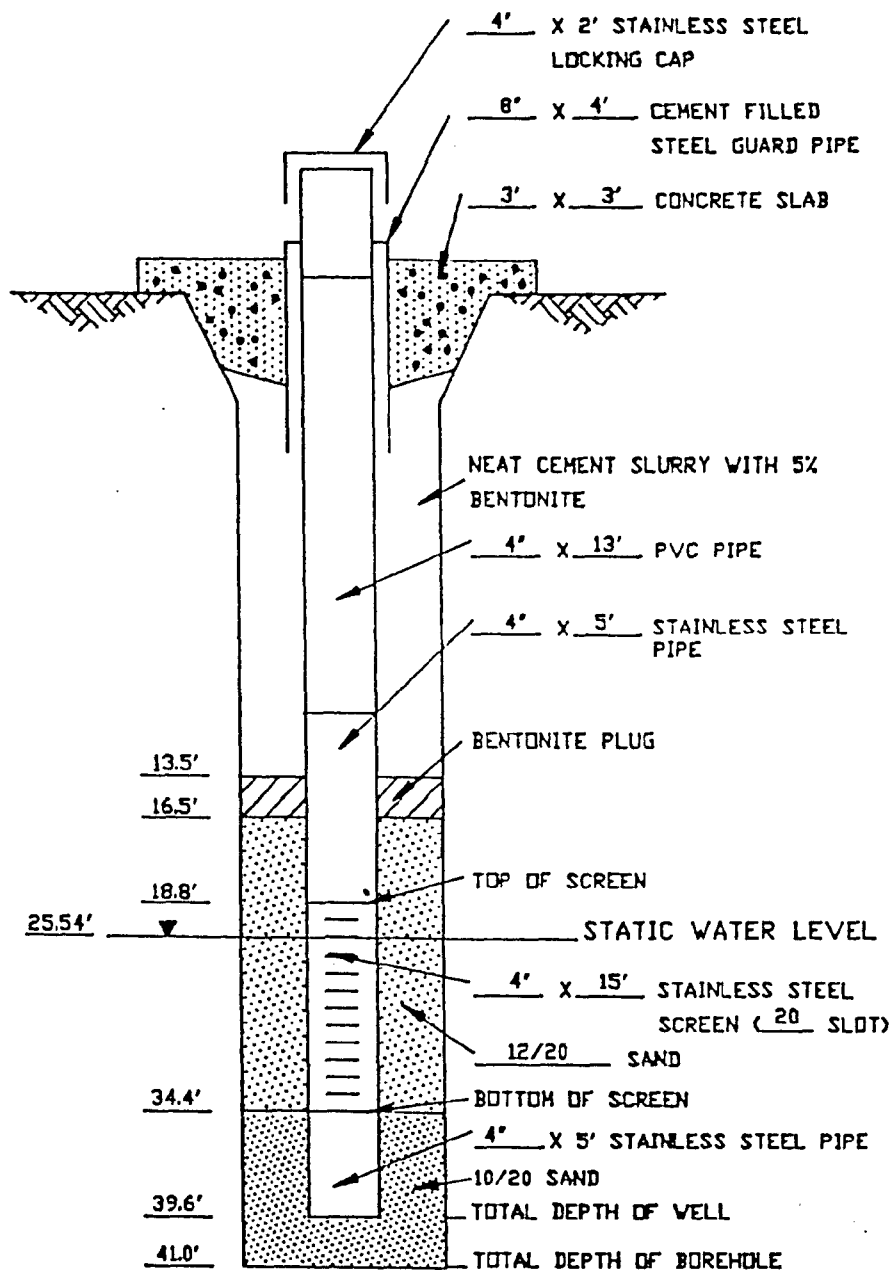


FIGURE B-1  
COMPLETION DIAGRAM  
RECOVERY WELL RV-1

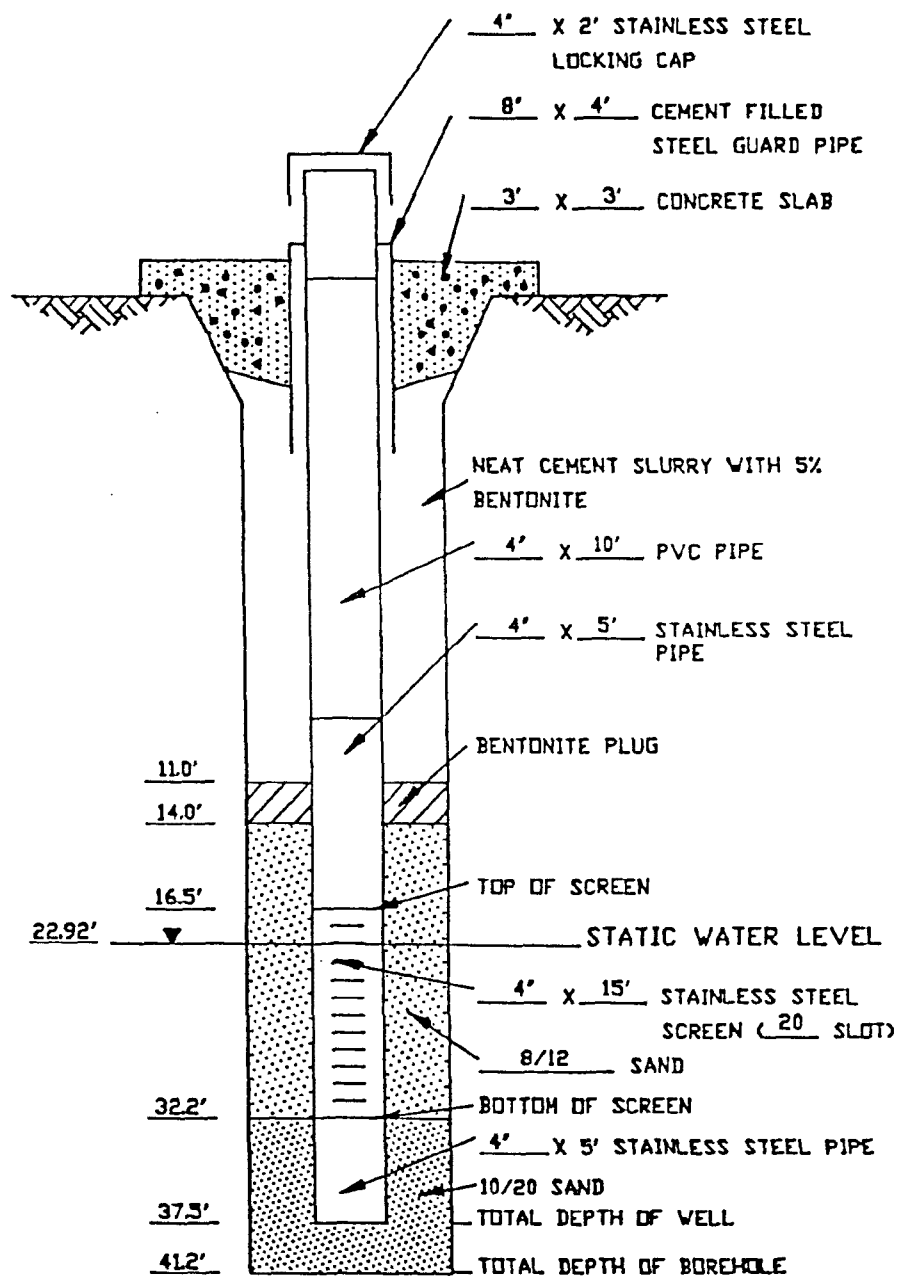


FIGURE B-2  
COMPLETION DIAGRAM  
RECOVERY WELL RV-2

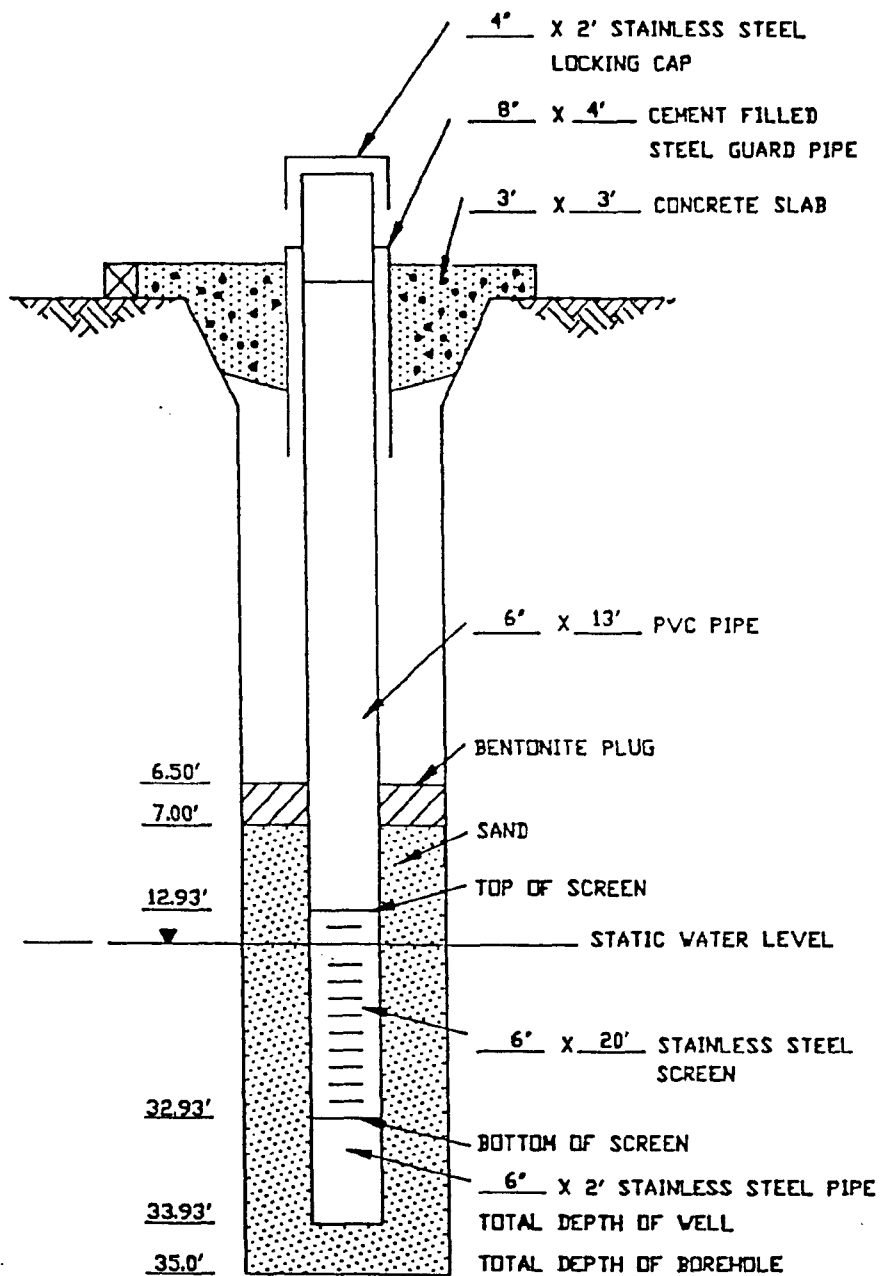


FIGURE B-3

COMPLETION DIAGRAM  
RECOVERY WELL MV-10 (RV-3)  
(RECONSTRUCTED FROM VERBAL DESCRIPTION  
SUPPLIED BY ENGINEERING-SCIENCE, 1987)



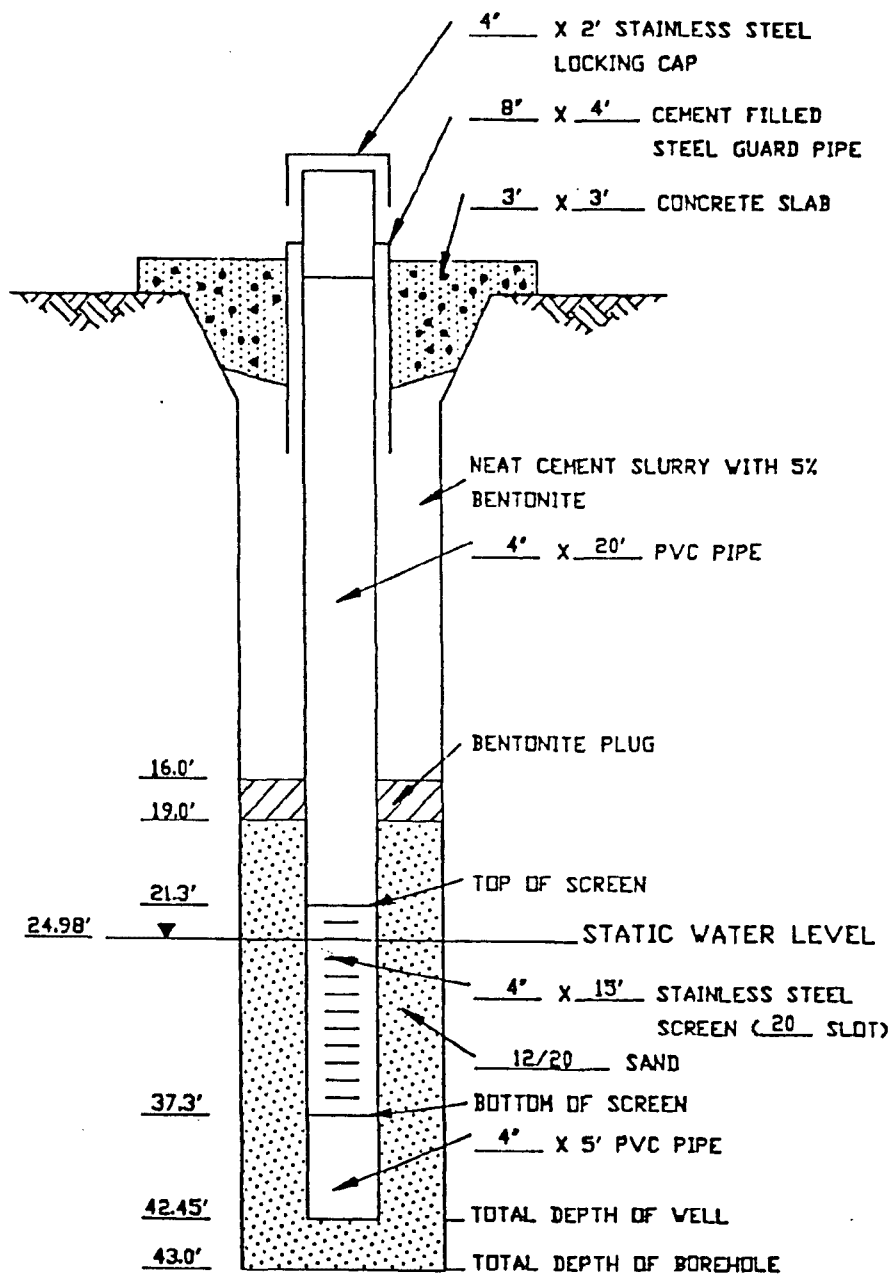


FIGURE B-4  
COMPLETION DIAGRAM  
PIEZOMETER P-1

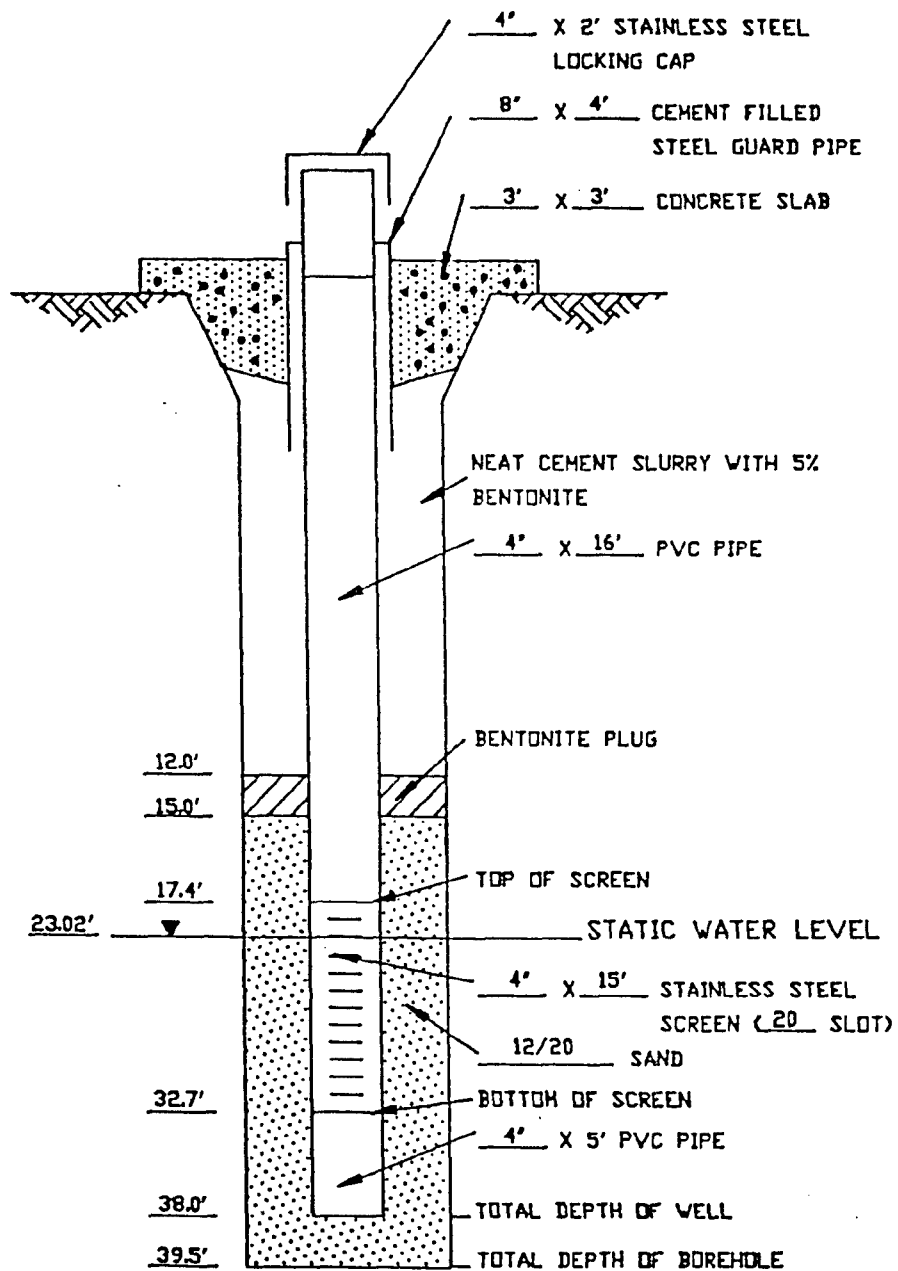


FIGURE B-5  
COMPLETION DIAGRAM  
PIEZOMETER P-2

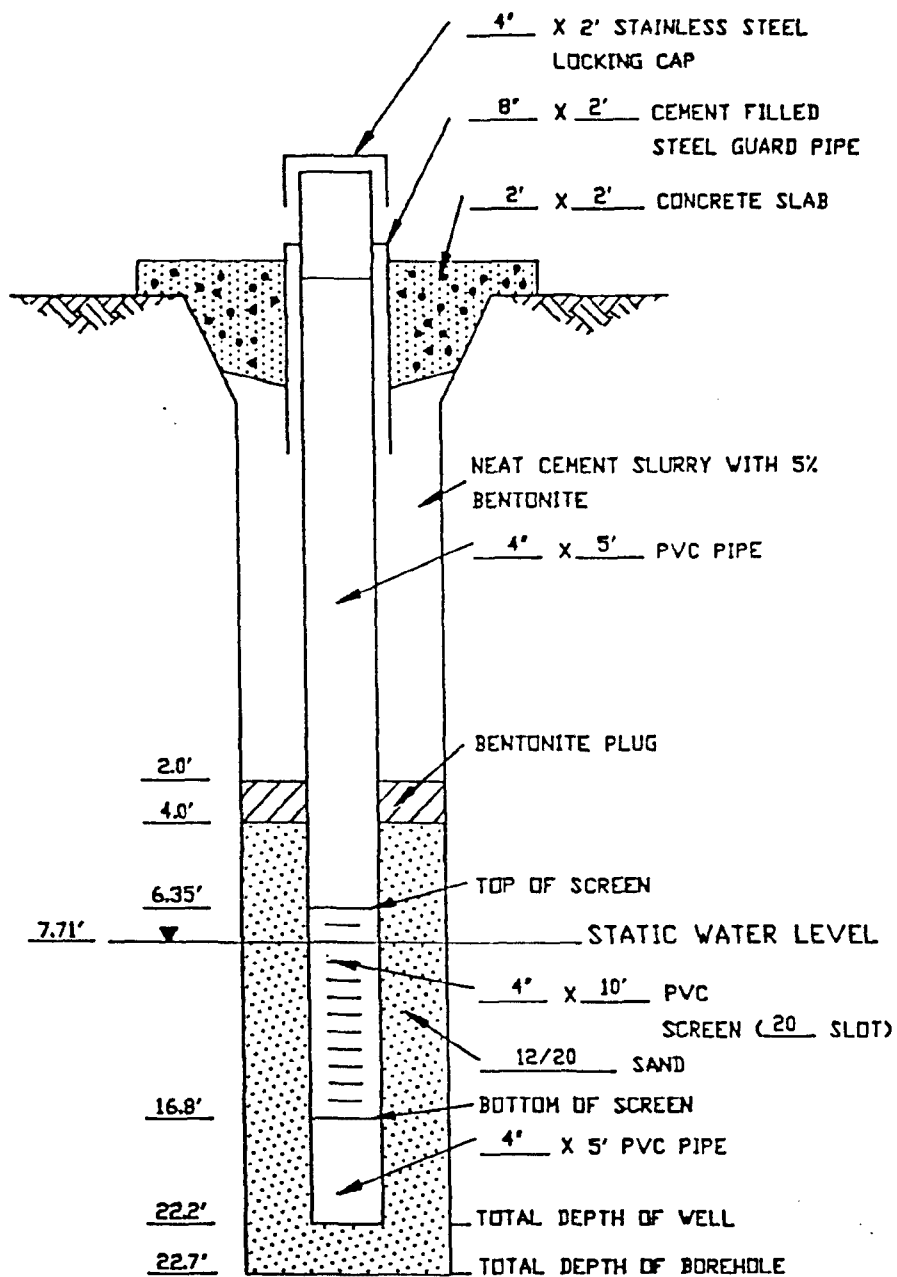


FIGURE B-6  
COMPLETION DIAGRAM  
PIEZOMETER P-3

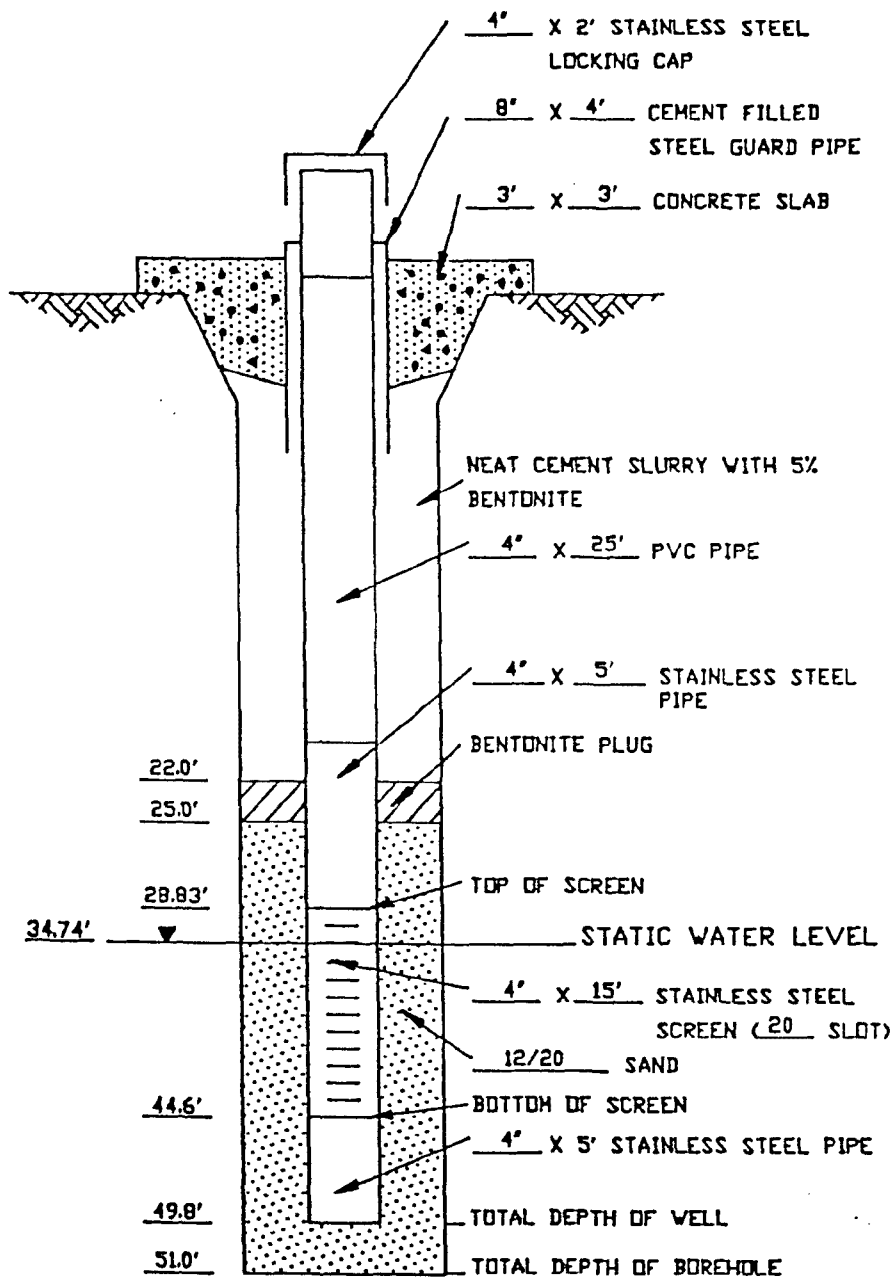


FIGURE B-7  
COMPLETION DIAGRAM  
PIEZOMETER P-4

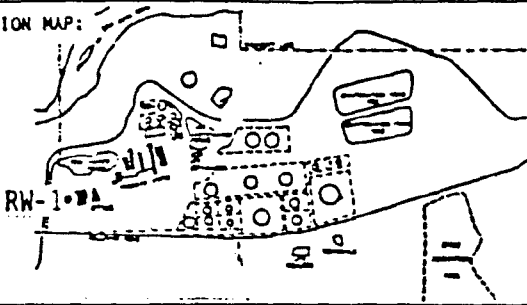
FIGURE B-8

## LITHOLOGIC LOG (SOIL)

RECOVERY WELL RW-1

Page 1 of 1

LOCATION MAP:



SITE ID: BRC LOCATION ID: RW-1  
 SITE COORDINATES (ft.): \_\_\_\_\_  
 N \_\_\_\_\_ E \_\_\_\_\_  
 GROUND ELEVATION (ft. MSL): 5525.92  
 STATE: New Mexico COUNTY: San Juan  
 DRILLING METHOD: Casing Driver  
 DRILLING CONTR.: Beeman Brothers  
 DATE STARTED: 30 August 1988 DATE COMPLETED: 31 August 1988  
 FIELD REP.: W.S. Dobyk  
 COMMENTS: Static on September 2, 1988; 26.65 from TOC.

LOCATION DESCRIPTION:

Depth	Visual X	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5			1642		0'-18' Silt and Sand - Dark yellowish brown (10 YR 4/2) to grayish brown (5 YR 3/2). Minor to strong hydrocarbon odor.
10			1646		
15			1710		
20			1720		18'-34' Sand and Gravel - Medium dark gray (N4). Sand is medium to very coarse grained, subangular to subrounded. Gravel is subrounded to well rounded, to 2" diameter. Strong hydrocarbon odor.
25			1725		
30			1730		
35			1738		34'-41' Shale - Macimiento Formation - Dusky yellow (5 YR 6/4) to light olive gray (5 Y 6/1) shale.
40			1758		
45		T.D. 41'			
50					

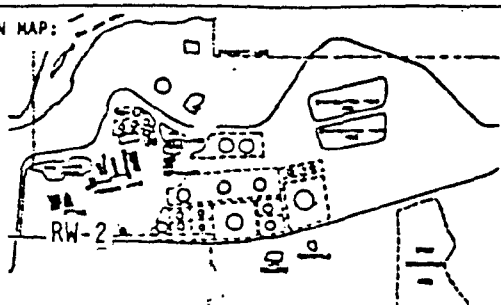
FIGURE B-9

## LITHOLOGIC LOG (SOIL)

RECOVERY WELL RW-2

Page 1 of 1

LOCATION MAP:



SITE ID: BRC LOCATION ID: RW-2  
 SITE COORDINATES (ft.): \_\_\_\_\_  
 N E  
 GROUND ELEVATION (ft. MSL): 5523.48  
 STATE: New Mexico COUNTY: San Juan  
 DRILLING METHOD: Casing Driver  
 DRILLING CONTR.: Beeman Brothers  
 DATE STARTED: 29 August 1988 DATE COMPLETED: 29 August 1988  
 FIELD REP.: W.S. Dubyk  
 COMMENTS: Static on September 2, 1988: 23.42 from TOC.

1/4 1/4 1/4 1/4 S T R

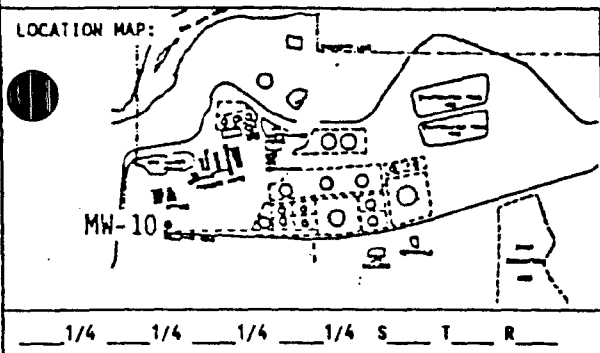
LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5			0948		0'-10' <u>Silt and Clay</u> - Medium dark gray (N4) to brownish gray (5 YR 4/1). Slightly effervescent in HCl. Faint hydrocarbon odor.
10			0953		10'-15' <u>Sand and Silt</u> - Moderate brown (5 YR 4/4), very fine grained and well sorted.
15			0958		15'-32' <u>Sand and Gravel</u> - Olive gray (5 Y 4/1) to brownish gray (5 YR 4/1). Sand is medium to very coarse grained, subangular to subrounded. Gravel is subangular to well rounded, to 2" diameter. Noticeable hydrocarbon odor below 25'.
20			1024		
25			1029		
30			1033		
35			1050		32'-41.2' <u>Shale - Macimiento Formation</u> - Dusky yellow (5 Y 6/4) to olive gray (5 Y 3/2).
40			1100		
45		T.D. 41.2'			
50					

**FIGURE B-10**  
**LITHOLOGIC LOG (SOIL)**  
**RECOVERY WELL MW-10 (RW-3)**

Page 1 of 1

LOCATION MAP:



SITE ID: BRC LOCATION ID: MW-10 (RW-3)  
 SITE COORDINATES (ft.):  
 N E  
 GROUND ELEVATION (ft. MSL): -5516  
 STATE: New Mexico COUNTY: San Juan  
 DRILLING METHOD: Auger  
 DRILLING CONTR.: Earl & Sons, Inc.  
 DATE STARTED: 4 March 1986 DATE COMPLETED: 4 March 1986  
 FIELD REP.: Engineering Science, Inc.  
 COMMENTS: \_\_\_\_\_

LOCATION DESCRIPTION: \_\_\_\_\_

Depth	Visual X	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
					0'-5' <u>Topsoil, Roadbase, Sandy Clay</u>
5					5'-10' <u>Silty, Sandy Clay</u>
10					10'-15' <u>Cobbles and Pebbles</u>
15					15'-20' <u>Gravel, Cobbles, and Pebbles</u>
20					20'-30' <u>Green Clay: Macimiento Formation</u>
25					30'-35' <u>Macimiento Formation - Yellow-green to blue-gray.</u>
30					
35					
40					
45					
50					

T.D. 35'

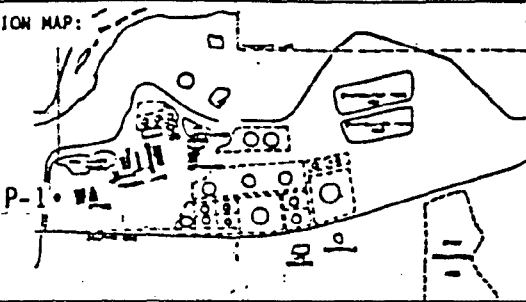
FIGURE B-11

## LITHOLOGIC LOG (SOIL)

PIEZOMETER P-1

Page 1 of 1

LOCATION MAP:



SITE ID: BRC LOCATION ID: P-1  
 SITE COORDINATES (ft.): \_\_\_\_\_  
 N \_\_\_\_\_ E \_\_\_\_\_  
 GROUND ELEVATION (ft. MSL): 5524.62  
 STATE: New Mexico COUNTY: San Juan  
 DRILLING METHOD: Casing Driver  
 DRILLING CONTR.: Beeman Brothers  
 DATE STARTED: 30 August 1988 DATE COMPLETED: 30 August 1988  
 FIELD REP.: W.S. Dobyk  
 COMMENTS: This well replaced by P-1a on August 31, 1988.

1/4 1/4 1/4 1/4 S T R

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5			1135		0'-20' Silt and Clay - Dark yellowish brown (10 YR 4/2) to grayish brown (5 YR 3/2). Weak hydrocarbon odor.
10			1140		
15			1145		
20			1200		20'-36.5' Sand and Gravel - Dark gray (N3) to grayish black (N2). Sand is fine to very coarse grained, subangular to rounded. Gravel is subangular to well rounded, to 2" diameter. Very strong to intense hydrocarbon odor.
25			1205		
30			1210		
35			1220		36.5'-42.0' Shale - <u>Nacimiento Formation</u> - Dusky yellow (5 Y 6/4) to olive gray (5 Y 3/2) shale.
40			1225 1240		
45		T.D. 42'			
50					



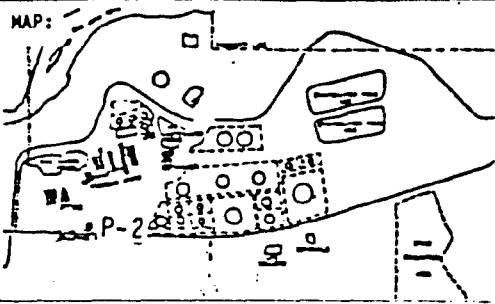
FIGURE B-12

# LITHOLOGIC LOG (SOIL)

## PIEZOMETER P-2

Page 1 of 1

LOCATION MAP:



SITE ID: BRC LOCATION ID: P-2  
 SITE COORDINATES (ft.): \_\_\_\_\_  
 N \_\_\_\_\_ E \_\_\_\_\_  
 GROUND ELEVATION (ft. MSL): 5523.73  
 STATE: New Mexico COUNTY: San Juan  
 DRILLING METHOD: Casing Driver  
 DRILLING CONTR.: Beeman Brothers  
 DATE STARTED: 29 August 1988 DATE COMPLETED: 29 August 1988  
 FIELD REP.: W.S. Dobyk  
 COMMENTS: This well replaced by P-2a. Static on September 2, 1988; 23.75 from TOC.

LOCATION DESCRIPTION: \_\_\_\_\_

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5			1650		0'-13' <u>Silty and Clay</u> - Dark gray (M3) to grayish black (M2) to dark yellowish brown (10 YR 4/2). Intense hydrocarbon odor.
10			1656		
15			1710		13'-31.5' <u>Sand and Gravel</u> - Moderate yellowish brown (10 YR 5/4) to medium gray (M5). Sand is medium to very coarse grained, subangular to subrounded. Gravel is subangular to well rounded, to 2" diameter. Strong hydrocarbon odor below 25'.
20			1720		
25			1730		
30			1734		
35			1752		
40		T.O. 39.5'	1808		31.5'-39.5' <u>Shale - Macinvento Formation</u> - Dusky yellow (5 Y 6/4) to olive gray (5 Y 3/2).
45					
50					

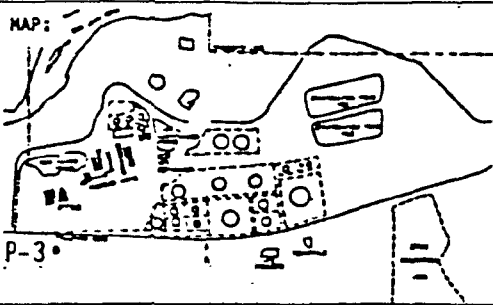
FIGURE B-13

## LITHOLOGIC LOG (SOIL)

PIEZOMETER P-3

Page 1 of 1

LOCATION MAP:



SITE ID: BRC LOCATION ID: P-3  
 SITE COORDINATES (ft.): \_\_\_\_\_  
 N \_\_\_\_\_ E \_\_\_\_\_  
 GROUND ELEVATION (ft. MSL): 5507.20  
 STATE: New Mexico COUNTY: San Juan  
 DRILLING METHOD: Casing Driver  
 DRILLING CONTR.: Beeman Brothers  
 DATE STARTED: 1 September 1988 DATE COMPLETED: 1 September 1988  
 FIELD REP.: W.S. Dubyk  
 COMMENTS: Static on September 2, 1988: 8.30' from TOC.

\_\_\_\_ 1/4 \_\_\_\_ 1/4 \_\_\_\_ 1/4 \_\_\_\_ 1/4 S \_\_\_\_ T \_\_\_\_ R \_\_\_\_

LOCATION DESCRIPTION: \_\_\_\_\_

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5	• • • • •	• • • • •	0902		0'-14' Sand and Gravel - Medium gray (N5) to dark gray (N3). Sand is medium to coarse grained, subangular to subrounded. Gravel is subrounded to rounded, to 2" diameter. Strong hydrocarbon odor.
10	• • • • •	• • • • •	0913		
15	• • • • •	• • • • •	0920		
20	• • • • •	• • • • •	0925		
25	• • • • •	• • • • •	1000		14'-22.7' Shale: <u>Maciniento Formation</u> - Dusky yellow (5 YR 6/4) to light olive gray (5 Y 6/1) shale.
30	• • • • •	• • • • •			
35	• • • • •	• • • • •			
40	• • • • •	• • • • •			
45	• • • • •	• • • • •			
50	• • • • •	• • • • •			

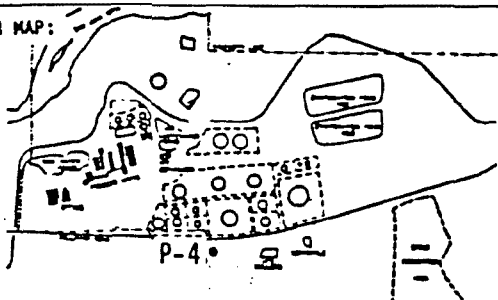
FIGURE B-14

## LITHOLOGIC LOG (SOIL)

PIEZOMETER P-4

Page 1 of 1

LOCATION MAP:



SITE ID: BRC LOCATION ID: P-4 (MW-13)  
 SITE COORDINATES (ft.): \_\_\_\_\_  
 N \_\_\_\_\_ E \_\_\_\_\_  
 GROUND ELEVATION (ft. MSL): 5538.42  
 STATE: New Mexico COUNTY: San Juan  
 DRILLING METHOD: Casing Driver  
 DRILLING CONTR.: Beeman Brothers  
 DATE STARTED: 2 September 1988 DATE COMPLETED: 3 September 1988  
 FIELD REP.: W.S. Dubyk  
 COMMENTS: Static on September 9, 1988: 37.91' from TOC.

1/4 1/4 1/4 1/4 S T R

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5					0'-27' <u>silt and clay</u> - Moderate brown (5 YR 4/4) to light brown (5 YR 5/6).
10					
15					
20					
25			1233		27'-30' <u>Sand</u> - Very pale or (5 YR 8/2) fine to coarse grained, angular to subangular predominantly quartz.
30					30'-40' <u>Gravel and Sand</u> - Light gray (N7). Sand is medium to coarse grained, subrounded to rounded. Gravel is subangular to rounded, up to 3" diameter.
35					
40			1415		41'-43' <u>Clay</u> - Pale olive (10 Y 6/2), plastic.
45			1420		43'-45' <u>Gravel and Sand</u> - As above.
50			1455		45'-51' <u>Sand; Macmillento Formation</u> - light bluish grey (5B7/1) Fine grained, silty.
		T.D. 51'			

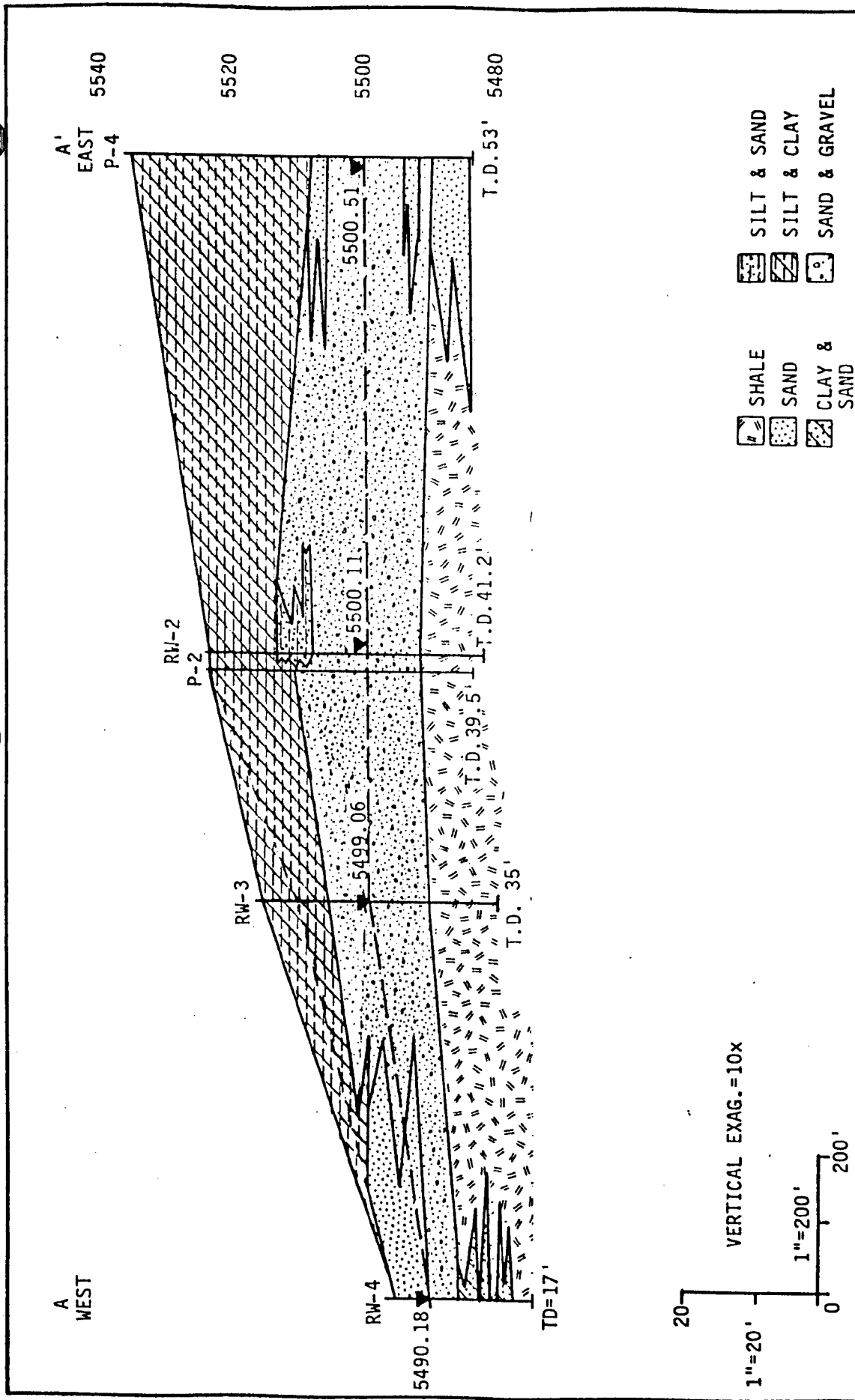


FIGURE B-15  
STRATIGRAPHIC SECTION AT BLOOMFIELD REFINING COMPANY (A-A')

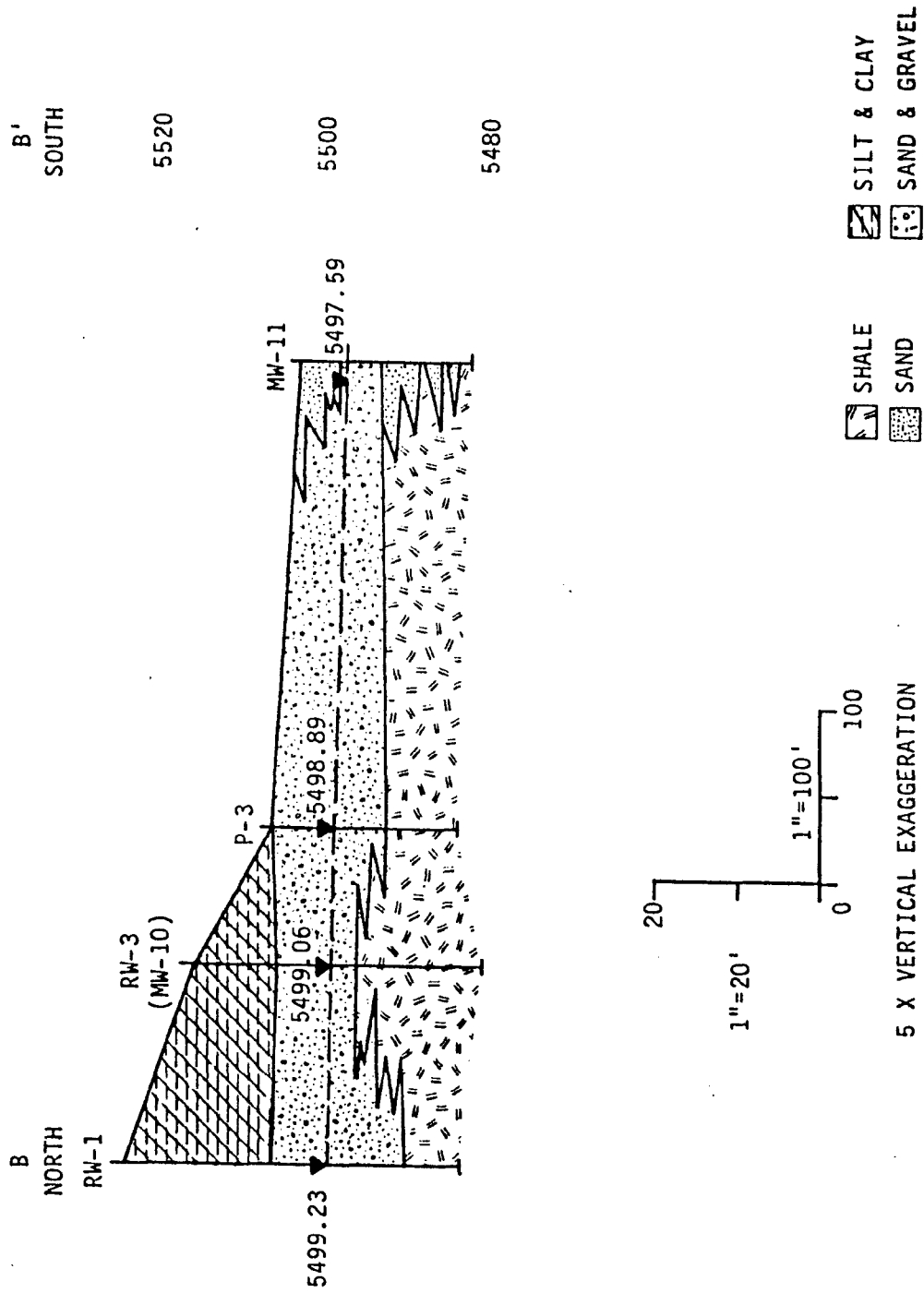
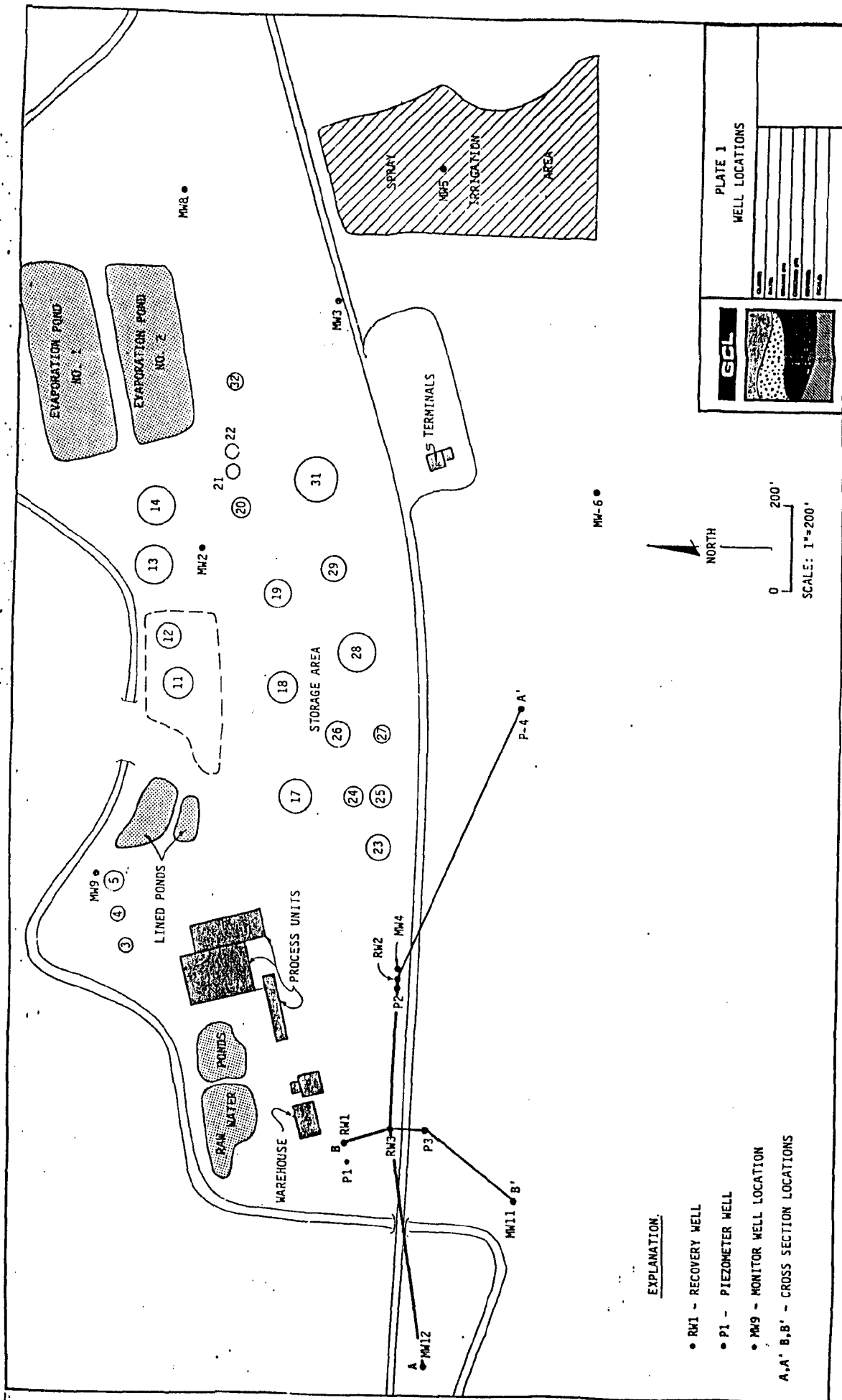
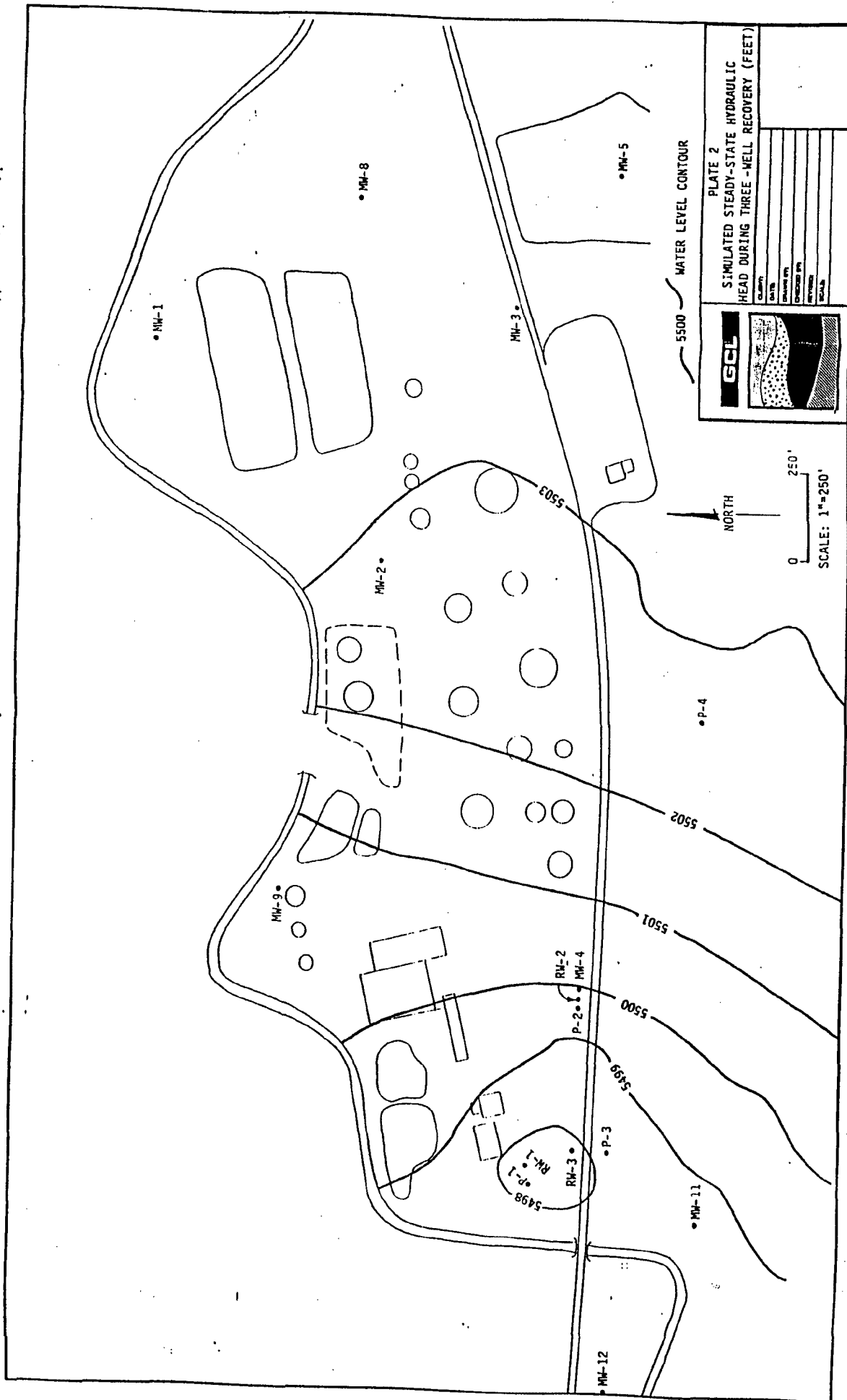
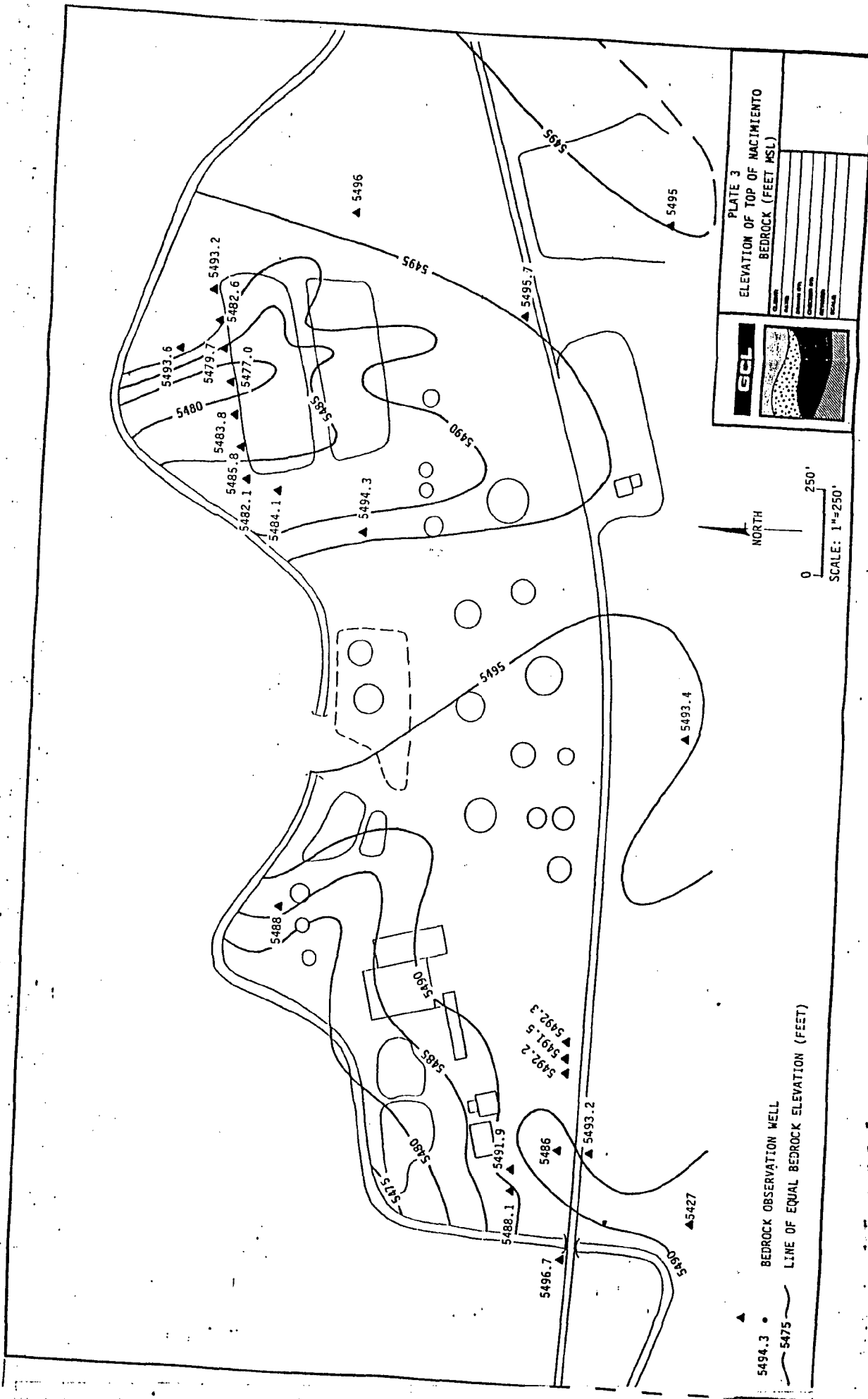


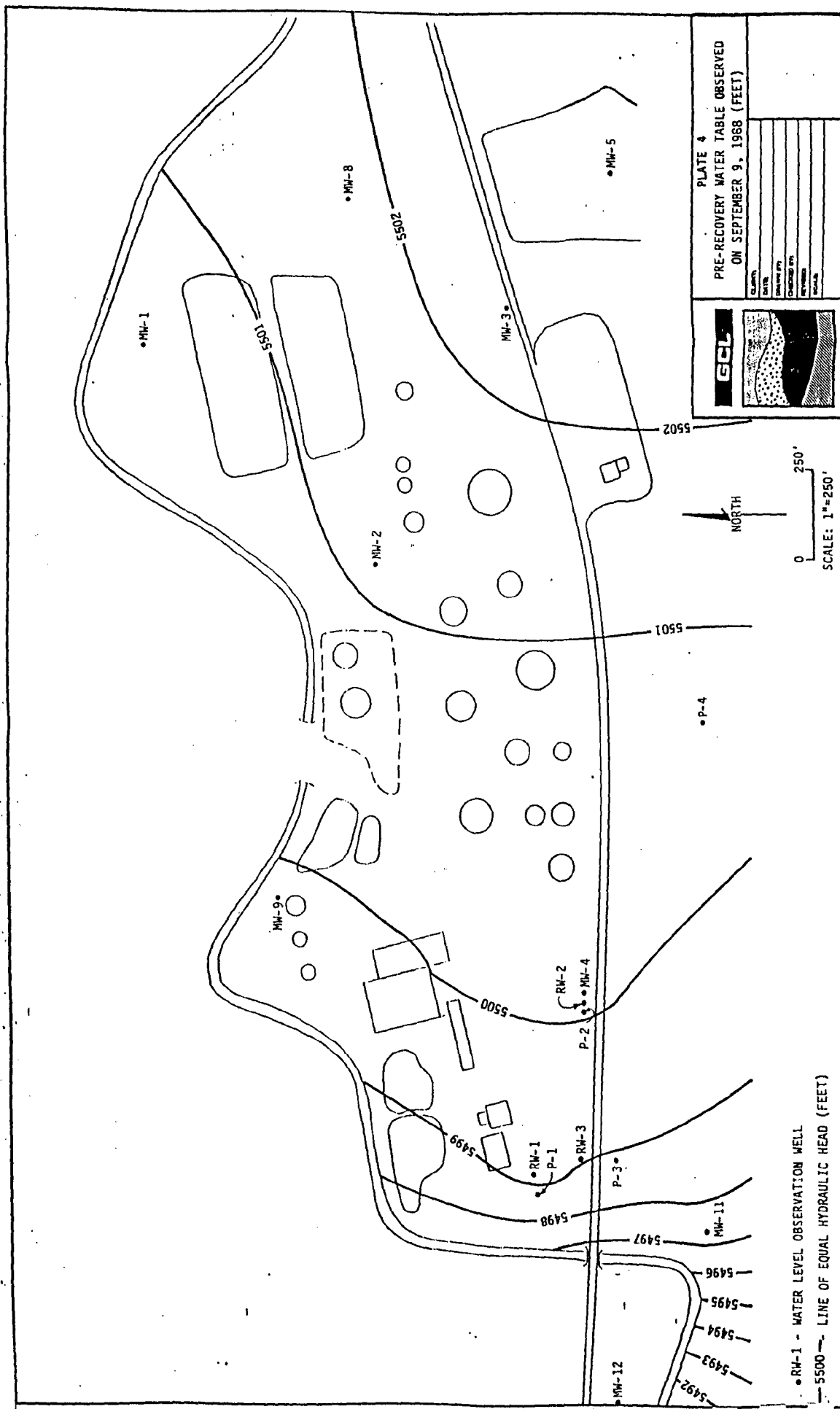
FIGURE B-16  
STRATIGRAPHIC SECTION AT BLOOMFIELD REFINING COMPANY (B-B')

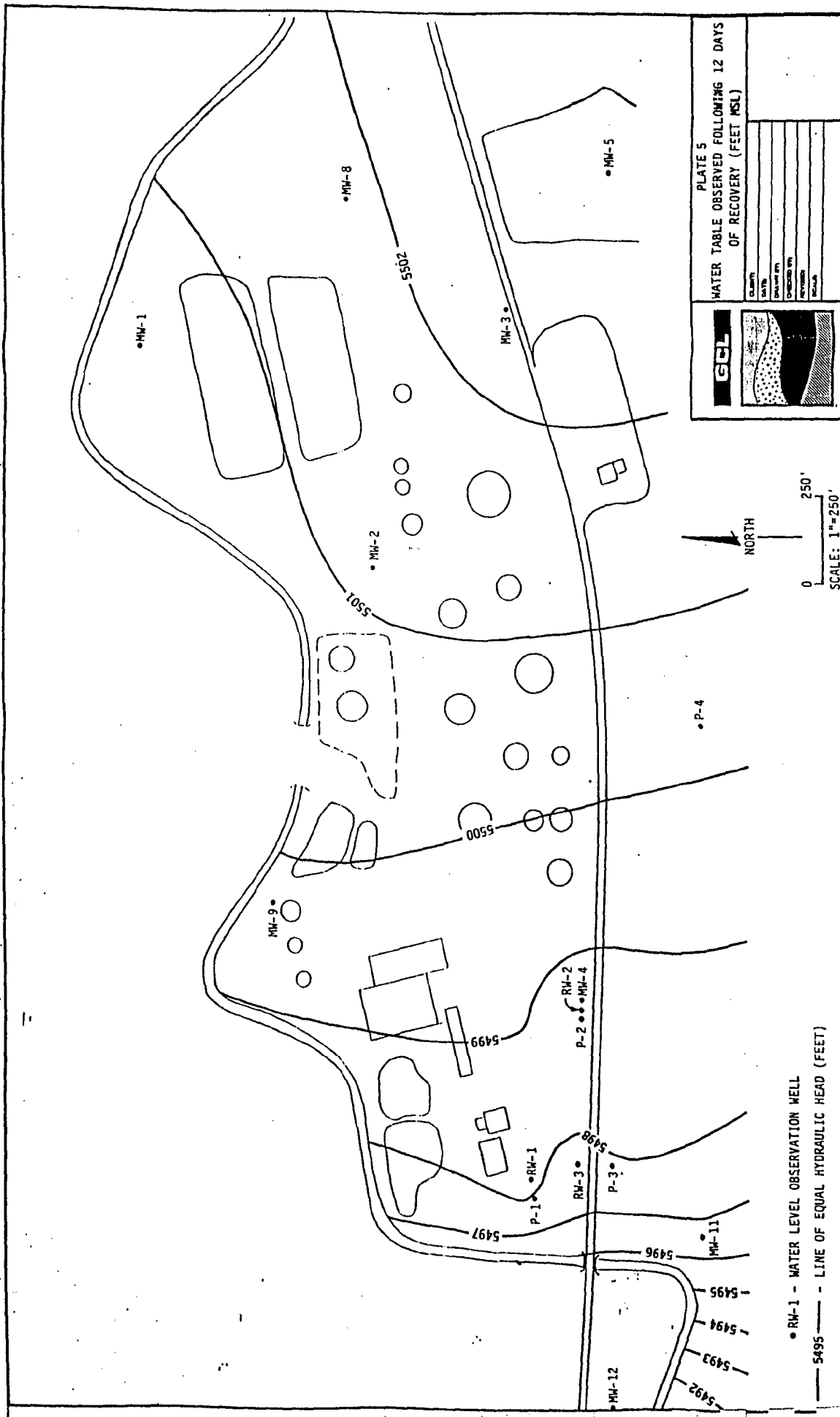


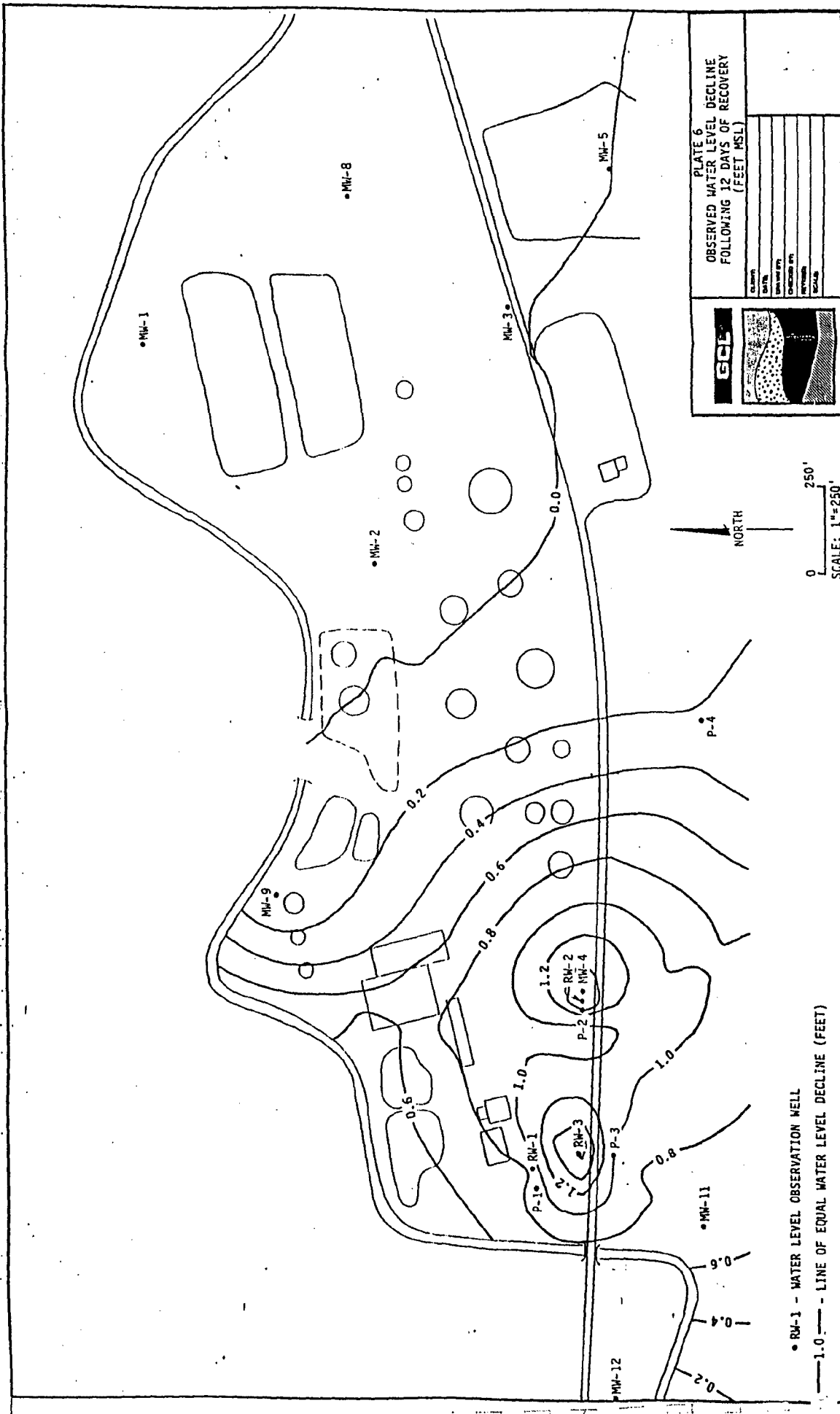


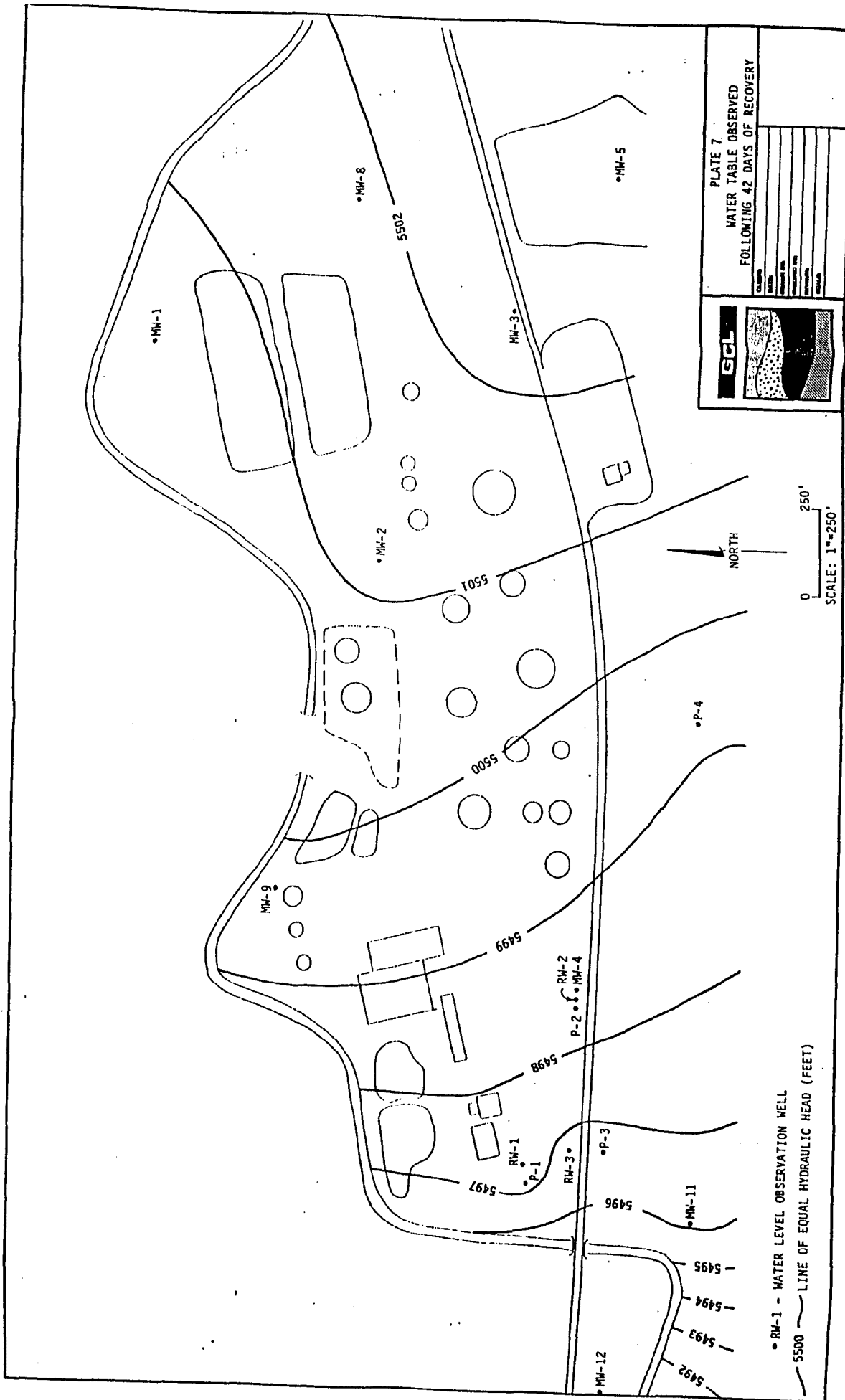


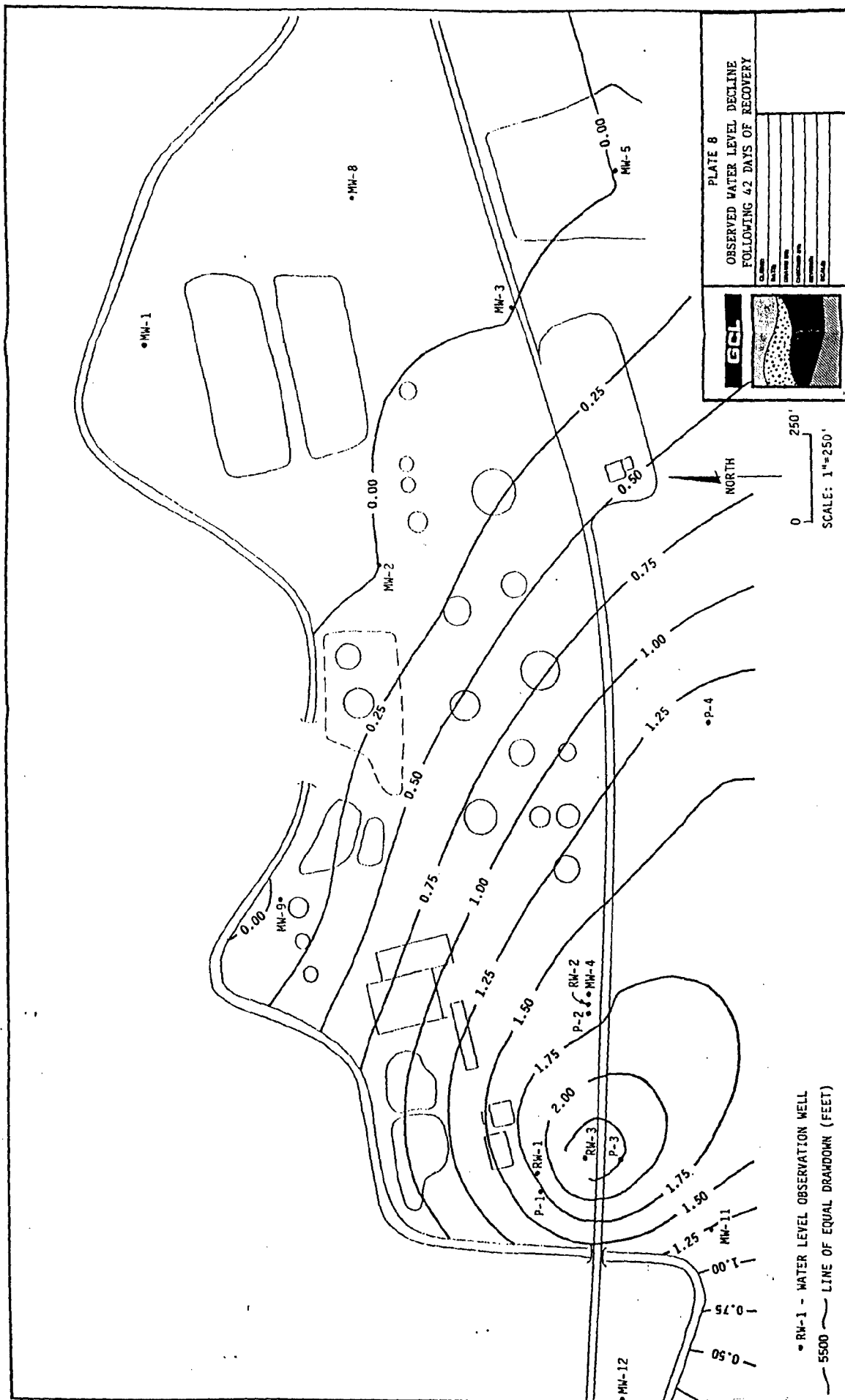












Attachment 4

Analytical Data

	<u>Page</u>
Evaporation Pond Data	1 - 15
Discharge Plan Groundwater Monitoring	16- 26
Groundwater Elevations	27- 31
Remedial Action GW Monitoring	32- 65
RCRA 3013 GW Monitoring	66- 86
San Juan River & Hammond Ditch	87-113

## SUMMARY OF POND DATA

mg/L

PARAMETER	1	2	3	4	5	6
	ASSA: GAI	ASSA: GAI	ASSA: GAI	ASSA: GAI	ASSA: GAI	ASSA: GAI
PARAMETER	4/1/87	7/1/87	7/10/87	7/13/87	PTS USED	AVERAGE
BOD	204.	159.3	93.75	160.	4	154
COD	234.	107.	146.	210.	4	174
TOC	97.	63.	120.	73.	4	88
TSS	50.	24.	104.	43.	4	55
NH <sub>3</sub> as N	50.	1.5	2.5	39. $\mu$ m	4	23
FLOW						
TEMP. WINTER						
TEMP. SUMMER						
pH	8.99	7.79	7.21		3	8.0
BROMIDE				1.3 $\mu$ m	1	1.3
CHLORIDE						
COLOR						
FECAL COLIFORM						
FLUORIDE		0.050	0.061	<10.00M	2	0.056
NITRATE-NITRITE-N <sup>3</sup>	<0.01	<0.01	<0.01	<1	3	<0.01
NITROGEN-TOTAL <sup>AS N</sup>						
OIL & GREASE	23.7	33.7	22.8		3	26.7
PHOSPHORUS AS P				1.9	1	1.9
RADIOACTIVITY						
Alpha						
Beta						
Radium						
Radium 226 Tot	2.3 $\pm$ 3.7 pCi/L	2.7 $\pm$ 2.8 pCi/L	2.0 $\pm$ 2.3 pCi/L		3	2.33 $\pm$ 2.9 pCi/L
SULFATE as SO <sub>4</sub>	545.	345.	345.	410	4	411
SULFIDE as S	<0.1	0	0			ND
SULFITE as SO <sub>3</sub>						
SURFACTANTS						
ALUMINUM	0.46 *	<0.5	<0.5	<0.1 *	2	0.28
BARIUM	1.70	2.5	4.70	0.3	4	2.3
BORON	<0.01	0.34	0.63	0.2	3	0.29
COBALT				<0.01	1	<0.01
IRON, TOT	0.62	<0.3	0.170	0.13	3	0.3
MAGNESIUM				96	1	96
MOLYBDENUM				<0.1		<0.1
MANGANESE	0.07	0.093	0.089	0.09	4	0.09
TIN				<0.1	1	<0.1
TITANIUM				<0.01	1	<0.01
ANTIMONY				<0.1	1	<0.1
ARSENIC	0.13	<0.05	<0.05	0.025	4	0.06
BERYLLIUM						
CADMIUM	0.03	<0.01	0.06	<0.01	4	0.03

		1	2	3	4	5	6	
		← ASSAIGAI →				NALCO		
		SALE WATER	N. EVAP	N. EVAP	N. EVAP	PTS. USED		
		4/1/87	7/1/87	7/10/87	7/13/89	IN AVG	AVERAGE	
1	CHROMIUM	<0.05	<0.05	<0.05	<0.01	3	<0.05	1
2	COPPER	<0.03	<0.01	0.015	<0.01	3	0.01	2
3	LEAD	0.14	0.180	0.175	<0.1	4	0.15	3
4	MERCURY	<0.002	<0.002	<0.002	0.0006	1	0.0006	4
5	NICKEL	0.05	0.262	0.202	<0.1	4	0.15	5
6	SELENIUM	0.02	0.070	0.036	0.093	4	0.05	6
7	SILVER	<0.05	<0.05	<0.05	<0.01	3	<0.05	7
8	THALLIUM				<0.1		<0.01	8
9	ZINC	0.17	0.032	0.074	0.02	4	0.07	9
10	CYANIDE	<0.01	<0.005	<0.005		2	<0.005	10
11	PHTENOLS	14	<0.001	0.008		3	4.7	11
12								12
13								13
14								14
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# ANALYTICAL LABORATORY REPORT

**From:**

Bloomfield Refining Company  
Bloomfield, NM.

Analysis No. W 154759

Date Sampled 7/13/87

Date Received 7/24/87

Date Printed 8/13/87

Page 1

**Sample Marked:**

North Evaporation Pond

## <<< WATER ANALYSIS >>>

**CATIONS:**

PPM

Sodium (CaCO <sub>3</sub> )	1900.
Potassium (K)	16.
Ammonia (CaCO <sub>3</sub> )	39.

**ANIONS:**

PPM

Fluoride (F) - Free and Combined	< 10.
Fluoride (F) - Free	< 10.
Chloride (CaCO <sub>3</sub> )	2100.
Bromide (Br)	1.3
Sulfate (CaCO <sub>3</sub> )	410.
Nitrate (CaCO <sub>3</sub> )	< 1.
Nitrite (NO <sub>2</sub> )	< 0.1
Phosphorus (PO <sub>4</sub> ) - Total	5.5

**OTHERS:**

PPM

Turbidity-Nephelometric Turbidity Units	18.
Total Dissolved Solids at 180 C	2900.
Total Suspended Solids at 105 C	43.
APHA Color Number (Units)	50.
Barium (Ba) - Soluble and Insoluble	0.3
Boron (B)	0.2
Phosphorus (P) - Soluble and Insoluble	1.9
Total Sulfur (S)	160.
Total Silica (SiO <sub>2</sub> )	36.
Calcium (CaCO <sub>3</sub> ) - Soluble and Insoluble	370.
Magnesium (CaCO <sub>3</sub> )-Soluble and Insoluble	96.
Iron (Fe) - Soluble and Insoluble	0.13
Manganese (Mn) - Soluble and Insoluble	0.09
Strontium (Sr) - Soluble and Insoluble	2.4
Zinc (Zn) - Soluble and Insoluble	0.02

NALCO CHEMICAL COMPANY

Form 738 (3-85)

One Nalco Center  
Naperville, IL 60566-1024

ANALYTICAL LABORATORIES

Box 87  
Sugar Land, TX 77478



# ANALYTICAL LABORATORY REPORT

**From:**

Bloomfield Refining Company  
Bloomfield, NM.

Analysis No. W 154759

Date Sampled 7/13/87

Date Received 7/24/87

Date Printed 8/13/87

Page 2 Last

**Sample Marked:**

North Evaporation Pond

Silver (Ag) - Soluble and Insoluble	< 0.01
Arsenic (As) - Soluble and Insoluble	0.025
Mercury (Hg) - Soluble and Insoluble	0.0006
Selenium (Se) - Soluble and Insoluble	0.093
Chemical Oxygen Demand (O2)	210.
Total Organic Carbon (C)	73.
Freon Extractables	2.
Nitrogen (N) - Organic	9.1

The following elements were < 0.1 PPM:

AL MO NI SB SN TL PB

The following elements were < 0.01 PPM:

CD CO CR CU TI V ZR

**Lab Comments:**

Cyanide, sulfide and phenol were not determined because the sample was not properly preserved.

NALCO CHEMICAL COMPANY

Form 738 (3-85)

One Nalco Center  
Naperville, IL 60566-1024

ANALYTICAL LABORATORIES

Box 87  
Sugar Land, TX 77478



# ANALYTICAL LABORATORY REPORT

From:

Bloomfield Refining Company  
Bloomfield, MN.

Analysis No. B 154759

Date Sampled 7/13/87

Date Received 7/23/87

Date Printed 7/31/87

Sample Marked:

North Evaporation Pond

>>> BOD EVALUATION <<<

5-DAY BOD (mg/l or ppm)

160.

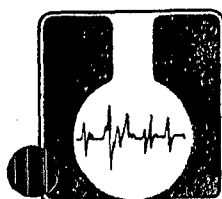
NALCO CHEMICAL COMPANY

Form 738 (3-85)

One Nalco Center  
Naperville, IL 60566-1024

ANALYTICAL LABORATORIES

Box 87  
Sugar Land, TX 77478



# ASSAIGAI ANALYTICAL LABORATORIES

NPDES DATA

NORTH EVAPORATION POND

SAMPLE : JULY 10, 1987

6

TO: Bloomfield Refining  
ATTN: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 10 August 1987  
1086

SAMPLE ID: Wastewater Evaluation

ANALYTE	ANALYTICAL RESULTS	NOMINAL DETECTION LIMITS
No 3 as N	<0.01 mg/l	0.01 mg/l
NH 3 as N	2.5 mg/l	0.01 mg/l
COD	146 mg/l	2 mg/l
Cr, T	<0.05 mg/l	0.05 mg/l
Cr, Hex	<0.01 mg/l	0.01 mg/l
Phenols	0.008 mg/l	0.001 mg/l
Sulfides	None Detected	
Oil & Grease	22.8 mg/l	0.01 mg/l
BOD	93.75 mg/l	0.01 mg/l
TSS	104 mg/l	1 mg/l
TDS	2976 mg/l	1 mg/l
pH	7.21	0.01
Alkalinity	198 mg/l	5 mg/l
Fluoride	0.061 mg/l	0.01 mg/l
Nitrite as N	<0.01 mg/l	0.01 mg/l
Boron	0.63 mg/l	0.04 mg/l
Cl	1100 mg/l	1.0 mg/l
SO 4	345 mg/l	1.0 mg/l
Al, Dissolved	<0.5 mg/l	0.5 mg/l
As	<0.05 mg/l	0.05 mg/l
Ba	4.70 mg/l	0.05 mg/l
Cd	0.06 mg/l	0.01 mg/l
Cu	0.015 mg/l	0.01 mg/l
CN	<0.005 mg/l	0.005 mg/l
Fe, D	0.122 mg/l	0.3 mg/l
Fe, T	0.170 mg/l	0.3 mg/l
Pb, T	0.175 mg/l	0.05 mg/l
Mn, D	0.088 mg/l	0.005 mg/l
Mn, T	0.089 mg/l	0.005 mg/l
Hg, T	<0.002 mg/l	0.002 mg/l
Ni, T	0.202 mg/l	0.01 mg/l
Se	0.036 mg/l	0.002 mg/l
Ag	<0.05 mg/l	0.05 mg/l
Zn	0.074 mg/l	0.004 mg/l
Urnaium	<0.02 mg/l	0.02 mg/l
Ra 226/228	2.0 ± 2.3 pCi/l	0.01 pCi/l
Phosphates	1.29 mg/l	0.06 mg/l

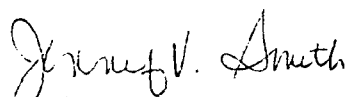
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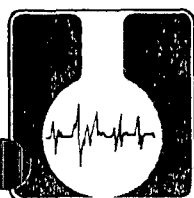
Na	605 mg/l	0.1 mg/l
TOC	120 mg/l	1 mg/l
TOX	178 ug/l	5 ug/l
Benzene	<0.001 mg/l	0.001 mg/l
Toluene	<0.001 mg/l	0.001 mg/l
Ethyl Benzene	<0.001 mg/l	0.001 mg/l
Xylenes	<0.001 mg/l	0.001 mg/l
PCB	<1 ppm	1 ppm

REFERENCE: "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", USEPA, SW 846, EMSL-Cincinnati, 1982.

An invoice for services is enclosed. Thank you for contacting Assaigai Laboratories.

Sincerely,

  
Jennifer V. Smith, Ph.D.  
Laboratory Director



ASSAIGAI  
ANALYTICAL  
LABORATORIES

*North Oxidation 10-9*

*B*

*Sample date: 7/10/87*

TO: Bloomfield Refinery  
Attn: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 14 October 1987  
1086, Updated

ANALYTE	ANALYTICAL RESULTS	NOMINAL DETECTION LIMIT
Acrolein	<0.01 mg/l	0.01 mg/l
Acrylonitrile	<0.01 mg/l	0.01 mg/l
Bis(chloromethyl)Ether	<0.001 mg/l	0.001 mg/l
Dichlorodifluoromethane	<0.001 mg/l	0.001 mg/l
Trichlorofluoromethane	<0.001 mg/l	0.001 mg/l
Aldrin	<0.001 mg/l	0.001 mg/l
$\alpha$ -BHC	<0.001 mg/l	0.001 mg/l
$\beta$ -BHC	<0.001 mg/l	0.001 mg/l
$\gamma$ -BHC	<0.001 mg/l	0.001 mg/l
$\delta$ -BHC	<0.001 mg/l	0.001 mg/l
Chlordane	<0.001 mg/l	0.001 mg/l
4,4'-DDT	<0.001 mg/l	0.001 mg/l
4,4'-DDE	<0.001 mg/l	0.001 mg/l
4,4'-DDD	<0.001 mg/l	0.001 mg/l
Dieldrin	<0.001 mg/l	0.001 mg/l
$\alpha$ -Endosulfan	<0.001 mg/l	0.001 mg/l
$\beta$ -Endosulfan	<0.001 mg/l	0.001 mg/l
Endosulfan	<0.001 mg/l	0.001 mg/l
Endrin	<0.001 mg/l	0.001 mg/l
Endrin Aldehyde	<0.001 mg/l	0.001 mg/l
Heptachlor	<0.001 mg/l	0.001 mg/l
Heptachlor Epoxide	<0.001 mg/l	0.001 mg/l
PCB-1242	<0.001 mg/l	0.001 mg/l
PCB-1254	<0.001 mg/l	0.001 mg/l
PCB-1221	<0.001 mg/l	0.001 mg/l
PCB-1232	<0.001 mg/l	0.001 mg/l
PCB-1248	<0.001 mg/l	0.001 mg/l
PCB-1260	<0.001 mg/l	0.001 mg/l
PCB-1016	<0.001 mg/l	0.001 mg/l
Toxaphene	<0.001 mg/l	0.001 mg/l

REFERENCES: Standard Methods for the Examination of Water and Wastewater, 16th Edition, APHA, NY, 1985.

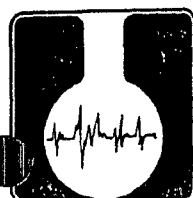
An invoice for services is enclosed. Thank you for contacting Assaigai Laboratories.

Sincerely,

*Dean Dupree*

Jennifer V. Smith, Ph.D.  
Laboratory Director

7300 Jefferson, N.E. • Albuquerque, New Mexico 87109 • (505) 345-8964

ASSAIGAI  
ANALYTICAL  
LABORATORIES

TO: Bloomfield Refinery  
Attn: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 8 September 1987  
1086

## ANALYTE

## ANALYTICAL RESULTS

## VOLATILES

Benzene	ND
Bromoform	ND
Carbon tetrachloride	0.266 mg/l
Chlorobenzene	ND
Chlorodibromomethane	ND
Chloroethane	ND
2-Chloroethylvinyl ether	ND
Chloroform	0.064 mg/l
Dichlorobromomethane	ND
1,1-Dichloroethane	ND
1,2-Dichloroethane	ND
1,1-Dichloroethylene	ND
1,2-Dichloropropane	ND
1,2-Dichloropropylene	ND
Ethylbenzene	ND
Methyl Bromide	ND
Methyl Chloride	ND
Methylene Chloride	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	ND
1,2-Transdichloroethylene	ND
1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	ND
Trichloroethylene	0.020 mg/l
Vinyl Chloride	ND

*ND bad data point*

NOMINAL DETECTION LIMIT: 0.001 mg/l

## Acid Compounds

2-Chlorophenol	ND
2,4-Dichlorophenol	ND
2,4-Dimethylphenol	ND
4,6-Dinitro-o-cresol	ND
2,4-Dinitrophenol	ND
2-Nitrophenol	ND
4-Nitrophenol	ND

-2-

P-chloro-m-cresol	ND
pentachlorophenol	ND
Phenol	ND
2,4,6-Trichlorophenol	ND

NOMINAL DETECTION LIMIT: 0.010 mg/l

Base Neutrals

Acenaphthylene	ND
Anthracene	ND
Benzidine	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
3,4-Benzofluoranthene	ND
Benzo(g,h,i)perylene	ND
Benzo(k)fluoranthene	ND
Bis(2-chloroethoxy)methane	ND
Bis(2-chloroethyl)ether	ND
Bis(2-chloroisopropyl)ether	ND
Bis(2-ethylhexyl)phthalate	ND
4-Bromophenyl phenyl ether	ND
Butylbenzyl phthalate	ND
2-Chloronaphthalene	ND
4-Chlorophenyl phenyl ether	ND
Chrysene	ND
Dibenzo(a,h)anthracene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND
3,3-Dichlorobenzidine	ND
Diethyl phthalate	ND
Dimethyl phthalate	ND
Din-n-butyl phthalate	ND
2,4-Dinitrotoluene	ND
2,6-Dinitrotoluene	ND
Di-n-octyl phthalate	ND
1,2-Diphenylhydrazine	ND
Fluoranthene	ND
Fluorene	ND
Hexachlorobenzene	ND
Hexachlorobutadiene	ND
Hexachlorocyclopentadiene	ND
Hexachloroethane	ND
Indeno(1,2,3-cd)pyrene	ND
Isophorone	ND
Naphthalene	ND
Nitrobenzene	ND
N-nitrosodimethylamine	ND
N-nitrosodie-n-propylamine	ND



-3-

N-nitrosodiphenylamine	ND
Phenanthrene	ND
Pyrene	ND
1,2,4-Trichlorobenzene	ND

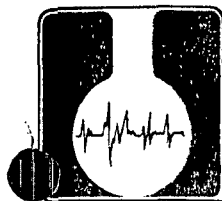
NOMINAL DETECTION LIMIT: 0.010 mg/l

REFERENCES: "Test Methods for Evaluating Solid Waste, -Physical/Chemical Methods", USEPA, SW 846, 3rd Edition.

An invoice for services is included. Thank you for contacting Assaigai Laboratories.

Sincerely,

*Jennifer V. Smith*  
Jennifer V. Smith, Ph.D.  
Laboratory Director



# ASSAIGAI ANALYTICAL LABORATORIES

NPDES DATA

NORTH EVAPORATION POND

SAMPLE: JULY 1, 1987

TO: Bloomfield Refining  
ATTN: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 10 August 1987  
1041

SAMPLE ID: Wastewater Evaluation

ANALYTE	ANALYTICAL RESULTS	NOMINAL DETECTION LIMITS
No 3 as N	<0.01 mg/l	0.01 mg/l
NH 3 as N	1.5 mg/l	0.01 mg/l
COD	107 mg/l	2 mg/l
Cr, T	<0.05 mg/l	0.05 mg/l
Cr, Hex	<0.01 mg/l	0.01 mg/l
Phenols	<0.001 mg/l	0.001 mg/l
Sulfides	None Detected	
Oil & Grease	33.7 mg/l	0.01 mg/l
BOD	159.3 mg/l	0.01 mg/l
TSS	24 mg/l	1 mg/l
TDS	2764 mg/l	1 mg/l
pH	7.79	0.01
Alkalinity	206 mg/l	5 mg/l
Fluoride	0.050 mg/l	0.01 mg/l
Nitrite as N	<0.01 mg/l	0.01 mg/l
Boron	0.34 mg/l	0.04 mg/l
Cl	1072 mg/l	1.0 mg/l
SO 4	345 mg/l	1.0 mg/l
Al, Dissolved	<0.5 mg/l	0.5 mg/l
As	<0.05 mg/l	0.05 mg/l
Ba	2.50 mg/l	0.05 mg/l
Cd	<0.01 mg/l	0.01 mg/l
Cu	<0.01 mg/l	0.01 mg/l
CN	<0.005 mg/l	0.005 mg/l
Fe, D	<0.3 mg/l	0.3 mg/l
Fe, T	<0.3 mg/l	0.3 mg/l
Pb, T	0.180 mg/l	0.05 mg/l
Mn, D	0.085 mg/l	0.005 mg/l
Mn, T	0.093 mg/l	0.005 mg/l
Hg, T	<0.002 mg/l	0.002 mg/l
Ni, T	0.262 mg/l	0.01 mg/l
Se	0.070 mg/l	0.002 mg/l
Ag	<0.05 mg/l	0.05 mg/l
Zn	0.032 mg/l	0.004 mg/l
Urnaium	<0.02 mg/l	0.02 mg/l
Ra 226/228	2.7 ± 2.8 pCi/l	0.01 pCi/l
Phosphates	0.32 mg/l	0.06 mg/l

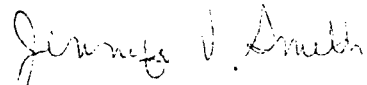
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Na	1522 mg/l	0.1 mg/l
TOC	63 mg/l	1 mg/l
TOX	363 ug/l	5 ug/l
Benzene	<0.001 mg/l	0.001 mg/l
Toluene	<0.001 mg/l	0.001 mg/l
Ethyl Benzene	<0.001 mg/l	0.001 mg/l
Xylenes	<0.001 mg/l	0.001 mg/l

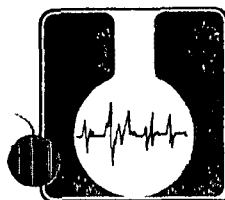
REFERENCE: "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", USEPA, SW 846, EMSL-Cincinnati, 1982.

An invoice for services is enclosed. Thank you for contacting Assaigai Laboratories.

Sincerely,



Jennifer V. Smith, Ph.D.  
Laboratory Director



# ASSAIGAI ANALYTICAL LABORATORIES

14  
SAMPLE FROM PUMP SUMP  
PRIOR TO EVAPORATION PONDS.

Copy to: Macy, King, Traylor

TO: Bloomfield Refining Company  
ATTN: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 30 April 1987  
0533

SAMPLE ID: Sour Water, 4/1/87.

ANALYTE	ANALYTICAL RESULTS	NOMINAL DETECTION LIMITS
NO 3 as N	<0.01 mg/l	0.01 mg/l
NE 3 as N	50 mg/l	0.1 mg/l
COD	234 mg/l	2 mg/l
Cr, Total	<0.05 mg/l	0.05 mg/l
Cr, Hexavalent	<0.05 mg/l	0.05 mg/l
Phenols	14 mg/l	0.01 mg/l
Sulfides	<0.1 mg/l	0.1 mg/l
Oil & Grease	23.7 mg/l	0.01 mg/l
BOD	204 mg/l	0.01 mg/l
TSS	50 mg/l	1 mg/l
TDS	2136 mg/l	1 mg/l
pH	8.99	0.01
Ca	88.5 mg/l	0.1 mg/l
F	0.35 mg/l	0.01 mg/l
Boron	<0.01 mg/l	0.01 mg/l
Cl	952 mg/l	1.0 mg/l
SO 4	545 mg/l	1.0 mg/l
Al, Dissolved	0.46 mg/l	0.05 mg/l
As	0.13 mg/l	0.002 mg/l
Ba	1.70 mg/l	0.05 mg/l
Cd	0.03 mg/l	0.002 mg/l
Cu	<0.03 mg/l	0.03 mg/l
CN	<0.01 mg/l	0.01 mg/l
Fe, Dissolved	0.44 mg/l	0.05 mg/l
Fe, Total	0.62 mg/l	0.05 mg/l
Pb, Total	0.14 mg/l	0.05 mg/l
Mn, Dissolved	0.05 mg/l	0.005 mg/l
Mn, Total	0.07 mg/l	0.005 mg/l
Hg, Total	<0.002 mg/l	0.002 mg/l
Ni	0.05 mg/l	0.01 mg/l
Se	0.02 mg/l	0.002 mg/l
Ag	<0.05 mg/l	0.05 mg/l
Zn	0.17 mg/l	0.004 mg/l
Uranium	<0.07 mg/l	0.07 mg/l
Ra 226 & 228	2.3 ± 3.7 pCi/l	0.1 pCi/l
Phosphates	<0.01 mg/l	0.01 mg/l
TOC	97 mg/l	1 mg/l
TOX	163 ug/l	1 ug/l
Benzene	2.2 mg/l	0.001 mg/l

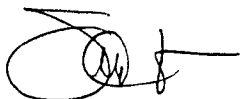
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Toluene	2.6 mg/l	0.001 mg/l
Ethyl Benzene	0.47 mg/l	0.001 mg/l
Xylenes	2.6 mg/l	0.001 mg/l

REFERENCE: "Test Methods for Evaluating Solid Waste, -Physical/Chemical Methods," USEPA, SW 846, EMSL-Cincinnati, 1982

An invoice for services is enclosed. Thank you for contacting Assaigai Laboratories.

Sincerely,



Jennifer V. Smith, Ph.D.  
Laboratory Director

BLOOMFIELD REFINING COMPANY  
SAMPLE DATE: NOVEMBER 18, 1988

16

		1		2		3		4		5		6	
				NOMINAL		MONITORING		MONITORING		MONITORING			
				DETECTION		NMWQ		WELL		WELL		WELL	
				LIMITS		STANDARD		P1		P4		P5	
		PARAMETER		UNITS									
1													
2		ARSENIC		mg/l		0.005		0.1		<0.005		<0.005	
3		Barium		u		0.5		1.0		<0.5		1.8	
4		Cadmium		u		0.002		0.01		<0.002		<0.002	
5		Chromium		u		0.02		0.05		<0.02		<0.02	
6		Lead		u		0.02		0.05		<0.02		<0.02	
7		Mercury		u		0.001		0.002		<0.001		<0.001	
8		Selenium		u		0.005		0.05		<0.005		<0.005	
9		Silver		u		0.01		0.05		<0.01		<0.01	
10		Copper		u		0.01		1.0		<0.01		<0.01	
11		Iron		u		0.05		1.0		<0.05		5.95	
12		Manganese		u		0.02		0.2		2.11		3.73	
13		Zinc		u		0.01		10.0		<0.01		<0.01	
14		Uranium		u		-		5.0		-		-	
15		Chloride		u		1		250.		1140.		490.	
16		Sulfate		u		1		600.		665.		<1.	
17		PCB		u		-		0.001		-		-	
18		Phenols		u		0.001		0.005		0.05		0.101	
19		Cyanide		u		0.01		0.2		<0.01		<0.01	
20		Nitrate as N		u		0.02		10.		4.03		0.09	
21		Aluminum		u		0.1		5.		<0.1		<0.1	
22		Boron		u		0.01		0.75		0.32		0.57	
23		Cobalt		u		0.02		0.05		<0.02		<0.02	
24		Molybdenum		u		0.02		1.0		<0.02		<0.02	
25		Nickel		u		0.01		0.2		<0.01		<0.01	
26		Fluoride		u		0.01		1.6		0.92		0.30	
27		TDS		u		1		1000.		3480.		1830.	
28		Benzene		u		0.0002		0.01		0.00075		11.130	
29		Toluene		u		0.0002		0.75		0.00268		8.916	
30		Carbon Tetrachloride		u		0.0005		0.01		ND		ND	
31		1,2-Dichloroethane		u		0.0005		0.01		ND		ND	
32		1,1-Dichloroethylene		u		0.0005		0.005		ND		ND	
33		1,1,2,2-Tetrachloroethylene		u		0.0005		0.02		ND		ND	
34		1,1,2-Trichloroethylene		u		0.0005		0.01		ND		ND	
35		pH		S.U.		0.1		6 TO 9		7.0		6.7	
36													
37													
38													
39													
40													

ND = NOT DETECTED

## BLOOMFIELD REFINING COMPANY

SAMPLE DATE: JUNE 3, 1988

11

PARAMETER	UNITS	NOMINAL	NMWQ	MONITORING		
		DETECTION LIMITS		WELL P1	WELL P4	WELL P5
1						
2	Arsenic	mg/l	0.005	0.1	<0.005	<0.005
3	Barium	"	0.5	1.0	<0.5	1.4
4	Cadmium	"	0.002	0.01	<0.002	<0.002
5	Chromium	"	0.02	0.05	<0.02	<0.02
6	Lead	"	0.02	0.05	<0.02	<0.02
7	Mercury	"	0.001	0.002	<0.001	<0.001
8	Selenium	"	0.005	0.05	<0.005	<0.005
9	Silver	"	0.01	0.05	<0.01	<0.01
10	Copper	"	0.01	1.0	0.02	<0.01
11	Iron	"	0.05	1.0	<0.05	6.44
12	Manganese	"	0.05	0.2	0.85	3.51
13	Zinc	"	0.01	10.0	0.03	0.01
14	Uranium	"	-	5.0	-	-
15	Chloride	"	1	250.	1040.	401.
16	Sulfate	"	1	600.	951.	3.
17	PCB	"	-	0.001	-	-
18	Phenols	"	0.001	0.005	0.021	0.069
19	Cyanide	"	0.005	0.2	0.022	<0.005
20	Nitrate as N	"	0.02	10.	3.22	0.14
21	Aluminum	"	0.1	5.	<0.1	<0.1
22	Boron	"	0.01	0.75	0.25	0.47
23	Cobalt	"	0.02	0.05	<0.02	<0.02
24	Molybdenum	"	0.02	1.0	0.21	<0.02
25	Nickel	"	0.02	0.2	0.03	0.02
26	Fluoride	"	0.01	1.6	0.60	0.28
27	TDS	"	1	1000.	3500.	1820.
28	Benzene	"	0.001	0.01	ND	8.9
29	Toluene	"	0.001	0.75	ND	0.93
30	Carbon Tetrachloride	"	0.001	0.01	ND	ND
31	1,2-Dichloroethane	"	0.001	0.01	ND	ND
32	1,1-Dichloroethylene	"	0.001	0.005	ND	ND
33	1,1,2,2-Tetrachloroethylene	"	0.001	0.02	ND	ND
34	1,1,2-Trichloroethylene	"	0.001	0.01	ND	ND
35	pH	S.W.	0.1	6 TO 9	7.3	6.8
36						
37						
38						
39						
40						

## BLOOMFIELD REFINING COMPANY

18

SAMPLE DATE: NOV. 17, 1987

PARAMETER	UNITS	NOMINAL	NMWQ	MONITORING		
		DETECTION LIMITS		WELL P1	WELL P4	WELL P5
1						
2	Arsenic	mg/l	0.005	0.1	<0.005	<0.005
3	Barium	"	0.5	1.0	<0.5	1.8
4	Cadmium	"	0.002	0.01	<0.002	<0.002
5	Chromium	"	0.02	0.05	<0.02	<0.02
6	Lead	"	0.02	0.05	<0.02	<0.02
7	Mercury	"	0.001	0.002	<0.001	<0.001
8	Selenium	"	0.005	0.05	<0.005	<0.005
9	Silver	"	0.01	0.05	<0.01	<0.01
10	Copper	"	0.01	1.0	<0.01	<0.01
11	Iron	"	0.05	1.0	<0.05	4.59
12	Manganese	"	0.02	0.2	1.45	4.77
13	Zinc	"	0.01	10.0	<0.01	<0.01
14	Uranium	"	-	5.0	-	-
15	Chloride	"	1	250	910.	588.
16	Sulfate	"	1	600.	655.	<1
17	PCB	"	-	0.001	-	-
18	Phenols	"	0.005	0.005	0.02	0.73
19	Cyanide	"	0.005	0.2	<0.005	0.005
20	Nitrate as N	"	0.01	10.	5.66	0.03
21	Aluminum	"	0.1	5.	<0.1	<0.1
22	Boron	"	0.1	0.75	0.32	0.59
23	Cobalt	"	0.02	0.05	<0.02	<0.02
24	Molybdenum	"	0.02	1.0	<0.02	0.03
25	Nickel	"	0.01	0.2	<0.01	<0.01
26	Fluoride	"	0.1	1.6	0.76	0.19
27	TDS	"	1	1000.	3050.	2050.
28	Benzene	"	0.001	0.01	ND	8.5
29	Toluene	"	0.001	0.75	ND	0.023
30	Carbon Tetrachloride	"	0.001	0.01	ND	ND
31	1,2-Dichloroethane	"	0.001	0.01	ND	ND
32	1,1-Dichloroethylene	"	0.001	0.005	ND	ND
33	1,1,2,2-Tetrachloroethylene	"	0.001	0.02	ND	ND
34	1,1,2-Trichloroethylene	"	0.001	0.01	ND	ND
35	pH	S.N.	0.1	6 TO 9	7.0	6.5
36						
37						
38						
39						
40						



BLOOMFIELD REFINING COMPANY  
SAMPLE DATE: May 28, 1987

19

		1	2	3	4	5	6
			NOMINAL		MONITORING	MONITORING	MONITORING
			DETECTION	NMWR	WELL	WELL	WELL
		PARAMETER	LIMITS	STANDARD	P1	P4	P5
1							
2		Arsenic	mg/l	0.05	0.1	<0.05	<0.05
3		Barium	"	1.0	1.0	<1.0	9.88
4		Cadmium	"	0.01	0.01	0.023	0.018
5		Chromium	"	0.05	0.05	<0.05	<0.05
6		Lead	"	0.05	0.05	0.20	0.14
7		Mercury	"	0.002	0.002	<0.002	<0.002
8		Selenium	"	0.01	0.05	0.10	0.08
9		Silver	"	0.05	0.05	<0.05	<0.05
10		Copper	"	0.01	1.0	0.013	0.010
11		Iron	"	0.04	1.0	0.14	0.17
12		Manganese	"	0.01	0.2	1.51	5.29
13		Zinc	"	0.004	10.0	0.024	0.022
14		Uranium	"	-	5.0	-	-
15		Chloride	"	0.1	250.	794	635.
16		Sulfate	"	1.0	600.	827.6	4.8
17		PCB	"	-	0.001	-	-
18		Phenols	"	0.01	0.005	0.123	0.278
19		Cyanide	"	0.005	0.2	0.0056	<0.005
20		Nitrate as N	"	0.01	10.	12.9	0.035
21		Aluminum	"	0.1	5.	<0.1	<0.1
22		Boron	"	0.1	0.75	0.70	0.97
23		Cobalt	"	0.01	0.05	0.07	0.04
24		Molybdenum	"	0.05	1.0	0.79	0.13
25		Nickel	"	0.06	0.2	0.12	0.12
26		Fluoride	"	0.01	1.6	0.0353	<0.01
27		TDS	"	1	1000.	3272.	2038.
28		Benzene	"	0.001	0.01	<0.001	10.7
29		Toluene	"	0.001	0.75	<0.001	0.71
30		Carbon Tetrachloride	"	0.08	0.01	<0.08	<0.08
31		1,2-Dichloroethane	"	0.001	0.01	<0.001	<0.001
32		1,1-Dichloroethylene	"	0.001	0.005	<0.001	<0.001
33		1,1,2,2-Tetrachloroethylene	"	0.001	0.02	<0.001	<0.001
34		1,1,2-Trichloroethylene	"	0.001	0.01	<0.001	<0.001
35		pH	S.H.	0.1	6 TO 9	-	-
36							
37							
38							
39							
40							

PARAMETER	UNITS	NOMINAL DETECTION	NM WQ STANDARD	MONITORING WELL P1	MONITORING WELL P4	MONITORING WELL P5
		LIMITS				
1						
2	Arsenic	mg/l	0.002	0.1	0.05	0.08
3	Barium	"	-	1.0	-	-
4	Cadmium	"	0.01	0.01	<0.01	<0.01
5	Chromium	"	0.05	0.05	<0.05	<0.05
6	Lead	"	0.05	0.05	0.15	<0.05
7	Mercury	"	0.002	0.002	<0.002	<0.002
8	Selenium	"	0.01	0.05	0.033	0.063
9	Silver	"	0.05	0.05	<0.05	<0.05
10	Copper	"	0.03	1.0	<0.03	<0.03
11	Iron	"	-	1.0	-	-
12	Manganese	"	-	0.2	-	-
13	Zinc	"	0.008	10.0	0.04	<0.008
14	Uranium	"	-	5.0	-	-
15	Chloride	"	1	250.	814	754
16	Sulfate	"	0.01	600.	673	<0.01
17	PCB	"	-	0.001	-	-
18	Phenols	"	0.001	0.005	0.19	0.085
19	Cyanide	"	0.01	0.2	0.07	<0.01
20	Nitrate as N	"	-	10.	-	-
21	Aluminum	"	-	5.	-	-
22	Boron	"	-	0.75	-	-
23	Cobalt	"	-	0.05	-	-
24	Molybdenum	"	-	1.0	-	-
25	Nickel	"	0.01	0.2	0.07	0.12
26	Fluoride	"	-	1.6	-	-
27	TDS	"	1	1000.	2866.	2308.
28	Benzene	"	0.001	0.01	ND	6.65
29	Toluene	"	0.001	0.75	ND	0.407
30	Carbon Tetrachloride	"	0.001	0.01	-	ND
31	1,2-Dichloroethane	"	0.001	0.01	-	ND
32	1,1-Dichloroethylene	"	0.001	0.005	-	ND
33	1,1,2,2-Tetrachloroethylene	"	0.001	0.02	-	ND
34	1,1,2-Trichloroethylene	"	0.001	0.01	-	ND
35	pH	S.K.	0.01	6 TO 9	7.27	6.70
36						
37						
38						
39						
40						

		1	2	3	4	5	6	
			NOMINAL DETECTION LIMITS	NMWQ STANDARD	MONITORING WELL P1	MONITORING WELL P4	MONITORING WELL P5	
PARAMETER	UNITS							
Arsenic	mg/l		0.05	0.1	<0.05	<0.05	<0.05	
Barium	"		0.005	1.0	0.055	2.3	0.010	
Cadmium	"		0.01	0.01	<0.01	<0.01	0.01	
Chromium	"		0.05	0.05	<0.05	<0.05	<0.05	
lead	"		0.05	0.05	<0.05	<0.05	<0.05	
Mercury	"		0.002	0.002	<0.002	<0.002	<0.002	
Selenium	"		0.002	0.05	0.03	0.03	0.03	
Silver	"		0.05	0.05	<0.05	<0.05	<0.05	
Copper	"		0.03	1.0	<0.03	<0.03	<0.03	
Iron	"		0.3	1.0	<0.3	18.6	<0.3	
Manganese	"		0.005	0.2	1.11	5.70	<0.005	
Zinc	"		0.001	10.0	0.012	0.040	0.016	
Uranium	"		-	5.0	-	-	-	
Chloride	"		1	250.	774.	675.	1118.	
Sulfate	"		1	600.	579.	<0.01	1132.	
PCB	"		-	0.001	-	-	-	
Phenols	"		0.001	0.005	0.012	0.096	0.021	
Cyanide	"		0.01	0.2	<0.01	<0.01	<0.01	
Nitrate as N	"		0.1	10.	2.9	<0.01	36.	
Aluminum	"		0.05	5.	4.54	3.8	4.34	
Boron	"		0.004	0.75	0.27	0.7	0.24	
Cobalt	"		0.05	0.05	<0.05	<0.05	<0.05	
Molybdenum	"		0.01	1.0	0.17	<0.01	0.08	
Nickel	"		0.06	0.2	0.06	<0.06	0.07	
Fluoride	"		0.01	1.6	0.960	0.410	0.580	
TDS	"		1	1000.	2498.	2128.	3788.	
Benzene	"		0.001	0.01	<0.001	1.91	<0.001	
Toluene	"		0.001	0.75	<0.001	1.78	<0.001	
Carbon Tetrachloride	"		0.001	0.01	<0.001	<0.001	<0.001	
1,2-Dichloroethane	"		0.001	0.01	0.002	<0.001	<0.001	
1,1-Dichloroethylene	"		0.001	0.005	<0.001	<0.001	<0.001	
1,1,2-Tetrachloroethylene	"		0.001	0.02	<0.001	<0.001	<0.001	
1,1,2-Trichloroethylene	"		0.001	0.01	<0.001	<0.001	<0.001	
pH	S.U.		0.01	6 TO 9	7.19	6.73	7.28	
O & G								

## Bloomfield Refining Company

Sample Date: June 23-24, 1986 ; Laboratory: Assaigai

22

Parameter	Units	Nominal		Monitoring		
		Detection Limits	NMWR Standard	Well P1	Well P4	Well P5
1						
2	Arsenic	mg/L	0.05	0.1	0.077	0.070
3	Barium	"	0.01	1.0	BDL	3.54
4	Cadmium	"	0.010	0.01	BDL	BDL
5	Chromium	"	0.050	0.05	BDL	BDL
6	Lead	"	0.050	0.05	0.065	0.066
7	Mercury	"	0.002	0.002	BDL	BDL
8	Selenium	"	0.010	0.05	0.035	0.080
9	Silver	"	0.050	0.05	BDL	BDL
10	Copper	"	0.03	1.0	BDL	BDL
11	Iron	"	0.04	1.0	BDL	12.0
12	Manganese	"	0.005	0.2	0.25	3.5
13	Zinc	"	0.01	10.0	0.020	0.019
14	Uranium	"	-	5.0	-	-
15	Chloride	"	1.0	250.	994.7	989.7
16	Sulfate	"	1.0	600.	630.	12.5
17	PCB	"	0.001	0.001	-	-
18	Phenols	"	0.002	0.005	0.017	0.430
19	Cyanide	"	0.01	0.2	0.1	0.5
20	Nitrate as N	"	0.01	10.0	0.1	BDL
21	Aluminum	"	0.05	5.0	2.07	1.93
22	Boron	"	0.01	0.75	BDL	BDL
23	Cobalt	"	0.05	0.05	BDL	BDL
24	Molybdenum	"	0.01	1.0	BDL	BDL
25	Nickel	"	0.06	0.2	BDL	BDL
26	Fluoride	"	0.1	1.6	0.54	0.21
27	TDS	"	1	1000.	2960.	2266.
28	Benzene	"	0.001	0.01	ND	3.1
29	Toluene	"	0.001	0.75	ND	0.290
30	Carbon tetrachloride	"	0.001	0.01	-	ND
31	1,2-Dichloroethane	"	0.001	0.01	ND	ND
32	1,1-Dichloroethylene	"	0.001	0.005	ND	ND
33	1,1,2,2-Tetrachloroethylene	"	0.001	0.02	ND	ND
34	1,1,2-Trichloroethylene	"	0.001	0.01	ND	ND
35	pH	S.U.	0.01	6 to 9	7.25	6.85
36						
37						
38						
39						
40						

BDL = Below Detection Limit

ND = Not Detected

# Bloomfield Refining Company

Sample Date: 3/26/86

23

AN - WRITE

		1	2	3	4	5	6	
	Parameter	Units	NMWRQ Standard	NOMINAL DETECTION LIMITS	Monitoring Well P1	Monitoring Well P4	Monitoring Well P5	
1								1
2	Arsenic	mg/l	0.1	0.050	<0.050	<0.050	<0.050	2
3	Barium	"	1.0	-	-	-	-	3
4	Cadmium	"	0.01	0.002	0.050	0.060	0.10	4
5	Chromium	"	0.05	0.050	<0.050	<0.050	<0.050	5
6	Lead	"	0.05	0.001	0.085	0.074	0.16	6
7	Mercury	"	0.002	0.002	<0.002	0.002	<0.002	7
8	Selenium	"	0.05	0.010	<0.010	<0.010	<0.010	8
9	Silver	"	0.05	0.050	<0.050	<0.050	<0.050	9
10	Copper	"	1.0	0.03	<0.03	<0.03	<0.03	10
11	Iron	"	1.0	-	-	-	-	11
12	Manganese	"	0.2	-	-	-	-	12
13	Zinc	"	10.0	0.01	<0.01	0.012	0.012	13
14	Uranium	"	5.0	-	-	-	-	14
15	Chloride	"	250.	1	750.	500.	1100.	15
16	Sulfate	"	600.	1	7.5	0.3	14.	16
17	PCB	"	0.001	-	-	-	-	17
18	Phenols	"	0.005	0.001	0.009	0.633	0.006	18
19	Cyanide	"	0.2	0.01	<0.01	<0.01	<0.01	19
20	Nitrate as N	"	10.0	-	-	-	-	20
21	Aluminum	"	5.0	-	-	-	-	21
22	Boron	"	0.75	-	-	-	-	22
23	Cobalt	"	0.05	-	-	-	-	23
24	Molybdenum	"	1.0	-	-	-	-	24
25	Nickel	"	0.2	0.01	0.08	0.08	0.10	25
26	Fluoride	"	1.6	-	-	-	-	26
27	TDS	"	1000.	1	2936.	1868.	3840.	27
28	Benzene	"	0.01	0.001	ND	11.8	ND	28
29	Toluene	"	0.75	0.001	ND	7.5	ND	29
30	Carbon Tetrachloride	"	0.01	0.001	-	ND	-	30
31	1,2-Dichloroethane	"	0.01	0.001	-	ND	-	31
32	1,1-Dichloroethylene	"	0.005	0.001	-	ND	-	32
33	1,1,2,2-Tetrachloroethylene	"	0.02	0.001	-	ND	-	33
34	1,1,2-Trichloroethylene	"	0.1	0.001	-	ND	-	34
35	pH	S.W.	6 To 9	±0.01	7.30	6.84	7.23	35
36								36
37								37
38								38
39								39
40								40

MW-1

DEC 13 1984 MARCH 21 1985 JULY 10 1985

STD	PARAMETER	UNITS	1ST Qtr September 1984	2nd Qtr December 1984	3rd Qtr March 1985	4th Qtr June 1985
1	0.1 Arsenic	mg/l	ND	0.054	0.010	ND
2	1.0 Barium		1.0	ND	ND	ND
3	0.01 Cadmium		0.014	ND	0.027	ND
4	0.05 Chromium		ND	0.070	ND	ND
5	0.05 Lead		0.125	0.18	0.040	ND
6	0.002 Mercury		ND	ND	ND	ND
7	0.05 Selenium		0.35	0.120	0.022	0.026
8	0.05 Silver		ND	ND	0.024	ND
9	* 1.0 Copper		0.10	0.11	ND	ND
10	* 1.0 Iron		57.0	128.0	0.07	ND
11	* 0.2 Manganese		1.70	1.05	0.50	0.52
12	* 10.0 Zinc		0.30	0.36	0.08	ND
13	5.0 Uranium		ND	ND	ND	ND
14	30.0 Radium 226 & 228	pCi/l	ND	ND	-	-
15	* 250.0 Chloride	mg/l	1059.0	1135.0	1135.0	953.0
16	* 600.0 Sulfate	mg/l	825.0	700.0	855.0	832.0
17	0.001 PCB	ppm	ND	ND	ND	ND
18	* 6-9 pH	S.U.	7.2	7.2	7.35	7.5
19	* 0.005 Phenols	mg/l	0.024	0.065	0.13	ND
20	0.2 Cyanide		ND	ND	ND	ND
21	10.0 Nitrate & N		7.2	ND	0.3	15.4
22	* 5.0 Aluminum		2.0	3.68	ND	ND
23	* 0.75 Boron		ND	0.25	0.69	0.13
24	* 0.05 Cobalt		0.08	0.20	0.32	ND
25	* 1.0 Molybdenum		ND	ND	0.41	0.28
26	* 0.2 Nickel		0.3	ND	0.13	ND
27	1.6 Fluoride		0.284	0.56	0.657	0.65
28	* 1000.0 TDS		3582.0	3512.0	3726.0	3246.0
29	0.01 Benzene		ND	0.015	ND	ND
30	15.0 Toluene		ND	ND	ND	ND
31	0.01 Carbon Tetrachloride		ND	ND	ND	ND
32	0.02 1,2-Dichloroethane		ND	ND	ND	ND
33	0.005 1,1-Dichloroethylene		ND	ND	ND	ND
34	0.02 1,1,2,2-Tetrachloroethylene		ND	ND	ND	ND
35	0.1 1,1,2-Trichloroethylene		ND	ND	ND	ND
36	DEPTH TO STATIC WATER (Rim)	FT.	-	17' 7"	16.63'	15.57'
37	DEPTH OF WELL FROM RIM	FT.	-	24' 5"		
38	STICKUP	FT.	-	1' 10"		
39	ND = < NOMINAL DETECTION LIMITS					

# BLOOMFIELD REFINING MW-4

25

DEC 13, 1984

MARCH 21, 1985

JULY 10, 1985

STD	PARAMETER	UNITS	1st Qtr September 1984	2nd Qtr December 1984	3rd Qtr March 1985	4th Qtr June 1985	
1	0.1 Arsenic	mg/l	ND	0.118	0.005	ND	1
2	1.0 Barium		4.0	7.0	2.5	ND	2
3	0.01 Cadmium		ND	ND	ND	ND	3
4	0.05 Chromium		0.10	0.28	ND	ND	4
5	0.05 Lead		0.088	0.22	0.015	ND	5
6	0.002 Mercury		ND	ND	ND	ND	6
7	0.05 Selenium		0.40	0.42	0.008	0.026	7
8	0.05 Silver		ND	ND	0.004	ND	8
*9	1.0 Copper		0.03	0.35	ND	ND	9
*10	1.0 Iron		43.7	132.0	6.8	12.0	10
*11	0.2 Manganese		7.8	25.4	5.2	5.0	11
*12	10.0 Zinc		0.18	0.38	0.03	ND	12
13	5.0 Uranium		ND	ND	ND	ND	13
14	30.0 Radium 226 & 228	pCi/L	ND	ND	-	-	14
*15	250.0 Chloride	mg/l	410.0	431.0	466.0	556.0	15
*16	600.0 Sulfate	mg/l	10.0	4.0	9.0	3.0	16
17	0.001 PCB	ppm	ND	ND	ND	ND	17
18	6-9 pH	S.U.	7.1	6.9	7.01	7.4	18
*19	0.005 Phenols	mg/l	0.55	0.120	0.005	0.08	19
20	0.2 Cyanide		ND	ND	ND	ND	20
21	10.0 Nitrate as N		0.02	ND	ND	ND	21
*22	5.0 Aluminum		ND	4.49	ND	ND	22
*23	0.75 Boron		ND	0.32	0.89	0.05	23
*24	0.05 Cobalt		ND	0.15	0.14	ND	24
*25	1.0 Molybdenum		ND	ND	0.18	ND	25
*26	0.2 Nickel		0.2	ND	0.16	ND	26
27	1.6 Fluoride		0.597	0.29	0.254	0.23	27
*28	1000.0 TDS		1860.0	2408.0	1860.0	2004.0	28
29	0.01 Benzene		0.419	3.64	14.81	8.64	29
30	15.0 Toluene		0.296	4.47	1.92	1.74	30
31	0.01 Carbon Tetrachloride		ND	ND	ND	ND	31
32	0.02 1,2-Dichloroethane		ND	ND	ND	ND	32
33	0.005 1,1-Dichloroethylene		ND	ND	ND	ND	33
34	0.02 1,1,2-Trichloroethylene		ND	ND	ND	ND	34
35	0.1 1,1,2-Trichloroethylene		ND	ND	ND	ND	35
36	DEPTH TO STATIC WATER FROM RIM	FT	-	24'5"	24'98"	24.50	36
37	DEPTH OF WELL FROM RIM	FT	-	31'2"			37
38	STICKUP			19'			38
39	ND = < NOMINAL DETECTION LIMITS						39
40							40



ELDOMFIELD REFINING  
MW-5

26

MAR 21 1985 JUN 5 1985

STD	PARAMETER	UNITS	1st Qtr September 1984	2nd Qtr December 1984	3rd Qtr March 1985	4th Qtr June 1985	
1	0.1 Arsenic	mg/l			0.011	ND	1
2	1.0 Barium				ND	ND	2
3	0.01 Cadmium				0.046	ND	3
4	0.05 Chromium				ND	ND	4
5	0.05 Lead				0.046	ND	5
6	0.002 Mercury				ND	ND	6
7	0.05 Selenium				0.022	0.026	7
8	0.05 Silver				0.037	ND	8
9	1.0 Copper				ND	ND	9
10	1.0 Iron				0.095	ND	10
11	0.2 Manganese				0.093	0.24	11
12	10.0 Zinc				0.060	ND	12
13	5.0 Uranium				ND	ND	13
14	30.0 Radium 226 & 228	pCi/L			—	—	14
15	250.0 Chloride	mg/l			1257.0	1360.0	15
16	500.0 Sulfate	mg/l			1153.0	1200.0	16
17	0.001 PCB	ppm			ND	ND	17
18	6.709 pH	S.U.			7.22	7.6	18
19	0.005 Phenols	mg/l			0.004	ND	19
20	0.2 Cyanide				ND	ND	20
21	10.0 Nitrate as N				29.0	35.0	21
22	5.0 Aluminum				ND	0.78	22
23	0.75 Boron				1.29	0.15	23
24	0.05 Cobalt				0.15	0.04	24
25	1.0 Molybdenum				ND	ND	25
26	0.2 Nickel				0.19	ND	26
27	1.6 Fluoride				0.391	0.37	27
28	1000.0 TDS				4758.0	4746.0	28
29	0.01 Benzene				ND	ND	29
30	15.0 Toluene				ND	ND	30
31	0.01 Carbon Tetrachloride				ND	ND	31
32	0.02 1,2-Dichloroethane				ND	ND	32
33	0.005 1,1-Dichloroethylene				ND	ND	33
34	0.02 1,1,2,2-Tetrachloroethylene				ND	ND	34
35	0.1 1,1,2-Trichloroethylene				ND	ND	35
36	DEPTH TO STATIC WATER				41.60	41.80	36
37							37
38							38
39							39
40							40



GROUNDWATER ELEVATIONS

9-9-1988

WELL DESIGNATION	T.O.P. ELEVATION (FT)	TOTAL DEPTH OF WELL FROM T.O.P. (FT)	DEPTH TO WATER FROM T.O.P. (FT)	ELEVATION OF TOP OF WATER (FT)
MW-1	5515.77	22.84	15.52	5500.25
MW-2	5519.45	26.67	18.31	5501.14
MW-3	5535.85	36.90	33.44	5502.41
MW-5	5545.10	44.40	42.17	5502.93
MW-6	5551.23	49.60	DRY	DRY
MW-7	5524.09	62.10	24.87	5499.22
MW-8	5531.12	34.94	29.33	5501.79
MW-9	5519.70	33.90	19.89	5499.81
MW-13	5538.42	53.00	37.91	5500.51
MW-4	5524.30	31.44	24.10	5500.20
RW-2	5523.48	38.03	23.37	5500.11
P-2	5523.73	38.33	23.67	5500.06
RW-3 (MW-10)	5516.86	33.92	17.80	5499.06
P-3	5507.20	22.80	8.31	5498.89
RW-1	5525.92	40.98	26.69	5499.23
P-1	5524.62	39.17	25.53	5499.09
MW-11	5506.83	24.73	9.24	5497.59
MW-12	5498.36	14.22	8.18	5490.18
HAMMOND AT SULLIVAN RD.	5504.82	-	6.62	5498.20
HAMMOND NEAR MW-9	5522.95	-	22.99	5499.96

BLOOMFIELD REFINING COMPANY  
GROUNDWATER ELEVATIONS

DATE	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7
T.O.P. →	5515.77	5519.45	5535.85	5524.30	5545.10	5551.23	5524.09
1/27/87	5499.44	5500.92	5502.60	5500.22	5503.10	DRY	5499.29
4/2/87	5499.76	5501.20	5502.86	5500.37	5503.77	AT 5501.63 "	5499.59
- DIMES REMOVED 4/3/87 IRRIGATION STARTED 4/13/87							
4/23/87	5499.33	5500.71	5502.94	5500.32	5504.01	DRY	5499.55
5/27/87	5499.71	5500.83	5502.94	5500.22	5503.95	"	5499.62
10/8/87	5499.63	5500.82	5502.63	5500.03	5503.54	"	5499.20
11/17/87	5498.46			5499.94	5503.17	-	-
6/3/88	5499.85		5502.52	5499.74	5503.03	"	5499.34
11/18/88	5498.27			5499.95	5502.90		

BLOOMFIELD REFINING COMPANY  
GROUNDWATER ELEVATIONS

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MW-8	MW-9	RW-3 MW-10	MW-11	MW-12	HAMMOND AT SULLIVAN	HAMMOND NEAR MW-9	DATE
5531.12	5519.70	5516.86	5506.83	5498.36	5504.82	5522.95	← T.O.P.
5501.85	5498.98	5499.09	-	-	5498.59	5498.60	1/27/87
5502.12	5498.92	5499.33	-	-	5498.55	5498.55	4/2/87
DICES REMOVED 4/3/87, IRRIGATION STARTED 4/13/87							
5502.03	5498.29	5499.07	-	-	5497.55	5497.92	4/23/87
5501.95	5498.73	5499.04	-	-	5498.09	5498.61	5/27/87
INSTALLED 8/1/87 +							
5501.65	5499.16	5498.66	5497.10	5489.03	5497.75	5499.13	10/8/87
DITCH WATER OFF 10/16/87, DICES 12/26/87							
-	-	5498.46	5496.95	5488.94	5497.45	-	10/27/87
-	-	-	-	-	-	-	11/17/87
-	-	-	5497.43	5490.57	-	-	6/3/88

## GROUNDWATER ELEVATIONS

30

		1	2	3	4	5	6	
		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	
	DATE T.O.P. →	5515.77	5519.45	5535.85	5524.32	5545.10	5551.23	
1	2/24/84	5498.91	5500.44	5501.74	5499.46	5502.26	DRY	1
2								2
3	2/23/85	5499.07	5500.55	5502.15	5499.30	5502.75	DRY	3
4	3/3/85	5499.14	5500.82	5502.55	5499.32	5503.50		4
5	WATER ON 4/11/85	5498.99	5500.62	5502.73	5499.30	5503.67		5
6	5/21/85	5499.67	5500.97	5502.74	5499.80	5503.64		6
7	6/14/85	5499.80	5500.99	5502.62	5499.90	5503.40		7
8	6/26/85	5499.94	5500.93	5502.49	5499.73	5503.24		8
9	7/12/85	5500.20	5500.99	5502.43	5499.80	5503.30		9
10	8/2/85	5501.00	5501.25	5502.43	5499.73	5503.67		10
11	9/7/85	5500.34	5501.05	5502.25	5499.60	5503.00		11
12	WATER OFF 10/3/85	5500.23	5500.87	5502.42	5499.70	5503.50		12
13	10/24/85	5499.23	5500.43	5502.23	5499.54	5503.10		13
14	11/3/85	5498.72	5500.05	5502.20	5499.60	5503.7		14
15	12/17/85	5498.35	5499.85	5501.35	5499.40	5502.30		15
16								16
17	1/8/86	5498.59	5500.03	5501.35	5499.35	5502.77	DRY	17
18	1/24/86	5493.75	5500.22	5502.04	5499.2	5502.76	"	18
19	2/20/86	5498.93	5500.62	5502.43	5499.35	5503.30	"	19
20	3/21/86	5499.10	5500.65	5502.89	5499.30	5504.23	"	20
21	SAMPLE 3/26/86	5499.07	5500.65	5502.91	5499.31	5504.24	"	21
22	DIKE REMOVED 4/4/86	5499.07	5500.57	5502.98	5499.21	5504.57	"	22
23	WATER ON 4/15 4/18/86	5498.85	5500.43	5502.98	5499.42	5504.42	"	23
24	4/24 5/5/86	5499.43	5500.57	5502.92	5499.32	5504.27	"	24
25	5/21/86	5500.05	5500.82	5502.85	5499.40	5504.35	"	25
26	6/4/86	5500.41	5500.93	5502.95	5499.40	5504.17	"	26
27	SAMPLE 6/23/86	5501.21	5501.18	5503.05	5499.45	5504.13	"	27
28	7/8/86	5501.34	5501.27	5502.96	5499.44	5503.87	"	28
29	8/4/86	5500.25	5501.13	5502.92	5499.67	5503.77	"	29
30	9/2/86	5500.23	5501.32	5502.94	5499.73	5503.58	"	30
31	SAMPLE 9/18/86	5500.03	5501.22	5502.77	5499.98	5503.52	"	31
32	WATER OFF 10/8/86	5499.83	5501.07	5502.63	5500.13	5503.46	"	32
33	10/15 11/7/86	5499.45	5500.82	5502.72	5500.19	5503.48	"	33
34	DIKE 12/8/86	5499.45	5501.01	5502.78	5500.28	5503.43	"	34
35	SAMPLE 12/16/86	5499.45	5501.05	5502.80	5500.28	5503.41	"	35
36	1/27/87	5499.44	5500.92	5502.60	5500.22	5503.10	DRY AT 5501.63	36
37	REMOVE DIKES 4/2/87	5499.76	5501.20	5502.86	5500.37	5503.77	"	37
38	4/23/87	5499.33	5500.71	5502.94	5500.32	5504.01	"	38
39	IRRIGATION 4/13/87	5499.71	5500.83	5502.94	5500.22	5503.95	"	39
40								40

## GROUNDWATER ELEVATIONS

31

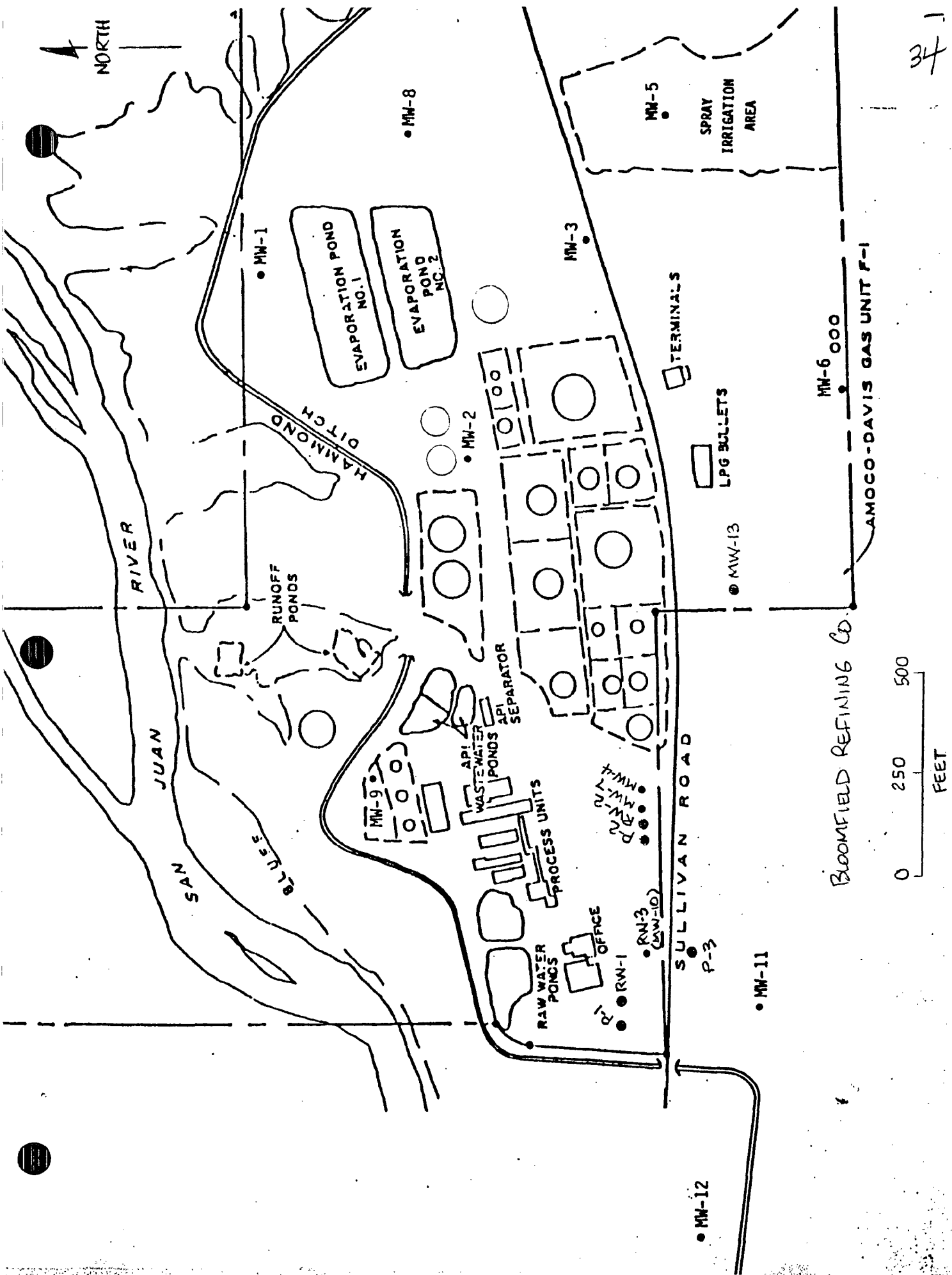
		1	2	3	4	5	6	
		MW-7	MW-8	MW-9	MW-10	HAMMOND	HAMMOND	
		AT SULLIVAN	AT WALKWAY					
DATE	T.O.P. →	5524.09	5531.12	553.70	5516.86	5504.32	5522.95	
								1
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**BLOOMFIELD REFINING COMPANY**  
**GROUNDWATER MONITORING SUMMARY OF DETECTED PARAMETERS**

52

PARAMETER	UNITS	DETECTION LIMIT	NEW MEXICO STANDARDS			
			63-88 3-103 (A)	63-88 MW-4	9-9-88 RW-2	9-9-88 P-2
Benzene	mg/l	0.0002	0.01	8.9	11.000	4.800
Ethylbenzene	mg/l	0.0002	0.75	-	2.900	0.900
Toluene	mg/L	0.0002	0.75	0.93	10.200	1.430
m-Xylene	mg/l	0.0002	0.62	-	17.700	4.500
O-Xylene	mg/l	0.0002		-	4.900	1.460
P-Xylene	mg/l	0.0002		-	6.200	1.570
1,2 Dichloroethane	mg/l	0.001	0.01	-	0.0016	ND
Trans 1,2 Dichloroethene	mg/l	0.001	-	-	ND	ND
Nitrate as N	mg/l	0.01	10.0	0.14	<0.01	-
Phenol	mg/L	0.001	0.005	0.069	0.13	-
Sulfate	mg/L	1	600.	3	<1	-
TDS	mg/L	10	1000	1820	1930	-
<u>OTHERS NOT DETECTED</u>						
1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Chlorobenzene,						
Chloromethane, Bromomethane, Vinyl chloride, Chloroethane,						
Methylene chloride, Trichlorofluoromethane, 1,1-Dichloroethene,						
Bromochloromethane, 1,1-Dichloroethane, Chloroform, 1,1,1-Trichloroethane,						
Carbon tetrachloride, 1,2-Dichloropropane, Trichloroethene,						
2-chloroethyl vinyl ether, Trans 1,3-Dichloropropene, Cis 1,3-Dichloropropene,						
Dibromo chloromethane, Bromoform, 1,1,2-Trichloroethane,						
1,1,2,2-Tetrachloroethane, Tetrachloroethene.						

PARAMETER	RW-3	P-3	RW-1	P-1	MW-11	MW-13
Benzene	12.000	19.400	6.400	102.200	44.400	0.00023
Ethylbenzene	0.00286	ND	0.540	0.00143	0.063	0.00029
Toluene	0.062	0.00435	0.070	0.034	0.340	0.00024
m-Xylene	3.500	22.800	4.800	0.483	2.600	0.00065
O-Xylene	0.103	3.600	8.300	0.061	0.061	0.00056
P-Xylene	1.800	8.700	1.700	0.322	0.745	0.00035
1,2 Dichloroethane	ND	ND	ND	ND	0.0022	0.0156
Trans, 1,2 Dichloroethene	ND	ND	ND	0.0015	ND	ND
Nitrate as N	<0.01	-	<0.01	-	0.06	13.1
Phenol	0.05	-	0.34	-	0.06	0.03
Sulfate	9.5	-	4.5	-	30.	728.
TDS	3250	-	3130	-	1900	3220



34



35

  
Inter-Mountain  
Laboratories, Inc.

2506 West Main Street  
Farmington, New Mexico 87401  
Tel. (505) 326-4737

BLOOMFIELD REFINING COMPANY  
Attn: Chris Hawley  
P.O. Box 159  
Bloomfield, NM 87413

September 27, 1988

Dear Chris:

On September 09, 1988, our laboratory received eight (8) water samples for analysis. Samples were analyzed for parameters requested.

Samples were analyzed according to 40 136, "Guidelines Establishing Test Procedures for Analysis", as amended.

Enclosed are the results of the analyses performed. If you have any questions, please don't hesitate to call.

Sincerely,



Ron R. Richardson  
Lab Director

BLOOMFIELD REFINING COMPANY  
Attn: Chris Hawley  
P.O. Box 159  
Bloomfield, NM 87413

September 26, 1988

RE: Environmental Analysis:

Sample Site: RW-1  
Lab No: F1872  
Date Sampled: 09/09/88 @ 1245  
Date Received: 09/09/88

-----  
Parameter

Nitrate + Nitrite as "N", mg/l.....	<0.01
Phenol, mg/l.....	0.34
Sulfate, mg/l.....	4.5
Total Dissolved Solids @ (180C), mg/l.	3130

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: RW-1  
Laboratory Number: F1872  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

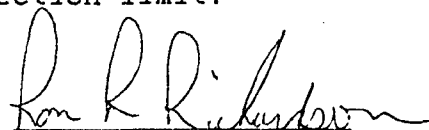
Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/16/88  
Date Analyzed: 09/16/88

Parameter	Concentration	Units
BENZENE	6400 (0.2)	ug/l
ETHYLBENZENE	540 (0.2)	ug/l
TOLUENE	70 (0.2)	ug/l
M-XYLENE	4800 (0.2)	ug/l
O-XYLENE	8300 (0.2)	ug/l
P-XYLENE	1700 (0.2)	ug/l
1,2-DICHLOROBENZENE	ND (0.2)	ug/l
1,3-DICHLOROBENZENE	ND (0.2)	ug/l
1,4-DICHLOROBENZENE	ND (0.2)	ug/l
CHLOROBENZENE	ND (0.2)	ug/l

Method 8020: Aromatic Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

  
Ron R. Richardson  
Laboratory Director

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: RW-1  
Laboratory Number: F1872  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

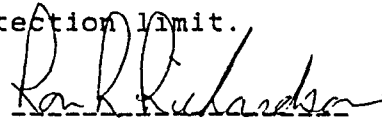
Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/22/88  
Date Analyzed: 09/22/88

Parameter	Concentration	Units
CHLOROMETHANE	ND (1.0)	ug/l
BROMOMETHANE	ND (1.0)	ug/l
VINYL CHLORIDE	ND (1.0)	ug/l
CHLOROETHANE	ND (1.0)	ug/l
METHYLENE CHLORIDE	ND (1.0)	ug/l
TRICHLOROFLUOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHENE	ND (1.0)	ug/l
BROMOCHLOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHANE	ND (1.0)	ug/l
CHLOROFORM	ND (1.0)	ug/l
1,2 DICHLOROETHANE	ND (1.0)	ug/l
1,1,1 TRICHLOROETHANE	ND (1.0)	ug/l
CARBONTETRACHLORIDE	ND (1.0)	ug/l
1,2 DICHLOROPROPANE	ND (1.0)	ug/l
TRICHLOROETHENE	ND (1.0)	ug/l
TRANS 1,2 DICHLOROETHENE	ND (1.0)	ug/l
2 CHLOROETHYL VINYL ETHER	ND (1.0)	ug/l
TRANS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
CIS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
DIBROMO CHLOROMETHANE	ND (1.0)	ug/l
BROMOFORM	ND (1.0)	ug/l
1,1,2 TRICHLOROETHANE	ND (1.0)	ug/l
1,1,2,2 TETRACHLOROETHANE	ND (1.0)	ug/l
TETRACHLOROETHENE	ND (1.0)	ug/l
CHLOROBENZENE	ND (1.0)	ug/l

Method 8010: Halogenated Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

  
Ron R. Richardson  
Laboratory Director

BLOOMFIELD REFINING COMPANY

Attn: Chris Hawley

P.O. Box 159

Bloomfield, NM 87413

September 26, 1988

RE: Environmental Analysis:

Sample Site: RW-2

Lab No: F1873

Date Sampled: 09/09/88 @ 1330

Date Received: 09/09/88

Parameter

Nitrate + Nitrite as "N", mg/l.....	<0.01
Phenol, mg/l.....	0.13
Sulfate, mg/l.....	<1
Total Dissolved Solids @ (180C), mg/l.	1980

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: RW-2  
 Laboratory Number: F1873  
 Analysis Requested: Purgeable Aromatics  
 Sample Matrix: Water

Date Sampled: 09/09/88  
 Date Received: 09/09/88  
 Date Extracted: 09/16/88  
 Date Analyzed: 09/16/88

Parameter	Concentration	Units
-----	-----	-----
BENZENE	11000 (0.2)	ug/l
ETHYLBENZENE	2900 (0.2)	ug/l
TOLUENE	10200 (0.2)	ug/l
M-XYLENE	17700 (0.2)	ug/l
O-XYLENE	4900 (0.2)	ug/l
P-XYLENE	6200 (0.2)	ug/l
1,2-DICHLOROBENZENE	ND (0.2)	ug/l
1,3-DICHLOROBENZENE	ND (0.2)	ug/l
1,4-DICHLOROBENZENE	ND (0.2)	ug/l
CHLOROBENZENE	ND (0.2)	ug/l

Method 8020: Aromatic Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.



Ron R. Richardson  
 Laboratory Director

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: RW-2  
Laboratory Number: F1873  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

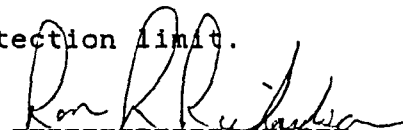
Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/22/88  
Date Analyzed: 09/22/88

Parameter	Concentration	Units
CHLOROMETHANE	ND (1.0)	ug/l
BROMOMETHANE	ND (1.0)	ug/l
VINYL CHLORIDE	ND (1.0)	ug/l
CHLOROETHANE	ND (1.0)	ug/l
METHYLENE CHLORIDE	ND (1.0)	ug/l
TRICHLOROFLUOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHENE	ND (1.0)	ug/l
BROMOCHLOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHANE	ND (1.0)	ug/l
CHLOROFORM	ND (1.0)	ug/l
1,2 DICHLOROETHANE	1.6 (1.0)	ug/l
1,1,1 TRICHLOROETHANE	ND (1.0)	ug/l
CARBONTETRACHLORIDE	ND (1.0)	ug/l
1,2 DICHLOROPROPANE	ND (1.0)	ug/l
TRICHLOROETHENE	ND (1.0)	ug/l
TRANS 1,2 DICHLOROETHENE	ND (1.0)	ug/l
2 CHLOROETHYL VINYL ETHER	ND (1.0)	ug/l
TRANS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
CIS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
DIBROMO CHLOROMETHANE	ND (1.0)	ug/l
BROMOFORM	ND (1.0)	ug/l
1,1,2 TRICHLOROETHANE	ND (1.0)	ug/l
1,1,2,2 TETRACHLOROETHANE	ND (1.0)	ug/l
TETRACHLOROETHENE	ND (1.0)	ug/l
CHLOROBENZENE	ND (1.0)	ug/l

Method 8010: Halogenated Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.



Ron R. Richardson  
Laboratory Director

BLOOMFIELD REFINING COMPANY  
 Attn: Chris Hawley  
 P.O. Box 159  
 Bloomfield, NM 87413

September 26, 1988

RE: Environmental Analysis:

Sample Site: RW-3  
 Lab No: F1874  
 Date Sampled: 09/09/88 @ 1415  
 Date Received: 09/09/88

Parameter

Nitrate + Nitrite as "N", mg/l.....	<0.01
Phenol, mg/l.....	0.05
Sulfate, mg/l.....	9.5
Total Dissolved Solids @ (180C), mg/l.	3250



Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: RW-3  
Laboratory Number: F1874  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

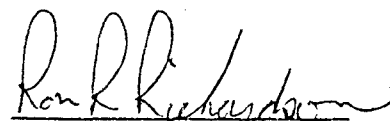
Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/20/88  
Date Analyzed: 09/20/88

Parameter	Concentration	Units
-----	-----	-----
BENZENE	12000 (0.2)	ug/l
ETHYLBENZENE	2.86 (0.2)	ug/l
TOLUENE	62. (0.2)	ug/l
M-XYLENE	3500 (0.2)	ug/l
O-XYLENE	103 (0.2)	ug/l
P-XYLENE	1800 (0.2)	ug/l
1,2-DICHLOROBENZENE	ND (0.2)	ug/l
1,3-DICHLOROBENZENE	ND (0.2)	ug/l
1,4-DICHLOROBENZENE	ND (0.2)	ug/l
CHLOROBENZENE	ND (0.2)	ug/l

Method 8020: Aromatic Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.



Ron R. Richardson  
Laboratory Director

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Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: RW-3  
Laboratory Number: F1874  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/23/88  
Date Analyzed: 09/23/88

Parameter	Concentration	Units
CHLOROMETHANE	ND (1.0)	ug/l
BROMOMETHANE	ND (1.0)	ug/l
VINYL CHLORIDE	ND (1.0)	ug/l
CHLOROETHANE	ND (1.0)	ug/l
METHYLENE CHLORIDE	ND (1.0)	ug/l
TRICHLOROFLUOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHENE	ND (1.0)	ug/l
BROMOCHLOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHANE	ND (1.0)	ug/l
CHLOROFORM	ND (1.0)	ug/l
1,2 DICHLOROETHANE	ND (1.0)	ug/l
1,1,1 TRICHLOROETHANE	ND (1.0)	ug/l
CARBONTETRACHLORIDE	ND (1.0)	ug/l
1,2 DICHLOROPROPANE	ND (1.0)	ug/l
TRICHLOROETHENE	ND (1.0)	ug/l
TRANS 1,2 DICHLOROETHENE	ND (1.0)	ug/l
2 CHLOROETHYL VINYL ETHER	ND (1.0)	ug/l
TRANS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
CIS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
DIBROMO CHLOROMETHANE	ND (1.0)	ug/l
BROMOFORM	ND (1.0)	ug/l
1,1,2 TRICHLOROETHANE	ND (1.0)	ug/l
1,1,2,2 TETRACHLOROETHANE	ND (1.0)	ug/l
TETRACHLOROETHENE	ND (1.0)	ug/l
CHLOROBENZENE	ND (1.0)	ug/l

Method 8010: Halogenated Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

*Ron R. Richardson*  
Ron R. Richardson  
Laboratory Director

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BLOOMFIELD REFINING COMPANY  
Attn: Chris Hawley  
P.O. Box 159  
Bloomfield, NM 87413

September 26, 1988

RE: Environmental Analysis:

Sample Site: MW-11  
Lab No: F1875  
Date Sampled: 09/09/88 @ 1445  
Date Received: 09/09/88

-----  
Parameter

Nitrate + Nitrite as "N", mg/l.....	0.06
Phenol, mg/l.....	0.06
Sulfate, mg/l.....	30
Total Dissolved Solids @ (180C), mg/l.	1900

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: MW-11  
Laboratory Number: F1875  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

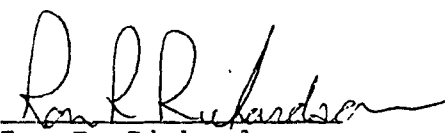
Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/20/88  
Date Analyzed: 09/20/88

Parameter	Concentration	Units
-----	-----	-----
BENZENE	44400 (0.2)	ug/l
ETHYLBENZENE	63. (0.2)	ug/l
TOLUENE	840 (0.2)	ug/l
M-XYLENE	2600 (0.2)	ug/l
O-XYLENE	61. (0.2)	ug/l
P-XYLENE	745 (0.2)	ug/l
1,2-DICHLOROBENZENE	ND (0.2)	ug/l
1,3-DICHLOROBENZENE	ND (0.2)	ug/l
1,4-DICHLOROBENZENE	ND (0.2)	ug/l
CHLOROBENZENE	ND (0.2)	ug/l

Method 8020: Aromatic Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

  
Ron R. Richardson  
Laboratory Director

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: MW-11  
Laboratory Number: F1875  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/22/88  
Date Analyzed: 09/22/88

Parameter	Concentration	Units
CHLOROMETHANE	ND (1.0)	ug/l
BROMOMETHANE	ND (1.0)	ug/l
VINYL CHLORIDE	ND (1.0)	ug/l
CHLOROETHANE	ND (1.0)	ug/l
METHYLENE CHLORIDE	ND (1.0)	ug/l
TRICHLOROFLUOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHENE	ND (1.0)	ug/l
BROMOCHLOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHANE	ND (1.0)	ug/l
CHLOROFORM	ND (1.0)	ug/l
1,2 DICHLOROETHANE	2.2 (1.0)	ug/l
1,1,1 TRICHLOROETHANE	ND (1.0)	ug/l
CARBONTETRACHLORIDE	ND (1.0)	ug/l
1,2 DICHLOROPROPANE	ND (1.0)	ug/l
TRICHLOROETHENE	ND (1.0)	ug/l
TRANS 1,2 DICHLOROETHENE	ND (1.0)	ug/l
2 CHLOROETHYL VINYL ETHER	ND (1.0)	ug/l
TRANS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
CIS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
DIBROMO CHLOROMETHANE	ND (1.0)	ug/l
BROMOFORM	ND (1.0)	ug/l
1,1,2 TRICHLOROETHANE	ND (1.0)	ug/l
1,1,2,2 TETRACHLOROETHANE	ND (1.0)	ug/l
TETRACHLOROETHENE	ND (1.0)	ug/l
CHLOROBENZENE	ND (1.0)	ug/l

Method 8010: Halogenated Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

*Ron R. Richardson*  
Ron R. Richardson  
Laboratory Director

BLOOMFIELD REFINING COMPANY

Attn: Chris Hawley

P.O. Box 159

Bloomfield, NM 87413

September 26, 1988

RE: Environmental Analysis:

Sample Site: MW-13

Lab No: F1876

Date Sampled: 09/09/88 @ 1145

Date Received: 09/09/88

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Parameter

Nitrate + Nitrite as "N", mg/l.....	13.1
Phenol, mg/l.....	0.03
Sulfate, mg/l.....	728
Total Dissolved Solids @ (180C), mg/l.	3220

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: MW-13  
Laboratory Number: F1876  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

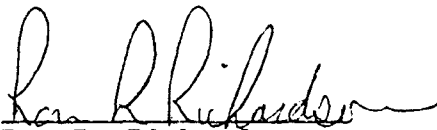
Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/19/88  
Date Analyzed: 09/19/88

Parameter	Concentration	Units
-----	-----	-----
BENZENE	0.23 (0.2)	ug/l
ETHYLBENZENE	0.29 (0.2)	ug/l
TOLUENE	0.24 (0.2)	ug/l
M-XYLENE	0.65 (0.2)	ug/l
O-XYLENE	0.56 (0.2)	ug/l
P-XYLENE	0.35 (0.2)	ug/l
1,2-DICHLOROBENZENE	ND (0.2)	ug/l
1,3-DICHLOROBENZENE	ND (0.2)	ug/l
1,4-DICHLOROBENZENE	ND (0.2)	ug/l
CHLOROBENZENE	ND (0.2)	ug/l

Method 8020: Aromatic Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

  
Ron R. Richardson  
Laboratory Director

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: MW-13  
Laboratory Number: F1876  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/23/88  
Date Analyzed: 09/23/88

Parameter	Concentration	Units
CHLOROMETHANE	ND (1.0)	ug/l
BROMOMETHANE	ND (1.0)	ug/l
VINYL CHLORIDE	ND (1.0)	ug/l
CHLOROETHANE	ND (1.0)	ug/l
METHYLENE CHLORIDE	ND (1.0)	ug/l
TRICHLOROFLUOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHENE	ND (1.0)	ug/l
BROMOCHLOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHANE	ND (1.0)	ug/l
CHLOROFORM	ND (1.0)	ug/l
1,2 DICHLOROETHANE	15.6 (1.0)	ug/l
1,1,1 TRICHLOROETHANE	ND (1.0)	ug/l
CARBONTETRACHLORIDE	ND (1.0)	ug/l
1,2 DICHLOROPROPANE	ND (1.0)	ug/l
TRICHLOROETHENE	ND (1.0)	ug/l
TRANS 1,2 DICHLOROETHENE	ND (1.0)	ug/l
2 CHLOROETHYL VINYL ETHER	ND (1.0)	ug/l
TRANS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
CIS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
DIBROMO CHLOROMETHANE	ND (1.0)	ug/l
BROMOFORM	ND (1.0)	ug/l
1,1,2 TRICHLOROETHANE	ND (1.0)	ug/l
1,1,2,2 TETRACHLOROETHANE	ND (1.0)	ug/l
TETRACHLOROETHENE	ND (1.0)	ug/l
CHLOROBENZENE	ND (1.0)	ug/l

Method 8010: Halogenated Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

*Ron R. Richardson*

Ron R. Richardson  
Laboratory Director



Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: P-1  
Laboratory Number: F1877  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

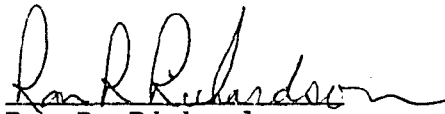
Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/20/88  
Date Analyzed: 09/20/88

Parameter	Concentration	Units
-----	-----	-----
BENZENE	102200 (0.2)	ug/l
ETHYLBENZENE	1.43 (0.2)	ug/l
TOLUENE	34. (0.2)	ug/l
M-XYLENE	483 (0.2)	ug/l
O-XYLENE	61 (0.2)	ug/l
P-XYLENE	322 (0.2)	ug/l
1,2-DICHLOROBENZENE	ND (0.2)	ug/l
1,3-DICHLOROBENZENE	ND (0.2)	ug/l
1,4-DICHLOROBENZENE	ND (0.2)	ug/l
CHLOROBENZENE	ND (0.2)	ug/l

Method 8020: Aromatic Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

  
Ron R. Richardson  
Laboratory Director

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Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: P-1  
Laboratory Number: F1877  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/23/88  
Date Analyzed: 09/23/88

Parameter	Concentration	Units
CHLOROMETHANE	ND (1.0)	ug/l
BROMOMETHANE	ND (1.0)	ug/l
VINYL CHLORIDE	ND (1.0)	ug/l
CHLOROETHANE	ND (1.0)	ug/l
METHYLENE CHLORIDE	ND (1.0)	ug/l
TRICHLOROFLUOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHENE	ND (1.0)	ug/l
BROMOCHLOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHANE	ND (1.0)	ug/l
CHLOROFORM	ND (1.0)	ug/l
1,2 DICHLOROETHANE	ND (1.0)	ug/l
1,1,1 TRICHLOROETHANE	ND (1.0)	ug/l
CARBONTETRACHLORIDE	ND (1.0)	ug/l
1,2 DICHLOROPROPANE	ND (1.0)	ug/l
TRICHLOROETHENE	ND (1.0)	ug/l
TRANS 1,2 DICHLOROETHENE	1.5 (1.0)	ug/l
2 CHLOROETHYL VINYL ETHER	ND (1.0)	ug/l
TRANS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
CIS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
DIBROMO CHLOROMETHANE	ND (1.0)	ug/l
BROMOFORM	ND (1.0)	ug/l
1,1,2 TRICHLOROETHANE	ND (1.0)	ug/l
1,1,2,2 TETRACHLOROETHANE	ND (1.0)	ug/l
TETRACHLOROETHENE	ND (1.0)	ug/l
CHLORO BENZENE	ND (1.0)	ug/l

Method 8010: Halogenated Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

*Ron R. Richardson*  
Ron R. Richardson  
Laboratory Director

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: P-2  
Laboratory Number: F1878  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

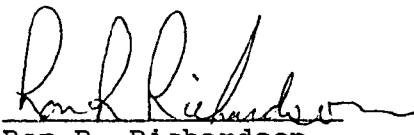
Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/21/88  
Date Analyzed: 09/21/88

Parameter	Concentration	Units
BENZENE	4800 (0.2)	ug/l
ETHYLBENZENE	900 (0.2)	ug/l
TOLUENE	1430 (0.2)	ug/l
M-XYLENE	4500 (0.2)	ug/l
O-XYLENE	1460 (0.2)	ug/l
P-XYLENE	1570 (0.2)	ug/l
1,2-DICHLOROBENZENE	ND (0.2)	ug/l
1,3-DICHLOROBENZENE	ND (0.2)	ug/l
1,4-DICHLOROBENZENE	ND (0.2)	ug/l
CHLOROBENZENE	ND (0.2)	ug/l

Method 8020: Aromatic Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

  
Ron R. Richardson  
Laboratory Director

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: P-2  
Laboratory Number: F1878  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/23/88  
Date Analyzed: 09/23/88

Parameter	Concentration	Units
CHLOROMETHANE	ND (1.0)	ug/l
BROMOMETHANE	ND (1.0)	ug/l
VINYL CHLORIDE	ND (1.0)	ug/l
CHLOROETHANE	ND (1.0)	ug/l
METHYLENE CHLORIDE	ND (1.0)	ug/l
TRICHLOROFLUOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHENE	ND (1.0)	ug/l
BROMOCHLOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHANE	ND (1.0)	ug/l
CHLOROFORM	ND (1.0)	ug/l
1,2 DICHLOROETHANE	ND (1.0)	ug/l
1,1,1 TRICHLOROETHANE	ND (1.0)	ug/l
CARBONTETRACHLORIDE	ND (1.0)	ug/l
1,2 DICHLOROPROPANE	ND (1.0)	ug/l
TRICHLOROETHENE	ND (1.0)	ug/l
TRANS 1,2 DICHLOROETHENE	ND (1.0)	ug/l
2 CHLOROETHYL VINYL ETHER	ND (1.0)	ug/l
TRANS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
CIS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
DIBROMO CHLOROMETHANE	ND (1.0)	ug/l
BROMOFORM	ND (1.0)	ug/l
1,1,2 TRICHLOROETHANE	ND (1.0)	ug/l
1,1,2,2 TETRACHLOROETHANE	ND (1.0)	ug/l
TETRACHLOROETHENE	ND (1.0)	ug/l
CHLOROBENZENE	ND (1.0)	ug/l

Method 8010: Halogenated Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

*Ron R. Richardson*  
Ron R. Richardson  
Laboratory Director

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: P-3  
Laboratory Number: F1879  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

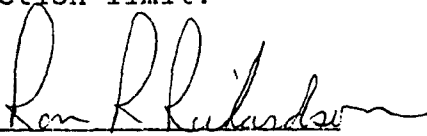
Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/21/88  
Date Analyzed: 09/21/88

Parameter	Concentration	Units
BENZENE	19400 (0.2)	ug/l
ETHYLBENZENE	ND (0.2)	ug/l
TOLUENE	4.35 (0.2)	ug/l
M-XYLENE	22800 (0.2)	ug/l
O-XYLENE	3600 (0.2)	ug/l
P-XYLENE	8700 (0.2)	ug/l
1,2-DICHLOROBENZENE	ND (0.2)	ug/l
1,3-DICHLOROBENZENE	ND (0.2)	ug/l
1,4-DICHLOROBENZENE	ND (0.2)	ug/l
CHLOROBENZENE	ND (0.2)	ug/l

Method 8020: Aromatic Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

  
Ron R. Richardson  
Laboratory Director

Report Date: 09/26/88

Client: BLOOMFIELD REFINING CO.

Sample ID: P-3  
Laboratory Number: F1879  
Analysis Requested: Purgeable Aromatics  
Sample Matrix: Water

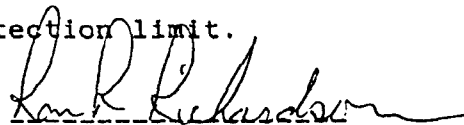
Date Sampled: 09/09/88  
Date Received: 09/09/88  
Date Extracted: 09/23/88  
Date Analyzed: 09/23/88

Parameter	Concentration	Units
-----	-----	-----
CHLOROMETHANE	ND (1.0)	ug/l
BROMOMETHANE	ND (1.0)	ug/l
VINYL CHLORIDE	ND (1.0)	ug/l
CHLOROETHANE	ND (1.0)	ug/l
METHYLENE CHLORIDE	ND (1.0)	ug/l
TRICHLOROFLUOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHENE	ND (1.0)	ug/l
BROMOCHLOROMETHANE	ND (1.0)	ug/l
1,1 DICHLOROETHANE	ND (1.0)	ug/l
CHLOROFORM	ND (1.0)	ug/l
1,2 DICHLOROETHANE	ND (1.0)	ug/l
1,1,1 TRICHLOROETHANE	ND (1.0)	ug/l
CARBONTETRACHLORIDE	ND (1.0)	ug/l
1,2 DICHLOROPROPANE	ND (1.0)	ug/l
TRICHLOROETHENE	ND (1.0)	ug/l
TRANS 1,2 DICHLOROETHENE	ND (1.0)	ug/l
2 CHLOROETHYL VINYL ETHER	ND (1.0)	ug/l
TRANS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
CIS 1,3 DICHLOROPROPENE	ND (1.0)	ug/l
DIBROMO CHLOROMETHANE	ND (1.0)	ug/l
BROMOFORM	ND (1.0)	ug/l
1,1,2 TRICHLOROETHANE	ND (1.0)	ug/l
1,1,2,2 TETRACHLOROETHANE	ND (1.0)	ug/l
TETRACHLOROETHENE	ND (1.0)	ug/l
CHLOROBENZENE	ND (1.0)	ug/l

Method 8010: Halogenated Volatile Organics, SW-846, USEPA, (1982).

(Detection limit in parenthesis.)

ND - Parameter not detected at the stated detection limit.

  
Ron R. Richardson  
Laboratory Director



2506 West Main Street  
Farmington, New Mexico 87401  
Tel. (505) 326-4737

June 24, 1988

Bloomfield Refining Company  
Attn.: Chris Hawley  
Environmental Engineer  
P.O. Box 159  
Bloomfield, NM 87413

Dear Mr. Hawley:

On June 06, 1988, our laboratory received five (5) water samples for analysis. Samples were analyzed for parameters requested.

Of the five samples received, sample MW4 and MW11 were the only two that had the presence of anything. Benzene and Toluene was found in both of these samples. As per conversation, MW11 was to have had Carbontetrachloride in the past and when analyzed this time there was no presence of it.

Methods referenced on the enclosed reports.

Enclosed are the results of the analyses performed. If you have any questions, please don't hesitate to call.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Ron R. Richardson', is written over the typed name.  
Ron R. Richardson  
Lab Director

enclosures:



2506 West Main Street  
Farmington, New Mexico 87401  
Tel. (505) 326-4737

Bloomfield Refining Company  
Attn: Chris Hawley  
Environmental Engineer  
PO Box 159  
Bloomfield, NM 87413

22 June, 1988

Re: Water Analysis

Sample Site: MW1  
IML Lab No: F1448  
Date Sampled: 06/03/88  
Date Received: 06/06/88

pH, (s.u.).....	7.3
Chloride, mg/l.....	1040
Fluoride, mg/l.....	0.60
Nitrate + Nitrite as "N", mg/l.....	3.22
Sulfate, mg/l.....	851
Total Dissolved Solids (180), mg/l...	3500
Phenol, mg/l.....	0.021
Cyanide, mg/l.....	0.022

Trace Metals (Dissolved Concentrations), mg/l

Aluminum.....	-0.1	Iron.....	-0.05
Arsenic.....	-0.005	Lead.....	-0.02
Barium.....	-0.5	Manganese.....	0.85
Boron.....	0.25	Mercury.....	-0.001
Cadimium.....	-0.002	Molybdenum.....	0.21
Chromium.....	-0.02	Nickel.....	0.03
Cobalt.....	-0.02	Selenium.....	-0.005
Copper.....	0.02	Silver.....	-0.01
		Zinc.....	0.03





2506 West Main Street  
Farmington, New Mexico 87401  
Tel. (505) 326-4737

Bloomfield Refining Company  
Attn: Chris Hawley  
Environmental Engineer  
PO Box 159  
Bloomfield, NM 87413

22 June, 1988

Re: Water Analysis

Sample Site: MW4  
IML Lab No: F1449  
Date Sampled: 06/03/88  
Date Received: 06/06/88

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pH, (s.u.).....	6.8
Chloride, mg/l.....	401
Fluoride, mg/l.....	0.28
Nitrate + Nitrite as "N", mg/l.....	0.14
Sulfate, mg/l.....	3
Total Dissolved Solids (180), mg/l...	1820
Phenol, mg/l.....	0.069
Cyanide, mg/l.....	-0.005

Trace Metals (Dissolved Concentrations, mg/l)

Aluminum.....	-0.1	Iron.....	6.44
Arsenic.....	-0.005	Lead.....	-0.02
Barium.....	1.4	Manganese.....	3.51
Boron.....	0.47	Mercury.....	-0.001
Cadimium.....	-0.002	Molybdenum.....	-0.02
Chromium.....	-0.02	Nickel.....	0.02
Cobalt.....	-0.02	Selenium.....	-0.005
Copper.....	-0.01	Silver.....	-0.01
		Zinc.....	0.01

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2506 West Main Street  
Farmington, New Mexico 87401  
Tel. (505) 326-4737

Bloomfield Refining Company  
Attn: Chris Hawley  
Environmental Engineer  
PO Box 159  
Bloomfield, NM 87413

22 June, 1988

Re: Water Analysis

Sample Site: MW5  
IML Lab No: F1450  
Date Sampled: 06/03/88  
Date Received: 06/06/88

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pH, (s.u.).....	
Chloride, mg/l.....	1300
Fluoride, mg/l.....	0.22
Nitrate + Nitrite as "N", mg/l.....	32.9
Sulfate, mg/l.....	1000
Total Dissolved Solids (180), mg/l...	4200
Phenol, mg/l.....	0.064
Cyanide, mg/l.....	0.030

Trace Metals (Dissolved Concentrations, mg/l)

Aluminum.....	-0.1	Iron.....	-0.05
Arsenic.....	-0.005	Lead.....	-0.02
Barium.....	-0.5	Manganese.....	1.45
Boron.....	0.48	Mercury.....	-0.001
Cadmium.....	-0.002	Molybdenum.....	-0.02
Chromium.....	-0.02	Nickel.....	0.04
Cobalt.....	-0.02	Selenium.....	-0.005
Copper.....	-0.01	Silver.....	-0.01
		Zinc.....	-0.01



2506 West Main Street  
Farmington, New Mexico 87401  
Tel. (505) 326-4737

Client: Bloomfield Refining Company

Sample ID: MW1  
Laboratory Number: F1448  
Analysis Requested: Method 602, 8010  
Sample Matrix: Water  
Date Sampled: 06/03/88  
Date Received: 06/06/88

Parameter	Method	Concentration	Units
BENZENE	602	ND (0.001)	mg/l
TOLUENE	602	ND (0.001)	mg/l
CARBONTETRACHLORIDE	8010	ND (0.001)	mg/l
1,2-DICHLOROETHENE	8010	ND (0.001)	mg/l
1,1-DICHLOROETHYLENE	8010	ND (0.001)	mg/l
1,1,2,2-TETRACHLOROETHYLENE	8010	ND (0.001)	mg/l
1,1,2-TRICHLOROETHYLENE	8010	ND (0.001)	mg/l

Method: 602, Purgeable Aromatics, Methods for Organic Chemical Analysis of  
of Muicipal and Industrial Wasrewater, USEPA (1984).

Method: 8010, Halogenated Volatile Organics, SW-846, USEPA (1982).

(Detection limit in Parenthesis)  
ND - Parameter not detected at the stated detection limit.

Ron R. Richardson  
Lab. Director



2506 West Main Street  
Farmington, New Mexico 87401  
Tel. (505) 326-4737

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Client: Bloomfield Refining Company

Sample ID: MW4  
Laboratory Number: F1449  
Analysis Requested: Method 602, 8010  
Sample Matrix: Water  
Date Sampled: 06/03/88  
Date Received: 06/06/88

Parameter	Method	Concentration	Units
BENZENE	602	8.9 (0.001)	mg/l
TOLUENE	602	0.93 (0.001)	mg/l
CARBONTETRACHLORIDE	8010	ND (0.001)	mg/l
1,2-DICHLOROETHENE	8010	ND (0.001)	mg/l
1,1-DICHLOROETHYLENE	8010	ND (0.001)	mg/l
1,1,2,2-TETRACHLOROETHYLENE	8010	ND (0.001)	mg/l
1,1,2-TRICHLOROETHYLENE	8010	ND (0.001)	mg/l

Method: 602, Purgeable Aromatics, Methods for Organic Chemical Analysis of  
of Municipal and Industrial Wastewater, USEPA (1984).

Method: 8010, Halogenated Volatile Organics, SW-846, USEPA (1982).

(Detection limit in Parenthesis)

ND - Parameter not detected at the stated detection limit.

Ron R. Richardson  
Lab. Director

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2506 West Main Street  
Farmington, New Mexico 87401  
Tel. (505) 326-4737

Client: Bloomfield Refining Company

Sample ID: MW5  
Laboratory Number: F1450  
Analysis Requested: Method 602, 8010  
Sample Matrix: Water  
Date Sampled: 06/03/88  
Date Received: 06/06/88

Parameter	Method	Concentration	Units
-----	-----	-----	-----
BENZENE	602	ND (0.001)	mg/l
TOLUENE	602	ND (0.001)	mg/l
CARBONTETRACHLORIDE	8010	ND (0.001)	mg/l
1,2-DICHLOROETHENE	8010	ND (0.001)	mg/l
1,1-DICHLOROETHYLENE	8010	ND (0.001)	mg/l
1,1,2,2-TETRACHLOROETHYLENE	8010	ND (0.001)	mg/l
1,1,2-TRICHLOROETHYLENE	8010	ND (0.001)	mg/l

Method: 602, Purgeable Aromatics, Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, USEPA (1984).

Method: 8010, Halogenated Volatile Organics, SW-846, USEPA (1982).

(Detection limit in Parenthesis)

ND - Parameter not detected at the stated detection limit.

A handwritten signature in dark ink, appearing to read 'Ron R. Richardson', is written over a horizontal line.

Ron R. Richardson  
Lab. Director

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2506 West Main Street  
Farmington, New Mexico 87401  
Tel. (505) 326-4737

Client: Bloomfield Refining Company

Sample ID: MW11  
Laboratory Number: F1528  
Analysis Requested: Method 602, 8010  
Sample Matrix: Water  
Date Sampled: 06/03/88  
Date Received: 06/06/88

Parameter	Method	Concentration	Units
-----	-----	-----	-----
BENZENE	602	3.0 (0.001)	mg/l
TOLUENE	602	0.46 (0.001)	mg/l
CARBONTETRACHLORIDE	8010	ND (0.001)	mg/l
1,2-DICHLOROETHENE	8010	ND (0.001)	mg/l
1,1-DICHLOROETHYLENE	8010	ND (0.001)	mg/l
1,1,2,2-TETRACHLOROETHYLENE	8010	ND (0.001)	mg/l
1,1,2-TRICHLOROETHYLENE	8010	ND (0.001)	mg/l

Method: 602, Purgeable Aromatics, Methods for Organic Chemical Analysis of  
of Municipal and Industrial Wastewater, USEPA (1984).

Method: 8010, Halogenated Volatile Organics, SW-846, USEPA (1982).

(Detection limit in Parenthesis)

ND - Parameter not detected at the stated detection limit.

A handwritten signature in dark ink, appearing to read 'Ron R. Richardson', is written over a horizontal line.

Ron R. Richardson  
Lab. Director

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2506 West Main Street  
Farmington, New Mexico 87401  
Tel. (505) 326-4737

Client: Bloomfield Refining Company

Sample ID: MW12  
Laboratory Number: F1529  
Analysis Requested: Method 602, 8010  
Sample Matrix: Water  
Date Sampled: 06/03/88  
Date Received: 06/06/88

Parameter	Method	Concentration	Units
BENZENE	602	ND (0.001)	mg/l
TOLUENE	602	ND (0.001)	mg/l
CARBONTETRACHLORIDE	8010	ND (0.001)	mg/l
1,2-DICHLOROETHENE	8010	ND (0.001)	mg/l
1,1-DICHLOROETHYLENE	8010	ND (0.001)	mg/l
1,1,2,2-TETRACHLOROETHYLENE	8010	ND (0.001)	mg/l
1,1,2-TRICHLOROETHYLENE	8010	ND (0.001)	mg/l

Method: 602, Purgeable Aromatics, Methods for Organic Chemical Analysis of  
of Municipal and Industrial Wastewater, USEPA (1984).

Method: 8010, Halogenated Volatile Organics, SW-846, USEPA (1982).

(Detection limit in Parenthesis)

ND - Parameter not detected at the stated detection limit.

A handwritten signature in dark ink, reading 'Ron R. Richardson', is written over a horizontal line.

Ron R. Richardson  
Lab. Director

## CHAPTER 4

### GROUNDWATER MONITORING WELL SAMPLING

#### BACKGROUND

Based on the requirements of the approved work plan, each of the groundwater monitoring wells at the Bloomfield refinery has been sampled by Bloomfield staff quarterly over a period of 12 months. Water samples from wells 1 through 3 and 5 were analyzed for priority pollutant heavy metals, cyanide, phenols, TOC, TDS, chloride, sulfate, and volatile organics including benzene, toluene, xylene, and ethylbenzene. In addition, at monitoring well 1, selected organic priority pollutants (see Appendix A) were analyzed during the second and fourth quarters. Water samples from monitoring wells 4 and 7 through 10 were analyzed for base/neutral priority pollutants in addition to the constituents already listed. Monitoring well 6 has been dry and therefore has never yielded any water for analyses.

#### FINDINGS

The laboratory results corresponding to each of the quarterly sampling efforts are presented in Appendix A to this report. In addition, sampling results for Hammond Ditch (covered in chapter 7) are presented in Appendix B to this report. Summaries of these data provide concentrations of detectable substances and laboratory detection limits. Field measurements of pH, conductivity, and water levels are also included. These summaries give a concise picture of each well's performance through the sampling period in Tables 4.1 through 4.9. As a reference, Appendix C presents EPA ambient standards and criteria for superfund remedial sites.

#### DISCUSSION

A review of the summaries shows that monitoring wells 1, 4, 7, 8, and 10 all show appearance of low levels of priority pollutants in only a single quarter's sampling effort. The lack of consistency in appearance



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TABLE 4.1  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-1

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Laboratory Analysis (mg/l)					
Cyanide		0.1	0.07		0.01
Total phenols	0.009	0.017	0.19	0.012	0.001
TOC	18	24	24	18	0.1
TDS	2,936	2,960	2,866	2,498	1
Chloride	750**	994.7	814	774	1
Sulfate	7.5**	630	673	579	1
Antimony				0.25	0.01
Arsenic		0.077	0.05		0.05
Beryllium				0.02	0.01
Cadmium	0.050				0.01
Lead	0.085	0.065	0.15		0.05
Nickel	0.08		0.07	0.06	0.06
Selenium		0.035	0.033	0.03	0.01
Zinc		0.20	0.04	0.012	0.01
Barium				0.055	0.005
Manganese		0.25		1.11	0.005
Aluminum		2.07		4.54	0.05
Boron				0.27	0.01
Molybdenum				0.17	0.01
Nitrate-nitrogen		0.54		2.9	0.1
1,2-dichloroethane				0.002	0.001
Physical Measurements					
pH, field, s.u.	7.30	7.25	7.27	7.19	
Conductivity		4600	4600	4400	
T.O.C. elevation, ft	5515.77	5515.77	5515.77	5515.77	

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TABLE 4.1 (Continued)  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY<sup>1</sup>  
MW-1

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Depth to groundwater, ft	16.70	14.56	15.74	16.32	
Elevation of groundwater, ft	5499.07	5501.21	5500.03	5499.45	

\*Summary includes only pollutants determined to be present at concentrations greater than detection limits.

\*\*Laboratory technique error detected.

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TABLE 4.2  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-2

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Laboratory Analysis (mg/l)					
Cyanide		0.1	0.18		0.01
Total phenols	0.063	0.023	0.17	0.110	0.001
TOC	18	27	23	15	0.1
TDS	2,796	3,650	3,598	3,664	1
Chloride	200**	1,204.6	993	1,012	1
Sulfate	11.0**	1,750	1,104	1,372	1
Antimony				0.48	0.01
Arsenic		0.094	0.08		0.05
Lead	0.12		0.08		0.05
Nickel	0.07		0.12	0.08	0.06
Selenium		0.070	0.104	0.04	0.01
Silver	0.003				0.002
Zinc		0.020	0.02	0.009	0.01
Physical Measurements					
pH, field, s.u.	7.23	7.17	6.78	7.22	
Conductivity		5400	5500	5800	
T.O.C. elevation, ft	5519.45	5519.45	5519.45	5519.45	
Depth to groundwater, ft	18.80	18.27	18.23	18.4	
Elevation of groundwater, ft	5500.76	5501.18	5501.22	5501.05	

\*Summary includes only pollutants determined to be present at concentrations greater than detection limits.

\*\*Laboratory technique error detected.

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TABLE 4.3  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-3

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Laboratory Analysis (mg/l)					
Cyanide		0.25	0.17	0.07	0.1
Total phenols	0.006	0.006	0.082	0.012	0.001
TOC	29	17	16	12	0.1
TDS	4,836	5,362	5,514	4,860	1
Chloride	1,500**	1,584	1,290	1,290	1
Sulfate	29.5**	1,950	2,056	2,204	1
Toluene		0.003			0.001
Xylene		0.030			0.001
Antimony				0.67	0.01
Arsenic		0.15	0.21		0.05
Cadmium	0.12	0.015		0.11	0.01
Lead	0.14	0.070	0.18		0.05
Mercury	0.004				0.002
Nickel	0.08	0.08	0.14	0.10	0.06
Selenium		0.010	0.100	0.05	0.01
Zinc		0.018	0.018	0.01	0.01
Physical Measurements					
pH, field, s.u.	7.08	7.10	7.06	7.12	
Conductivity		6900	7200	6900	
T.O.C. elevation, ft	5535.85	5535.85	5535.85	5535.85	
Depth to groundwater, ft	32.94	32.80	33.08	33.05	
Elevation of groundwater, ft	5502.91	5503.05	5502.77	5502.8	

\*Summary includes only pollutants determined to be present at concentrations greater than detection limits.

\*\*Laboratory technique error detected.

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TABLE 4.4  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-4

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Laboratory Analysis (mg/l)					
Cyanide		0.5			0.01
Total phenols	0.633	0.430	0.085	0.096	0.001
TOC	110	130	63	170	0.1
TDS	1,868	2,266	2,398	2,128	1
Chloride	500**	989.7	754	675	1
Sulfate		12.5			1
Benzene	11.8	3.1	6.65	1.91	0.001
Toluene	7.5	0.290	0.407	1.78	0.001
Ethylbenzene	0.107	0.070	0.140	4.48	0.001
Antimony				0.40	0.01
Arsenic		0.070	0.08		0.05
Cadmium	0.060				0.01
Lead	0.074	0.066			0.05
Nickel	0.08		0.12		0.06
Selenium		0.080	0.063	0.03	0.01
Zinc		0.019	0.008	0.04	0.01
Barium		3.54		2.3	0.005
Iron		12.0		18.6	0.3
Manganese		3.5		5.7	0.005
Aluminum		1.93		3.8	0.05
Boron				0.7	0.01
Fluoride		0.21			0.01
Nitrate-nitrogen				0.41	0.1
2,4-Dichloro-phenol	0.200				0.001
2,4-Dimethyl-phenol		0.058			0.001
4,6-Dinitro-o-cresol	0.100				0.001
2,4-Dinitro-phenol	0.050				0.001
2-Nitrophenol		0.108	0.026		0.001
4-Nitrophenol	0.090	0.302	0.331		0.001

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TABLE 4.4 (Continued)  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-4

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Phenol	0.202				0.001
Benzo(a)anthra- cene		0.016	0.010		0.001
Chrysene		0.012			0.001
Fluorene	0.150			0.023	0.001
Naphthalene	0.036	0.019	0.015	0.036	0.001
Pyrene	0.166		0.005		0.001
2-Chloro- phenol			0.001		0.001
P-chloro-m- cresol			0.045		0.001
Acenaphthene	0.044			0.049	0.001
Physical Measurements					
pH, field, s.u.	6.84	6.85	6.70	6.73	
Conductivity		3800	3900	3800	
T.O.C. eleva- tion, ft	5524.30	5524.30	5524.30	5524.30	
Depth to ground- water, ft	24.9	24.85	24.32	24.02	
Elevation of groundwater, ft	5499.31	5499.45	5499.98	5500.28	

\*Summary includes only pollutants determined to be present at concentrations greater than detection limits.

\*\*Laboratory technique error detected.

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TABLE 4.5  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-5

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Laboratory Analysis (mg/l)					
Cyanide		0.2	0.24		0.01
Total phenols	0.006	0.007	0.034	0.021	0.001
TOC	14	21	20	9	0.1
TDS	3,840	3,778	3,184	3,788	1
Chloride	1,100**	1,339.6	1,151	1,118	1
Sulfate	14**	1,800	1,237	1,132	1
Antimony				0.5	0.01
Arsenic		0.087	0.07		0.05
Cadmium	0.10				0.01
Lead	0.16	0.055			0.05
Nickel	0.10		0.09	0.07	0.06
Selenium		0.071	0.03	0.03	0.01
Zinc	0.012	0.02	0.02	0.016	0.01
Barium				0.01	0.005
Manganese		0.025			0.005
Aluminum		2.75		4.34	0.05
Boron				0.24	0.01
Molybdenum				0.08	0.01
Fluoride		0.3		0.580	0.01
Nitrate-nitrogen		12.5		36	0.1
Physical Measurements					
pH, field, s.u.	7.23	7.18	7.19	7.28	
Conductivity		5400	6000	5700	
T.O.C. elevation, ft	5545.10	5545.10	5545.10	5545.10	
Depth to groundwater, ft	40.86	40.97	41.58	44.69	

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TABLE 4.5 (Continued)  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-5

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Elevation of groundwater, ft	5404.24	5504.13	5503.52	5500.41	

\*Summary includes only pollutants determined to be present at concentrations greater than detection limits.

\*\*Laboratory technique error detected.



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TABLE 4.6  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-7

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Laboratory Analysis (mg/l)					
Cyanide		0.25	0.10		0.01
Total phenols		0.006	0.036	0.025	0.001
TOC	11	4	4	2	0.1
TDS	6,076	6,406	6,348	6,940	1
Chloride	30**	79.9	20	29	1
Sulfate	5.5**	2,400	5,802	3,630	1
Benzene	0.015		0.058	0.009	0.001
Toluene	0.053		0.006		0.001
Ethylbenzene	0.007		0.004		0.001
Antimony				0.83	0.01
Arsenic		0.36	0.22		0.05
Cadmium	0.050	0.030		0.02	0.01
Chromium		0.052		0.08	0.05
Lead		0.24	0.05	0.26	0.05
Nickel	0.08	0.07	0.08	0.07	0.06
Selenium		0.65	0.36	0.09	0.01
Silver		0.060			0.05
Zinc	0.018	0.016	0.02	0.017	0.001
4,6-Dinitro-o-cresol	0.013				0.001
Benzo(a)anthracene		0.001			0.001
Chrysene				0.002	0.001
4-Nitrophenol			0.007		0.001
P-chloro-m-cresol			0.001		0.001
Benzo(k)fluoranthene				0.001	0.001

TABLE 4.6 (Continued)  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-7

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Physical Measurements					
pH, field, s.u.	12.15	11.08	11.35	10.58	
Conductivity		8100	8600	8000	
T.O.C. elevation, ft	5524.09	5524.09	5524.09	5524.09	
Depth to groundwater, ft	26.07	51.00	31.30	24.68	
Elevation of groundwater, ft	5498.02	5473.09	5492.79	5499.41	

\*Summary includes only pollutants determined to be present at concentrations greater than detection limits.

\*\*Laboratory technique error detected.

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TABLE 4.7  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-8

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Laboratory Analysis (mg/l)					
Cyanide				0.1	0.01
Total phenols		0.005	0.097	0.042	0.001
TOC	5	13	8	8	0.1
TDS	806	2,910	2,284	3,450	1
Chloride	160**	839.7	576	913	1
Sulfate	4.0**	1,500	586	1,270	1
Ethylbenzene	0.107				0.01
Antimony				0.67	0.01
Arsenic		0.072	0.03		0.05
Lead		0.055			0.05
Nickel		0.86	0.21	0.43	0.06
Selenium		0.21		0.04	0.01
Zinc		0.020	0.02	0.016	0.01
4-Nitrophenol			0.008		0.01
Physical Measurements					
pH, field, s.u.	7.86	7.26	7.47	7.44	
Conductivity		4400	4000	5000	
T.O.C. elevation, ft	5531.12	5531.12	5531.12	5531.12	
Depth to groundwater, ft	29.15	29.08	29.00	29.02	
Elevation of groundwater, ft	5501.97	5502.04	5502.12	5502.1	

\*Summary includes only pollutants determined to be present at concentrations greater than detection limits.

\*\*Laboratory technique error detected.

TABLE 4.8  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-9

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Laboratory Analysis (mg/l)					
Cyanide		0.4			0.01
Total phenols	0.304	0.372	0.17	0.16	0.001
TOC	143	1,809	240	275	0.1
TDS	2,360	1,718	1,428	1,684	1
Chloride	149**	1,009.7	89	109	1
Sulfate	13.0**	114		20	1
Benzene	7.4	4	17.7	1.49	0.001
Toluene	6.3	1.7	10.6	0.754	0.001
Ethylbenzene	3.2	0.71	0.015	0.504	0.001
Antimony				0.4	0.01
Arsenic			0.02		0.05
Lead		0.059			0.05
Nickel	0.30	0.25	0.13	0.16	0.06
Selenium		0.040		0.03	0.01
Zinc	0.012	0.015	0.05	0.011	0.01
2,4-Dimethyl- phenol	0.160	0.150			0.001
Phenol	0.149	0.170	0.013	0.133	0.001
Fluorene	0.012				0.001
4-Nitrophenol			1.10		0.001
Acenaphthalene			0.028		0.001
Benzo(a)anthra- cene			0.007		0.001
Pyrene			0.010		0.001
Naphthalene				0.029	0.001

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TABLE 4.8 (Continued)  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-9

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Physical Measurements					
pH, field, s.u.	7.01	6.98	6.89	6.91	
Conductivity		2500	2200	2600	
T.O.C. elevation, ft	5519.70	5519.70	5519.70	5519.70	
Depth to groundwater, ft	21.50	20.23	20.13	20.55	
Elevation of groundwater, ft	5498.20	5499.47	5499.57	5499.15	

\*Summary includes only pollutants determined to be present at concentrations greater than detection limits.

\*\*Laboratory technique error detected.

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TABLE 4.9  
RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-10

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Laboratory Analysis (mg/l)					
Cyanide			0.050		0.01
Total phenols	0.147	0.186	0.065	0.055	0.001
TOC	34	76	125	114	0.1
TDS	1,546	2,820	2,408	3,272	1
Chloride	245**	569.8	587	457	1
Sulfate	5.3**	165		10	1
Benzene	0.093		0.041	14.1	0.002
Toluene			0.054	7.4	0.001
Ethylbenzene				0.03	0.001
Antimony				0.56	0.01
Arsenic		0.053			0.05
Beryllium				0.04	0.01
Cadmium	0.020				0.01
Lead		0.059	0.05		0.05
Nickel	0.08	0.25	0.18	0.08	0.06
Selenium		0.040	0.071	0.03	0.01
Zinc		0.015	0.16	0.01	0.01
2,4-Dimethyl-phenol	0.025				0.001
4,6-Dinitro-o-cresol	0.020				0.001
Phenol	0.090				0.001
Anthracene	0.039				0.001
Fluoranthene	0.034				0.001
Fluorene	0.033				0.001
Pyrene	0.030				0.001
2-Nitrophenol			0.002		0.001
4-Nitrophenol			0.016		0.001
Naphthalene				0.004	0.001

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TABLE 4.9 (Continued)

RCRA 3013  
GROUNDWATER RESULTS SUMMARY\*  
MW-10

Parameter	3/26/86	6/23/86	9/18/86	12/16/86	Nominal Detection Limits
Physical Measurements					
pH, field, s.u.	7.07	7.08	6.93	7.05	
Conductivity		4400	4800	5100	
T.O.C. elevation, ft	5516.86	5516.86	5516.86	5516.86	
Depth to groundwater, ft	19.20	18.75	18.11	17.56	
Elevation of groundwater, ft	5497.66	5498.11	5498.75	5499.3	

\*Summary includes only pollutants determined to be present at concentrations greater than detection limits.

\*\*Laboratory technique error detected.

of these compounds is believed to suggest the possibility of laboratory error — particularly when the reported concentration of the substance is very near detection limits.

A good example of the singularity of results is seen in Table 4.6, which reports a summary of monitoring well 7 results. Every hydrocarbon substance detected was at low levels close to the detection limit. Laboratory error may be responsible for detection of these substances.

The monitoring well sampling method is also important in assessing the significance of sample results. Basically, the technique involved BRC staff collection of a sample of water such that the air/liquid interface was acquired in the sample. This process maximized the possibility of acquiring any free-phase hydrocarbons and thus the highest concentrations in the sample. Therefore, sample concentrations for each sampling effort constitute a worst-case assessment of the well water when floating separate-phase contaminants are present.

The significance of concentrations measured at the BRC monitoring wells should be judged from two different standpoints: (1) water use, and (2) subsurface hydrocarbon contamination. From a water use standpoint, the concentrations of pollutants under the BRC site are insignificant. Groundwater is not currently used, and there are no plans for its use in the future.

The monitoring well sampling results include an indicator parameter in total organic carbon (TOC). This parameter can be useful in identifying suspected locations of significant concentrations of subsurface hydrocarbon since TOC values are generally higher in samples having free product.

A review of Tables 4.1 through 4.10 show that TOC values measured in monitoring well 4 were higher than all wells except 9 and 10. Well 9 has exhibited an indication of films of hydrocarbon material at the surface (reported by BRC staff on January 27, 1987). The fact that the TOC results from this well are the highest is consistent with an indication of films in this well. Films have also been indicated in monitoring well 10 during the third and fourth quarter sampling efforts recorded by



BRC staff January 27, 1987. This evidence is consistent with the highest TOC values recorded for these two sampling efforts. The proximity of well 10 to well 4 and the similarity of their respective TOC values during periods of indications of floating hydrocarbon evidence suggest they may be influenced by the same source of hydrocarbon material.

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TO: Bloomfield Refinery

DATE: 0502 revised

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SAMPLE DATE: 3/26/86

ANALYTE

SAMPLE ID/ ANALYTICAL RESULTS

	MW 4	MW 5	MW 7
CN	<0.01 mg/l	<0.01 mg/l	<0.10 <sup>0.1</sup> mg/l
Phenols	0.633 mg/l	0.006 mg/l	<0.001 mg/l
TOC	110 mg/l	14 mg/l	11 mg/l
TDS	1868 mg/l	3840 mg/l	6076 mg/l
Cl	500 mg/l	1100 mg/l	30 mg/l
SO 4	0.3 mg/l	14.0 mg/l	5.5 mg/l
Benzene	11.8 mg/l	ND	0.015 mg/l
Toluene	7.5 mg/l	ND	0.053 mg/l
Xylenes	ND	ND	ND
Ethylbenzene	0.107 mg/l	ND	0.007 mg/l
Sb	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l
As	<0.050 mg/l	<0.050 mg/l	<0.050 mg/l
Be	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l
Cd	0.060 mg/l	0.10 mg/l	0.050 mg/l
Cr	<0.050 mg/l	<0.050 mg/l	<0.050 mg/l
Cu	<0.03 mg/l	<0.03 mg/l	<0.03 mg/l
Pb	0.074 mg/l	0.16 mg/l	<0.050 mg/l
Hg	0.002 mg/l	<0.002 mg/l	<0.002 mg/l
Ni	0.08 mg/l	0.10 mg/l	0.08 mg/l
Se	<0.010 mg/l	<0.010 mg/l	<0.010 mg/l
Ag	<0.050 mg/l	<0.050 mg/l	<0.050 mg/l
Tl	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l
Zn	0.012 mg/l	0.012 mg/l	0.018 mg/l
Acrolein	ND		ND
Acrylonitrile	ND		ND
Bromoform	ND		ND
Carbon Tetrachloride	ND		ND
Chlorobenzene	ND		ND
Chlorodibromomethane	ND		ND
Chloroethane	ND		ND
2-Chloroethylvinyl Ether	ND		ND
Chloroform	ND		ND
Dichlorogromomethane	ND		ND
1,1-Dichloroethane	ND		ND
1,2-Dichloroethane	ND		ND
1,1-Dichloroethylene	ND		ND
1,2-Dichloropropane	ND		ND
1,3-Dichloropropylene	ND		ND

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SAMPLE DATE 7/20/00

TO: Bloomfield Refinery

0502

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## ANALYTE

## SAMPLE ID/ ANALYTICAL RESULTS

	MW 4	MW 5	MW 7
Methyl Bromide	ND		ND
Methyl Chloride	ND		ND
Methylene Chloride	ND		ND
1,1,2,2-Tetrachloroethane	ND		ND
Tetrachloroethylene	ND		ND
1,2-Transdichloroethylene	ND		ND
1,1,1-Trichloroethane	ND		ND
1,1,2-Trichloroethane	ND		ND
Trichloroethylene	ND		ND
Vinyl Chloride	ND		ND
Acid Compounds			
2-chlorophenol	ND		ND
2,4-dichlorophenol	0.200 mg/l		ND
2,4-dimethylphenol	ND		ND
4,6-dinitro-o-cresol	0.100 mg/l		0.013 mg/l
2,4-dinitrophenol	0.050 mg/l		ND
2-nitrophenol	ND		ND
4-nitrophenol	0.090 mg/l		ND
p-chloro-m-cresol	ND		ND
pentachlorophenol	ND		ND
Phenol	0.202 mg/l		ND
2,4,6-trichlorophenol	ND		ND
Base Neutrals			
Acenaphthene	0.044 mg/l		ND
Acenaphthylene	ND		ND
Anthracene	ND		ND
Benzidine	ND		ND
Benzo(a)anthracene	ND		ND
Benzo(a)pyrene	ND		ND
3,4-benzofluoranthene	ND		ND
Benzo(ghi)perylene	ND		ND
Benzo(k)fluoranthene	ND		ND
Bis(2-chloroethoxy)methane	ND		ND
Bis(2-chloroethyl)ether	ND		ND
Bis(2-chloroisopropyl)ether	ND		ND
Bis(2-ethylhexyl)phthalate	ND		ND
4-bromophenyl phenyl ether	ND		ND
Butylbenzyl phthalate	ND		ND
2-chloronaphthalene	ND		ND
4-chlorophenyl phenyl ether	ND		ND
Chrysene	ND		ND

SAMPLE DATE: 3/26/86 86

TO: Bloomfield Refinery

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ANALYTE

SAMPLE ID/ ANALYTICAL RESULTS

	MW 4	MW 5	MW 7
Dibenzo (a,h) anthracene	ND		ND
1,2-Dichlorobenzene	ND		ND
1,3-Dichlorobenzene	ND		ND
1,4-Dichlorobenzene	ND		ND
3,3-Dichlorobenzidine	ND		ND
Diethyl phthalate	ND		ND
Dimethyl phthalate	ND		ND
Din-n-butyl phthalate	ND		ND
2,4-dinitrotoluene	ND		ND
2,6-dinitrotoluene	ND		ND
Di-n-octyl phthalate	ND		ND
1,2-diphenylhydrazine	ND		ND
Fluoranthene	ND		ND
Fluorene	0.150 mg/l		ND
Hexachlorobenzene	ND		ND
Hexachlorobutadiene	ND		ND
Hexachlorocyclopentadiene	ND		ND
Hexachloroethane	ND		ND
Indeno (1,2,3-cd) pyrene	ND		ND
Isophorone	ND		ND
Naphthalene	0.036 mg/l		ND
Nitrobenzene	ND		ND
N-nitrosodimethylamine	ND		ND
N-nitrosodie-n-propylamine	ND		ND
N-nitrosodiphenylamine	ND		ND
Phenanthrene	ND		ND
Pyrene	0.166 mg/l		ND
1,2,4-trichlorobenzene	ND		ND

## CHAPTER 7

### SURFACE WATER SAMPLING

#### BACKGROUND

Surface water sampling of Hammond Ditch and the San Juan River was required by the approved work plan. This sampling was specified to be accomplished during worst-case, low-flow conditions.

Low-flow conditions were determined in the work plan to be at the beginning of the irrigation season for Hammond Ditch (generally mid-April). During this period, the potential for flushing hydrocarbons downstream is the greatest. BRC installs berms in Hammond Ditch at the end of the irrigation season to retain and remove hydrocarbons that may seep into the ditch. Just before resumption of irrigation, the berms are removed. The potential for downstream contamination is therefore greatest when upstream irrigation flows are released and flush the ditch.

Low-flow conditions in the San Juan River generally occur during winter months. Precipitation is generally low during winter. Throughout 1986, flows in the river were unusually high, and low-flow conditions did not occur. Maintenance activities for Navajo Dam (controlling San Juan River flows) in April and May 1987 required lowering the upstream reservoir approximately 31 feet from normal operating level. The lowering of the reservoir has resulted in unseasonably high discharge rates from the dam, which precluded low-flow sampling efforts. Therefore, an extension for sampling of the San Juan River has been requested to permit future sampling during representative low-flow conditions.

#### SAMPLING PROTOCOL

The Hammond Ditch was sampled by BRC staff on April 22, 1986 within 24 hours after initiation of irrigation flows in the ditch. Flows were observed to be intermittent during this period, so a second sampling effort was conducted on April 28, 1986 to assure acquisition of a representative data set.

All samples were collected consistent with the protocol stated in the approved work plan. As specified, depth-integrated samples were collected from a location just downstream of the refinery property south of Sullivan Road, and just downstream of the API wastewater ponds.

## FINDINGS

Results from both Hammond Ditch sampling efforts are contained in Appendix B to this report. Tables 7.1 and 7.2 are summaries of compounds detected during the April 22, 1986 and April 28, 1986 sampling efforts, respectively. Table 7.1 shows that very low levels of pollutants were found during worst-case conditions. Table 7.2 shows that no priority pollutants were detected during the second survey, conducted after irrigation flows had been reestablished.

The results of the April 28, 1986 survey are consistent with the finding in Chapter 5 showing that Hammond Ditch irrigation flows create a hydraulic gradient directed towards the BRC site that minimizes the potential for groundwater transport into the ditch.

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TABLE 7.1  
SUMMARY OF DETECTED ORGANIC COMPOUNDS  
FROM HAMMOND DITCH ON 4/22/86

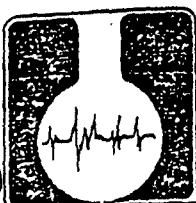
Laboratory Parameter	Hammond Ditch Near Sullivan Road Results (Downstream) (mg/l)	Hammond Ditch Near API Ponds Results (Upstream) (mg/l)	Detection Limits (mg/l)
Phenols	0.002	0.002	0.001
Benzene	0.006		0.001
Toluene	0.003		0.001
Anthracene	0.006		0.001
Benzo(a)anthracene	0.003		0.001
Chrysene	0.005		0.001
Fluoranthene		0.001	0.001
Naphthalene	0.13		0.001
Phenanthrene	0.008		0.001
Pyrene	0.008		0.001

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TABLE 7.2  
SUMMARY OF DETECTED ORGANIC COMPOUNDS  
FROM HAMMOND DITCH ON 4/28/86

Laboratory Parameter	Hammond Ditch Near Sullivan Road Results (Downstream) (mg/l)	Hammond Ditch Near API Ponds Results (Upstream) (mg/l)	Detection Limits (mg/l)
NONE DETECTED			





# ASSAIGAI ANALYTICAL LABORATORIES

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TO: Bloomfield Refinery  
Attn: Chris Hawley  
P.O. Box 159  
Bloomfield NM 87413

## HAMMOND DITCH

DATE: 22 May 1986  
0660 completed  
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SAMPLE DATE: 4/22/86

### ANALYTE

SAMPLE ID/  
NEAR SULLIVAN ROAD  
HSRD 5

ANALYTICAL RESULTS  
NEAR API PONDS  
HAPI 5

CN	<0.01 mg/l	<0.01 mg/l
Phenols	0.002 mg/l	0.002 mg/l
Sb	<0.2 mg/l	<0.2 mg/l
As	<0.050 mg/l	<0.050 mg/l
Be	<0.01 mg/l	<0.01 mg/l
Cd	<0.010 mg/l	<0.010 mg/l
Cr	<0.050 mg/l	<0.050 mg/l
Cu	<0.03 mg/l	<0.03 mg/l
Pb	<0.050 mg/l	<0.050 mg/l
Hg	<0.002 mg/l	<0.002 mg/l
Ni	<0.06 mg/l	<0.06 mg/l
Se	<0.010 mg/l	<0.010 mg/l
Ag	<0.050 mg/l	<0.050 mg/l
Tl	<0.01 mg/l	<0.01 mg/l
Zn	<0.01 mg/l	<0.01 mg/l
Acrolein	ND	ND
Acrylonitrile	ND	ND
Benzene	0.006 mg/l	ND
Bromoform	ND	ND
Carbon Tetrachloride	ND	ND
Chlorobenzene	ND	ND
Chlorodibromomethane	ND	ND
Chloroethane	ND	ND
2-Chloroethylvinyl Ether	ND	ND
Chloroform	ND	ND
Dichlorogromomethane	ND	ND
1,1-Dichloroethane	ND	ND
1,2-Dichloroethane	ND	ND
1,1-Dichloroethylene	ND	ND
1,2-Dichloropropane	ND	ND
1,2-Dichloropropylene	ND	ND
Ethylbenzene	ND	ND

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ANALYTE

SAMPLE ID/ ANALYTICAL RESULTS

HSRD 5

HAPI 5

Methyl Bromide	ND	ND
Methyl Chloride	ND	ND
Methylene Chloride	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND
Tetrachloroethylene	ND	ND
Toluene	0.003 mg/l	ND
1,2-Transdichloroethylene	ND	ND
1,1,1-Trichloroethane	ND	ND
1,1,2-Trichloroethane	ND	ND
Trichloroethylene	ND	ND
Vinyl Chloride	ND	ND
Acid Compounds		
2-chlorophenol	ND	ND
2,4-dichlorophenol	ND	ND
2,4-dimethylphenol	ND	ND
4,6-dinitro-o-cresol	ND	ND
2,4-dinitrophenol	ND	ND
2-nitrophenol	ND	ND
4-nitrophenol	ND	ND
p-chloro-m-cresol	ND	ND
pentachlorophenol	ND	ND
Phenol	ND	ND
2,4,6-trichlorophenol	ND	ND
Base Neutrals		
Acenaphthene	ND	ND
Acenaphthylene	ND	ND
Anthracene	0.006 mg/l	ND
Benzidine	ND	ND
Benzo(a)anthracene	0.003 mg/l	ND
Benzo(a)pyrene	ND	ND
3,4-benzofluoranthene	ND	ND
Benzo(ghi)perylene	ND	ND
Benzo(k)fluoranthene	ND	ND
Bis(2-chloroethoxy)methane	ND	ND
Bis(2-chloroethyl)ether	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND
4-bromophenyl phenyl ether	ND	ND
Butylbenzyl phthalate	ND	ND
2-chloronaphthalene	ND	ND
4-chlorophenyl phenyl ether	ND	ND
Chrysene	0.005 mg/l	ND

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0660 completed

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## ANALYTE

## SAMPLE ID/ ANALYTICAL RESULTS

HSRD 5

HAPI 5

Dibenzo(a,h)anthracene	ND	ND
1,2-Dichlorobenzene	ND	ND
1,3-Dichlorobenzene	ND	ND
1,4-Dichlorobenzene	ND	ND
3,3-Dichlorobenzidine	ND	ND
Diethyl phthalate	ND	ND
Dimethyl phthalate	ND	ND
Din-n-butyl phthalate	ND	ND
2,4-dinitrotoluene	ND	ND
2,6-dinitrotoluene	ND	ND
Di-n-octyl phthalate	ND	ND
1,2-diphenylhydrazine	ND	ND
Fluoranthene	ND	0.001 mg/l
Fluorene	ND	ND
Hexachlorobenzene	ND	ND
Hexachlorobutadiene	ND	ND
Hexachlorocyclopentadiene	ND	ND
Hexachloroethane	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND
Isophorone	ND	ND
Naphthalene	0.013 mg/l	ND
Nitrobenzene	ND	ND
N-nitrosodimethylamine	ND	ND
N-nitrosodie-n-propylamine	ND	ND
N-nitrosodiphenylamine	ND	ND
Phenanthrene	0.007 mg/l	ND
Pyrene	0.008 mg/l	ND
1,2,4-trichlorobenzene	ND	ND

ND = None Detected

REFERENCE: "Test Methods for Evaluating Solid Waste Chemical/Physical Methods", USEPA, SW 846, EMSL-Cincinnati, 1982.

94

TO: Bloomfield Refinery

0660 completed  
Page 4 of 4


NOMINAL DETECTION LIMITS

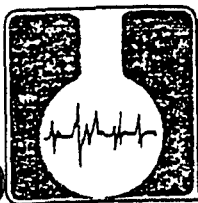
CN	0.01 mg/l
Phenols	0.002 mg/l
Benzene	0.001 mg/l
Toluene	0.001 mg/l
Xylenes	0.001 mg/l
Ethylbenzene	0.001 mg/l
Sb	0.2 mg/l
As	0.050 mg/l
Be	0.010 mg/l
Cd	0.010 mg/l
Cr	0.050 mg/l
Cu	0.03 mg/l
Pb	0.050 mg/l
Hg	0.002 mg/l
Ni	0.06 mg/l
Se	0.010 mg/l
Ag	0.050 mg/l
Tl	0.01 mg/l
Zn	0.01 mg/l

Detection limits for Volatiles, Acid Compounds, and Base/Neutrals are  
all 0.001 mg/l

An invoice for services is enclosed. Thank you for contacting Assaigai  
Laboratories.

Sincerely,

  
Jennifer V. Smith, Ph.D.  
Laboratory Director



# ASSAIGAI ANALYTICAL LABORATORIES

95

TO: Bloomfield Refinery  
Attn: Chris Hawley  
P.O. Box 159  
Bloomfield NM 87413

DATE: 22 May 1986  
0695

Page 1 of 3  
SAMPLE DATE: 4/28/86

HAMMOND DITCH

## ANALYTE

## SAMPLE ID/ ANALYTICAL RESULTS

	U4 NEAR ART WASTE Ponds 0.003 mg/l	D4 NEAR SULLIVAN ROAD 0.002 mg/l
	U6A	D6A
Phenols		
Acrolein	ND	ND
Acrylonitrile	ND	ND
Benzene	ND	ND
Bromoform	ND	ND
Carbon Tetrachloride	ND	ND
Chlorobenzene	ND	ND
Chlorodibromomethane	ND	ND
Chloroethane	ND	ND
2-Chloroethylvinyl Ether	ND	ND
Chloroform	ND	ND
Dichlorogromomethane	ND	ND
1,1-Dichloroethane	ND	ND
1,2-Dichloroethane	ND	ND
1,1-Dichloroethylene	ND	ND
1,2-Dichloropropane	ND	ND
1,2-Dichloropropylene	ND	ND
Ethylbenzene	ND	ND
Methyl Bromide	ND	ND
Methyl Chloride	ND	ND
Methylene Chloride	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND
Tetrachloroethylene	ND	ND
Toluene	ND	ND
1,2-Transdichloroethylene	ND	ND
1,1,1-Trichloroethane	ND	ND
1,1,2-Trichloroethane	ND	ND
Trichloroethylene	ND	ND
Vinly Chloride	ND	ND
Base Neutrals		
Acenapthene	ND	ND
Acenphthylene	ND	ND
Anthracene	ND	ND
Benzidine	ND	ND

96

TO: Bloomfield Refinery

0695

Page 2 of 3

## ANALYTE

## SAMPLE ID/ ANALYTICAL RESULTS

	U6A	D6A
Benzo(a)anthracene	ND	ND
Benzo(a)pyrene	ND	ND
3,4-benzofluoranthene	ND	ND
Benzo(ghi)perylene	ND	ND
Benzo(k)fluoranthene	ND	ND
Bis(2-chloroethoxy)methane	ND	ND
Bis(2-chloroethyl)ether	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND
4-bromophenyl phenyl ether	ND	ND
Butylbenzyl phthalate	ND	ND
2-chloronaphthalene	ND	ND
4-chlorophenyl phenyl ether	ND	ND
Chrysene	ND	ND
Dibenzo(a,h)anthracene	ND	ND
1,2-Dichlorobenzene	ND	ND
1,3-Dichlorobenzene	ND	ND
1,4-Dichlorobenzene	ND	ND
3,3-Dichlorobenzidine	ND	ND
Diethyl phthalate	ND	ND
Dimethyl phthalate	ND	ND
Din-n-butyl phthalate	ND	ND
2,4-dinitrotoluene	ND	ND
2,6-dinitrotoluene	ND	ND
Di-n-octyl phthalate	ND	ND
1,2-diphenylhydrazine	ND	ND
Fluoranthene	ND	ND
Fluorene	ND	ND
Hexachlorobenzene	ND	ND
Hexachlorobutadiene	ND	ND
Hexachlorocyclopentadiene	ND	ND
Hexachloroethane	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND
Isophorone	ND	ND
Naphthalene	ND	ND
Nitrobenzene	ND	ND
N-nitrosodimethylamine	ND	ND
N-nitrosodie-n-propylamine	ND	ND
N-nitrosodiphenylamine	ND	ND
Phenanthrene	ND	ND
Pyrene	ND	ND
1,2,4-trichlorobenzene	ND	ND

ND = None Detected

REFERENCE: "Test Methods for Evaluating Solid Waste Chemical/Physical  
Methods", USEPA, SW 846, EMSL-Cincinnati, 1982



97

September 14, 1987

Mr. William H. Taylor, Jr.  
Chief, Enforcement Section (SA-HE)  
U. S. Environmental Protection Agency  
Region VI  
1201 Elm Street  
Dallas, Texas 75270

RE: Administrative Order (AO)  
Docket No. RCRA-3013-00-185

Dear Mr. Taylor:

Enclosed are the sampling results obtained from the San Juan River during a low-flow condition on July 24, 1987. The samples were taken as stipulated in the approved work plan. We trust that the attached data submitted as an Amendment to the Final Report fulfills the requirements of the subject Administrative Order.

Again, the data submitted herewith was done in fulfillment of a unilaterally issued Administrative Order. It should not be construed, for any purpose, as an admission of liability under any governmental statute or rule or an admission of any question of law. Furthermore, given the complexity of the investigation, Bloomfield Refining Company reserves the right to further interpret or modify any statements or data contained here, if appropriate, in the future.

Sincerely,

*R W Traylor*  
Richard Traylor  
Refinery Manager

RT/jm

Attachment

cc: Mr. Jack Ellvinger  
New Mexico Environmental Improvement Division  
Mr. David G. Boyer  
New Mexico Oil Conservation Division

bcc: Joe Warr  
Mike Leger  
Mike Macy  
~~James Hawley~~

# SAN JUAN RIVER

## SUMMARY OF RESULTS

(mg/L)

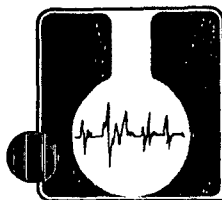
7-24-87

CIA

DAM RELEASE: 1070CES 98

	NOMINAL RETENTION LIMIT	HWY 44 BRIDGE NEAR SIDE	HWY 44 BRIDGE MIDDLE	HWY 44 BRIDGE FAR SIDE	UPSTREAM
CN	0.005	0.066	0.038	0.053	0.044
Phenols	0.001	0.018	<0.001	0.013	0.018
TDS	1	238	228	248	232
Cl	1.0	4.96	4.96	4.96	4.46
SO <sub>4</sub>	1.0	64.5	75.0	64.9	62.4
TDC	1	5	5	6	5
As	0.05	<0.05	<0.05	<0.05	<0.05
Ba	1.0	<1.0	<1.0	<1.0	<1.0
Cd	0.01	<0.01	<0.01	<0.01	<0.01
Cr	0.05	<0.05	<0.05	<0.05	<0.05
Pb	0.05	0.061	0.054	<0.05	<0.05
Hg	0.002	<0.002	<0.002	<0.002	<0.002
Sb	0.01	<0.01	<0.01	<0.01	<0.01
Ag	0.05	<0.05	<0.05	<0.05	<0.05
Volatiles	0.001	ND	ND	ND	ND
Acid Compounds & Base Neutrals	0.01	ND	ND	ND	ND





# ASSAIGAI ANALYTICAL LABORATORIES

SAMPLE DATE : 7-24-87 10:00 AM 99  
HIGHWAY 44 BRIDGE  
20 FEET FROM REFINERY SIDE OF RIVER

TO: Bloomfield Refining  
ATTN: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 28 August 1987  
1174

SAMPLE ID: Plant 1

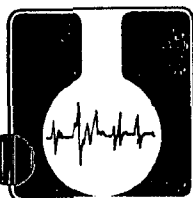
ANALYTE	ANALYTICAL RESULTS	NOMINAL DETECTION LIMITS
CN	0.066 mg/l	0.005 mg/l
Phenols	0.018 mg/l	0.001 mg/l
TDS	238 mg/l	1 mg/l
Cl	4.96 mg/l	1.0 mg/l
SO 4	64.5 mg/l	1.0 mg/l
TOC	5 mg/l	1 mg/l
As	<0.05 mg/l	0.05 mg/l
Ba	<1.0 mg/l	1.0 mg/l
Cd	<0.01 mg/l	0.01 mg/l
Cr	<0.05 mg/l	0.05 mg/l
Pb	0.061 mg/l	0.05 mg/l
Hg	<0.002 mg/l	0.002 mg/l
Se	<0.01 mg/l	0.01 mg/l
Ag	<0.05 mg/l	0.05 mg/l

REFERENCE: "Test Methods for Evaluating Solid Waste, Physical/  
Chemical Methods", USEPA, SW 846, EMSL-Cincinnati, 1982.

An invoice for services is enclosed. Thank you for contacting  
Assaigai Laboratories.

Sincerely,

*Jennifer V. Smith*  
Jennifer V. Smith, Ph.D.  
Laboratory Director



# ASSAIGAI ANALYTICAL LABORATORIES

100

TO: Bloomfield Refinery  
Attn: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 28 August 1987  
1174

SAMPLE ID: Plant 1

## ANALYTE

## ANALYTICAL RESULTS

### VOLATILES

Acrolein	ND
Acrylonitrile	ND
Benzene	ND
Bromoform	ND
Carbon Tetrachloride	ND
Chlorobenzene	ND
Chlorodibromomethane	ND
Chloroethane	ND
2-Chloroethylvinyl ether	ND
Chloroform	ND
Dichlorobromomethane	ND
1,1-Dichloroethane	ND
1,2-Dichloroethane	ND
1,1-Dichloroethylene	ND
1,2-Dichloropropane	ND
1,2-Dichloropropylene	ND
Ethylbenzene	ND
Methyl Bromide	ND
Methyl Chloride	ND
Methylene Chloride	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	ND
1,2-Transdichloroethylene	ND
1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Vinyl Chloride	ND

NOMINAL DETECTION LIMIT: 0.001 mg/l

### ACID COMPOUNDS & BASE NEUTRALS

2-Chlorophenol	ND
2,4-Dichlorophenol	ND
2,4-Dimethylphenol	ND
4,6-Dinitro-o-cresol	ND
2,4-Dinitrophenol	ND
2-Nitrophenol	ND
4-Nitrophenol	ND
P-chloro-m-cresol	ND

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pentachlorophenol	ND
Phenol	ND
2,4,6-Trichlorophenol	ND
Acenaphthylene	ND
Anthracene	ND
Benzidine	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
3,4-Benzofluoranthene	ND
Benzo(g,h,i)perylene	ND
Benzo(k)fluoranthene	ND
Bis(2-chloroethoxy)methane	ND
Bis(2-chloroethyl)ether	ND
Bis(2-chloroisopropyl)ether	ND
Bis(2-ethylhexyl)phthalate	ND
4-Bromophenyl phenyl ether	ND
Butylbenzyl phthalate	ND
2-Chloronaphthalene	ND
4-Chlorophenyl phenyl ether	ND
Chrysene	ND
Dibenzo(a,h)anthracene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND
3,3-Dichlorobenzidine	ND
Diethyl phthalate	ND
Dimethyl phthalate	ND
Din-n-butyl phthalate	ND
2,4-Dinitrotoluene	ND
2,6-Dinitrotoluene	ND
Di-n-octyl phthalate	ND
1,2-Diphenylhydrazine	ND
Fluoranthene	ND
Fluorene	ND
Hexachlorobenzene	ND
Hexachlorobutadiene	ND
Hexachlorocyclopentadiene	ND
Hexachloroethane	ND
Indeno(1,2,3-cd)pyrene	ND
Isophorone	ND
Naphthalene	ND
Nitrobenzene	ND
N-nitrosodimethylamine	ND
N-nitrosodie-n-propylamine	ND
N-nitrosodiphenylamine	ND
Phenanthrene	ND
Pyrene	ND
1,2,4-Trichlorobenzene	ND

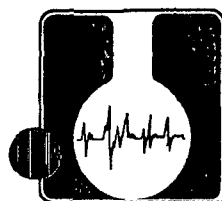
NOMINAL DETECTION LIMIT: 0.01 mg/l

REFERENCES: "Test Methods for Evaluating Solid Waste,-Physical/Chemical Methods", USEPA, SW 846, 3rd Edition.

An invoice for services is included. Thank you for contacting Assaigai Laboratories.

Sincerely,

*Jennifer V. Smith*  
Jennifer V. Smith, Ph.D.  
Laboratory Director



# ASSAIGAI ANALYTICAL LABORATORIES

SAMPLE DATE: 7-24-87 9A.M. 103  
HIGHWAY 44 BRIDGE  
MIDDLE OF RIVER (TOTAL WIDTH=230')

TO: Bloomfield Refining  
ATTN: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 28 August 1987  
1174

SAMPLE ID: Plant 2

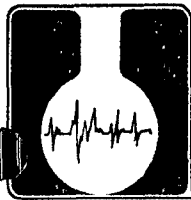
ANALYTE	ANALYTICAL RESULTS	NOMINAL DETECTION LIMITS
CN	0.038 mg/l	0.005 mg/l
Phenols	<0.001 mg/l	0.001 mg/l
TDS	228 mg/l	1 mg/l
Cl	4.96 mg/l	1.0 mg/l
SO <sub>4</sub>	75.0 mg/l	1.0 mg/l
TOC	5 mg/l	1 mg/l
As	<0.05 mg/l	0.05 mg/l
Ba	<1.0 mg/l	1.0 mg/l
Cd	<0.01 mg/l	0.01 mg/l
Cr	<0.05 mg/l	0.05 mg/l
Pb	0.054 mg/l	0.05 mg/l
Hg	<0.002 mg/l	0.002 mg/l
Se	<0.01 mg/l	0.01 mg/l
Ag	<0.05 mg/l	0.05 mg/l

REFERENCE: "Test Methods for Evaluating Solid Waste, Physical/  
Chemical Methods", USEPA, SW 846, EMSL-Cincinnati, 1982.

An invoice for services is enclosed. Thank you for contacting  
Assaigai Laboratories.

Sincerely,

*Jennifer V. Smith*  
Jennifer V. Smith, Ph.D.  
Laboratory Director



# ASSAIGAI ANALYTICAL LABORATORIES

104

TO: Bloomfield Refinery  
ATTN: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: August 28, 1987  
1174

SAMPLE ID: Plant 2

## ACID COMPOUNDS & BASE NEUTRALS

2-Chlorophenol	ND
2,4-Dichlorophenol	ND
2,4-Dimethylphenol	ND
4,6-Dinitro-o-cresol	ND
2,4-Dinitrophenol	ND
2-Nitrophenol	ND
4-Nitrophenol	ND
2-chloro-m-cresol	ND
pentachlorophenol	ND
Phenol	ND
2,4,6-Trichlorophenol	ND
Acenaphthylene	ND
Anthracene	ND
Benzidine	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
3,4-Benzofluoranthene	ND
Benzo(g,h,i)perylene	ND
Benzo(k)fluoranthene	ND
Bis(2-chloroethoxy)methane	ND
Bis(2-chloroethyl)ether	ND
Bis(2-chloroisopropyl)ether	ND
Bis(2-ethylhexyl)phthalate	ND
4-Bromophenyl phenyl ether	ND
Butylbenzyl phthalate	ND
2-Chloronaphthalene	ND
4-Chlorophenyl phenyl ether	ND
Chrysene	ND
Dibenzo(a,h)anthracene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND
3,3-Dichlorobenzidine	ND
Diethyl phthalate	ND
Dimethyl phthalate	ND
Din-n-butyl phthalate	ND
2,4-Dinitrotoluene	ND
2,6-Dinitrotoluene	ND
Di-n-octyl phthalate	ND
1,2-Diphenylhydrazine	ND
Fluoranthene	ND
Fluorene	ND

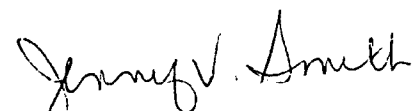
Hexachlorobenzene	ND
Hexachlorobutadiene	ND
Hexachlorocyclopentadiene	ND
Hexachloroethane	ND
Indeno(1,2,3-cd)pyrene	ND
Isophorone	ND
Naphthalene	ND
Nitrobenzene	ND
N-nitrosodimethylamine	ND
N-nitrosodie-n-propylamine	ND
N-nitrosodiphenylamine	ND
Phenanthrene	ND
Pyrene	ND
1,2,4-Trichlorobenzene	ND

NOMINAL DETECTION LIMIT: 0.01 mg/l

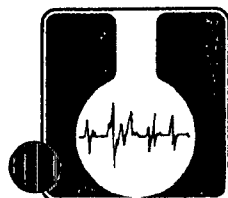
REFERENCES: "Test Methods for Evaluating Solid Waste, -Physical/Chemical Methods", USEPA, SW 846, 3rd Edition.

An invoice for services is included. Thank you for contacting Assaigai Laboratories.

Sincerely,



Jennifer V. Smith, Ph.D.  
Laboratory Director



# ASSAIGAI ANALYTICAL LABORATORIES

SAMPLE DATE : 7-24-87 9:30 AM 106  
HIGHWAY 44 BRIDGE  
20 FEET FROM BLOOMFIELD SIDE OF  
RIVER

TO: Bloomfield Refining  
ATTN: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 28 August 1987  
1174

SAMPLE ID: Plant 3

ANALYTE	ANALYTICAL RESULTS	NOMINAL DETECTION LIMITS
CN	0.053 mg/l	0.005 mg/l
Phenols	0.013 mg/l	0.001 mg/l
TDS	248 mg/l	1 mg/l
Cl	4.96 mg/l	1.0 mg/l
SO 4	64.9 mg/l	1.0 mg/l
TOC	6 mg/l	1 mg/l
As	<0.05 mg/l	0.05 mg/l
Ba	<1.0 mg/l	1.0 mg/l
Cd	<0.01 mg/l	0.01 mg/l
Cr	<0.05 mg/l	0.05 mg/l
Pb	<0.05 mg/l	0.05 mg/l
Hg	<0.002 mg/l	0.002 mg/l
Se	<0.01 mg/l	0.01 mg/l
Ag	<0.05 mg/l	0.05 mg/l

REFERENCE: "Test Methods for Evaluating Solid Waste, Physical/  
Chemical Methods", USEPA, SW 846, EMSL-Cincinnati, 1982.

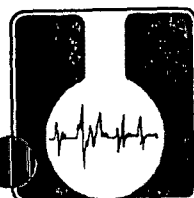
An invoice for services is enclosed. Thank you for contacting  
Assaigai Laboratories.

Sincerely,

*Jennifer V. Smith*  
Jennifer V. Smith, Ph.D.  
Laboratory Director

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# ASSAIGAI ANALYTICAL LABORATORIES

TO: Bloomfield Refinery  
ATTN: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: August 28, 1987  
1174

SAMPLE ID: Plant 3

## ACID COMPOUNDS & BASE NEUTRALS

2-Chlorophenol	ND
2,4-Dichlorophenol	ND
2,4-Dimethylphenol	ND
4,6-Dinitro-o-cresol	ND
2,4-Dinitrophenol	ND
2-Nitrophenol	ND
4-Nitrophenol	ND
2-nitro-o-cresol	ND
pentachlorophenol	ND
Phenol	ND
2,4,6-Trichlorophenol	ND
Acenaphthylene	ND
Anthracene	ND
Benzidine	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
3,4-Benzofluoranthene	ND
Benzo(g,h,i)perylene	ND
Benzo(k)fluoranthene	ND
Bis(2-chloroethoxy)methane	ND
Bis(2-chloroethyl)ether	ND
Bis(2-chloroisopropyl)ether	ND
Bis(2-ethylhexyl)phthalate	ND
4-Bromophenyl phenyl ether	ND
Butylbenzyl phthalate	ND
2-Chloronapthalene	ND
4-Chlorophenyl phenyl ether	ND
Chrysene	ND
Dibenzo(a,h)anthracene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND
3,3-Dichlorobenzidine	ND
Diethyl phthalate	ND
Dimethyl phthalate	ND
Din-n-butyl phthalate	ND
2,4-Dinitrotoluene	ND
2,6-Dinitrotoluene	ND
Di-n-octyl phthalate	ND
1,2-Diphenylhydrazine	ND
Fluoranthene	ND
Fluorene	ND

-2-

Hexachlorobenzene	ND
Hexachlorobutadiene	ND
Hexachlorocyclopentadiene	ND
Hexachloroethane	ND
Indeno(1,2,3-cd)pyrene	ND
Isophorone	ND
Naphthalene	ND
Nitrobenzene	ND
N-nitrosodimethylamine	ND
N-nitrosodie-n-propylamine	ND
N-nitrosodiphenylamine	ND
Phenanthrene	ND
Pyrene	ND
1,2,4-Trichlorobenzene	ND

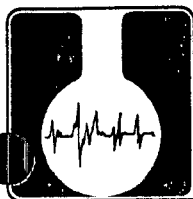
NOMINAL DETECTION LIMIT: 0.01 mg/l

REFERENCES: "Test Methods for Evaluating Solid Waste, -Physical/Chemical Methods", USEPA, SW 846, 3rd Edition.

An invoice for services is included. Thank you for contacting Assaigai Laboratories.

Sincerely,

*Jennifer V. Smith*  
Jennifer V. Smith, Ph.D.  
Laboratory Director



# ASSAIGAI ANALYTICAL LABORATORIES

SAMPLE DATE: 7-24-87 10:30 A.M.  
~ 1/2 MILE UPSTREAM FROM REFINERY  
FROM BANK ON REFINERY SIDE.

109

TO: Bloomfield Refining  
ATTN: Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 28 August 1987  
1174

SAMPLE ID: Plant 4

ANALYTE	ANALYTICAL RESULTS	NOMINAL DETECTION LIMITS
CN	0.044 mg/l	0.005 mg/l
Phenols	0.018 mg/l	0.001 mg/l
TDS	232 mg/l	1 mg/l
Cl	4.46 mg/l	1.0 mg/l
SO <sub>4</sub>	62.6 mg/l	1.0 mg/l
TOC	5 mg/l	1 mg/l
As	<0.05 mg/l	0.05 mg/l
Ba	<1.0 mg/l	1.0 mg/l
Cd	<0.01 mg/l	0.01 mg/l
Cr	<0.05 mg/l	0.05 mg/l
Pb	<0.05 mg/l	0.05 mg/l
Hg	<0.002 mg/l	0.002 mg/l
Se	<0.01 mg/l	0.01 mg/l
Ag	<0.05 mg/l	0.05 mg/l

REFERENCE: "Test Methods for Evaluating Solid Waste, Physical/  
Chemical Methods", USEPA, SW 846, EMSL-Cincinnati, 1982.

An invoice for services is enclosed. Thank you for contacting  
Assaigai Laboratories.

Sincerely,

*Jennifer V. Smith*  
Jennifer V. Smith, Ph.D.  
Laboratory Director



# ASSAIGAI ANALYTICAL LABORATORIES

110

TO: Bloomfield Refinery  
Attn. Chris Hawley  
PO Box 159  
Bloomfield, NM 87413

DATE: 28 August 1987  
1174

SAMPLE ID: Plant 4

## ANALYTE

## ANALYTICAL RESULTS

### VOLATILES

Acrolein	ND
Acrylonitrile	ND
Benzene	ND
Bromoform	ND
Carbon Tetrachloride	ND
Chlorobenzene	ND
Chlorodibromomethane	ND
Chloroethane	ND
2-Chloroethylvinyl ether	ND
Chloroform	ND
Dichlorobromomethane	ND
1,1-Dichloroethane	ND
1,2-Dichloroethane	ND
1,1-Dichloroethylene	ND
1,2-Dichloropropane	ND
1,2-Dichloropropylene	ND
Ethylbenzene	ND
Methyl Bromide	ND
Methyl Chloride	ND
Methylene Chloride	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	ND
1,2-Transdichloroethylene	ND
1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Vinyl Chloride	ND

NOMINAL DETECTION LIMIT: 0.001 mg/l

### ACID COMPOUNDS & BASE NEUTRALS

2-Chlorophenol	ND
2,4-Dichlorophenol	ND
2,4-Dimethylphenol	ND
4,6-Dinitro-o-cresol	ND
2,4-Dinitrophenol	ND
2-Nitrophenol	ND
4-Nitrophenol	ND
p-chloro-m-cresol	ND

7300 Jefferson, N.E. • Albuquerque, New Mexico 87109 • (505) 345-8964

pentachlorophenol	ND
Phenol	ND
2,4,6-Trichlorophenol	ND
Acenaphthylene	ND
Anthracene	ND
Benzidine	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
3,4-Benzofluoranthene	ND
Benzo(g,h,i)perylene	ND
Benzo(k)fluoranthene	ND
Bis(2-chloroethoxy)methane	ND
Bis(2-chloroethyl)ether	ND
Bis(2-chloroisopropyl)ether	ND
Bis(2-ethylhexyl)phthalate	ND
4-Bromophenyl phenyl ether	ND
Butylbenzyl phthalate	ND
2-Chloronaphthalene	ND
4-Chlorophenyl phenyl ether	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND
3,3-Dichlorobenzidine	ND
Diethyl phthalate	ND
Dimethyl phthalate	ND
Din-n-butyl phthalate	ND
2,4-Dinitrotoluene	ND
2,6-Dinitrotoluene	ND
Di-n-octyl phthalate	ND
1,2-Diphenylhydrazine	ND
Fluoranthene	ND
Fluorene	ND
Hexachlorobenzene	ND
Hexachlorobutadiene	ND
Hexachlorocyclopentadiene	ND
Hexachloroethane	ND
Indeno(1,2,3-cd)pyrene	ND
Isophorone	ND
Naphthalene	ND
Nitrobenzene	ND
N-nitrosodimethylamine	ND
N-nitrosodie-n-propylamine	ND
N-nitrosodiphenylamine	ND
Phenanthrene	ND
Pyrene	ND
1,2,4-Trichlorobenzene	ND

NOMINAL DETECTION LIMIT: 0.01 mg/l

REFERENCES: "Test Methods for Evaluating Solid Waste, -Physical/Chemical Methods", USEPA, SW 846, 3rd Edition.

An invoice for services is included. Thank you for contacting Assaigai Laboratories.

Sincerely,

*Jennifer V. Smith*  
Jennifer V. Smith, Ph.D.  
Laboratory Director

STATUS OF RESERVOIRS PROCESSED ON: 03 AUG 87

COLORADO RIVER STORAGE PROJECT

NAVAJO RESERVOIR BEHIND NAVAJO DAM

DATE	SURFACE ELEVATION	LIVE STORAGE	BANK STORAGE	RELEASE AAAAAAAAAAAA		DIVERSION TO		EVAP	INFLW
				POWER	OTHER	NIIP	CFS		
JUL 87	FEET	ACRE-FT	ACRE-FT	CFS	CFS	CFS	CFS		CFS
1	6,053.91	1,268,500		0	5,040	580	70		3,930
2	6,053.52	1,263,800		0	5,040	580	70		3,330
3	6,053.13	1,259,100		0	5,040	500	70		3,250
4	6,052.77	1,254,800		0	5,040	330	70		3,270
5	6,052.47	1,251,200		0	5,040	330	70		3,620
6	6,052.06	1,246,300		0	5,040	500	70		3,150
7	6,051.54	1,240,100		0	5,040	550	70		2,540
8	6,050.98	1,233,500		0	5,040	550	70		2,340
9	6,050.45	1,227,300		0	5,040	550	70		2,540
10	6,049.85	1,220,200		0	5,040	550	70		2,090
11	6,049.24	1,213,100		0	5,040	550	70		2,090
12	6,048.63	1,206,000		0	5,040	550	70		2,090
13	6,047.92	1,197,800		0	5,040	600	70		1,580
14	6,047.28	1,190,500		0	5,040	480	70		1,910
15	6,046.56	1,182,300		0	5,040	600	70		1,580
16	6,045.83	1,174,000		0	5,040	600	70		1,530
17	6,045.23	1,167,300		0	5,040	550	70		2,280
18	6,044.68	1,161,100		0	5,040	550	70		2,540
19	6,043.90	1,152,400		0	5,040	550	60		1,270
20	6,043.23	1,145,000		0	5,040	550	60		1,930
21	6,042.83	1,140,500		0	3,180	600	60		1,570
22	6,042.61	1,138,100		0	1,750	600	60		1,200
23	6,042.49	1,136,800		0	1,020	550	60		980
24	6,042.40	1,135,800	SAMPLE DATE	0	1,010	580	60		1,140
25	6,042.32	1,134,900		0	1,010	580	60		1,190
26	6,042.24	1,134,100		0	1,010	580	60		1,240
27	6,042.19	1,133,500		0	1,010	580	60		1,340
28	6,042.09	1,132,400		0	1,010	590	60		1,100
29	6,042.05	1,132,000		0	760	580	60		1,200
30	6,042.05	1,132,000		0	760	550	60		1,380
31	6,042.01	1,131,500		0	710	280	60		790

TOTALS

ACRE-FT	ACRE-FT	ACRE-FT	ACRE-FT	ACRE-FT
226,230	33,240	3,980	122,960	

MEANS

CFS	CFS	CFS	CFS	CFS
3,679	540		1,999	

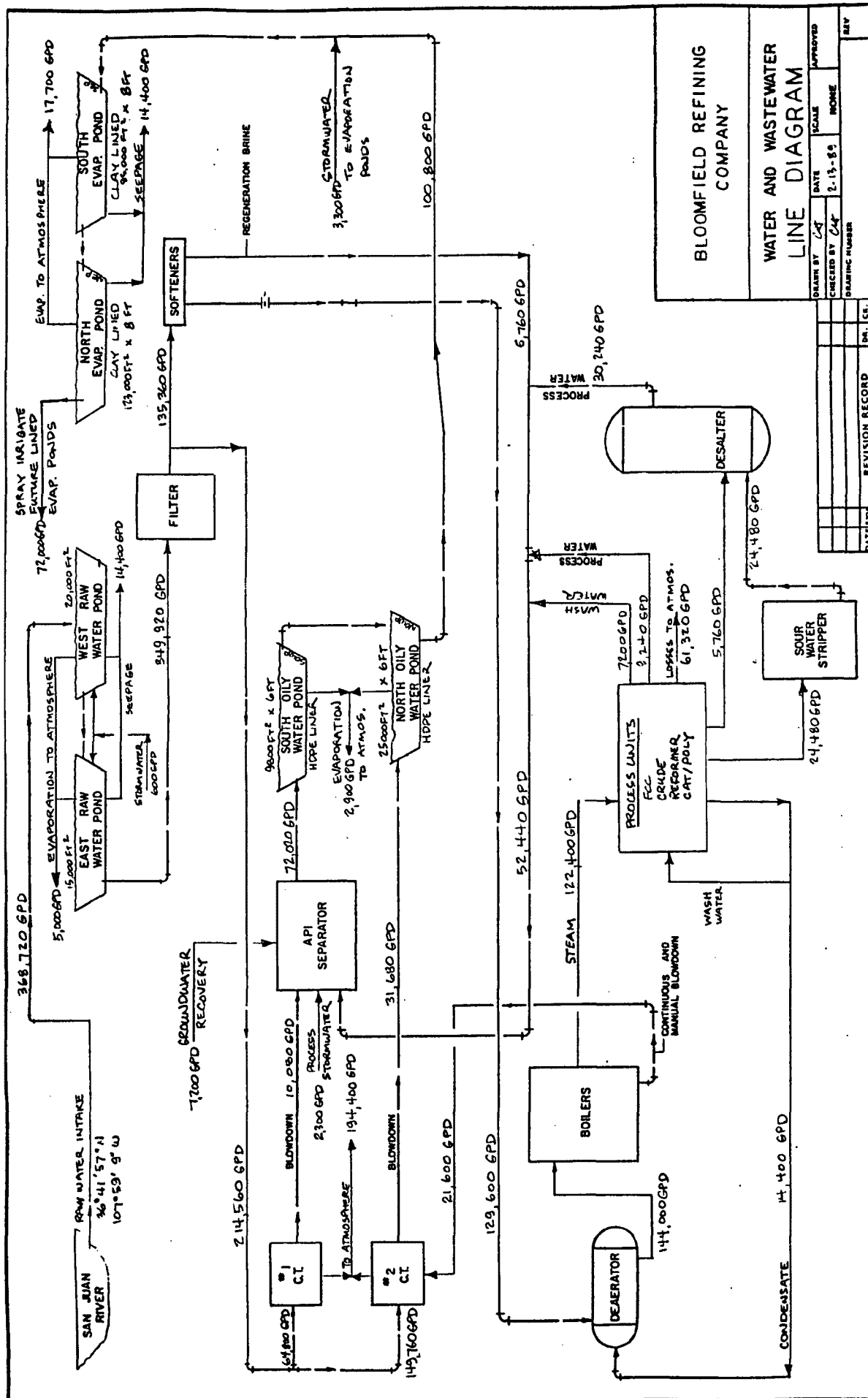
NOTES: ADD DEAD STORAGE OF 12,612 ACRE-FT TO GET TOTAL STORAGE.  
SUBTRACT INACTIVE STORAGE OF 659,900 ACRE-FT TO GET ACTIVE STORAGE.  
LIVE STORAGE VALUES MAY DIFFER SLIGHTLY FROM PUBLISHED TABLES  
NWS ELEV = 6085 FT, CONTENT = 1695900 ACFT

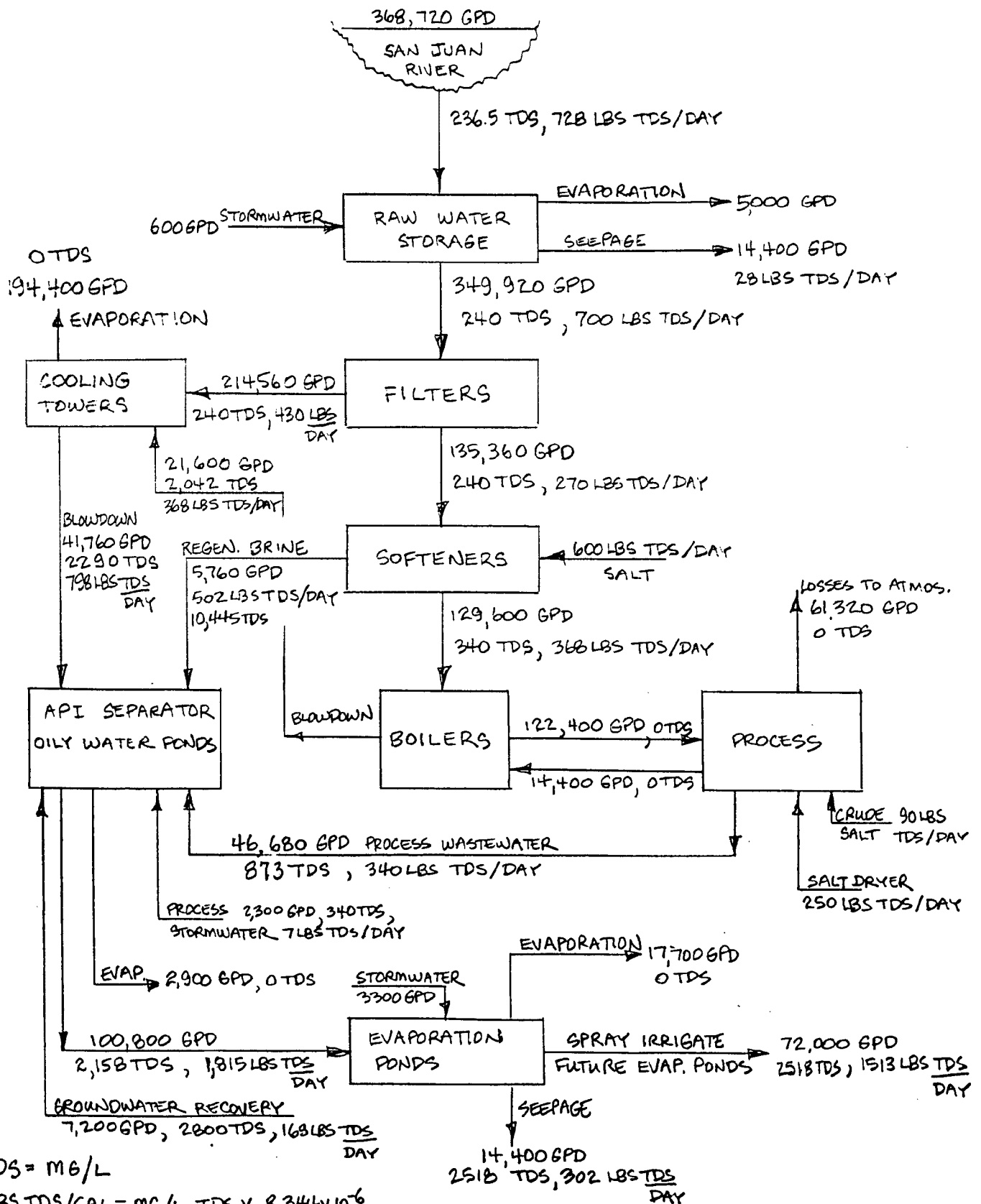
Attachment 5

Water and Wastewater Flow Schematics

1. Water and Wastewater Line Diagram
2. Water and Wastewater TDS Balance







$$\text{TDS} = \text{MG/L}$$

$$\text{LBS TDS/GAL} = \text{MG/L TDS} \times 8.344 \times 10^{-6}$$

Attachment 6

RCRA Contingency Plan & Spill Prevention  
Control and Countermeasure Plan

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Contingency Plan

SPCC Plan

Waste Description

Manifest System

Closure Requirements

Personnel Records

Organizational Chart

Plot Plan

EMERGENCY PLAN  
Revised: 2-12-86

BLOOMFIELD REFINING COMPANY

The purpose of the contingency plan is to outline the actions to be taken, and to assign the responsibility for these actions in the event that explosions, fires, or serious accidents occur. In addition, the plan includes the specific requirements of the Resource Conservation and Recovery Act Part 265 Subpart C - Preparedness and Prevention and Subpart D - Contingency Plan and Emergency Procedures as they apply to Bloomfield Refining Company as a generator only of hazardous waste.

The persons qualified to act as emergency coordinators in response to fires, explosions, or any unplanned, sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility are given in Attachment III to the Plan.

The list of emergency equipment at the facility is provided in Attachment IV to the Plan.

In that each person in the refinery has assigned duties with respect to any fire or emergency, evacuation is not indicated for refinery employees unless as part of the fire fighting and emergency reaction procedures. All contractors and persons other than Bloomfield Refinery employees are instructed to immediately evacuate the refinery premises upon sounding of the siren/alarm and assemble at a safe distance from the front gate. Evacuation, if necessary, will be the responsibility of the Emergency Coordinator on-scene at the time and shall be accomplished based upon the extent of the fire or other emergency and the necessity for evacuation from the area in which such fire emergency is contained. Each employee shall follow the instructions of the on-site Emergency Coordinator with respect to evacuation and shall be responsible for communicating to others any such evacuation instructions.

## EMERGENCY PLAN

## GENERAL

Explosions, fires, or serious accidents may occur despite the finest possible safety precautions. In these times of emergency, it is essential for the protection of personnel and property that preplanned, well rehearsed action be taken. It is the purpose of this emergency plan to outline the action to be taken, and to assign the responsibility for these actions.

This plan is intended to cover foreseeable types of emergencies.

Examples are:

1. Fire and/or explosions.
2. Release of Flammable Vapor or Gas.
3. Release of Toxic Vapor or Gas.
4. Bomb Threats.

All Bloomfield Refinery personnel are part of the emergency organization and are expected to carry out their assigned duties of fire fighting operations involving incipient stage fires as well as more advanced fire and emergencies to the ability of received training. Each employee will participate in a minimum of 16 hours per year of combined academic and practical training to better equip them with the knowledge and skill required for performance of their duties.

All members of the emergency organization should remain currently informed as to their roles in handling these emergency situations.

Each employee will receive the following aspects of industrial firefighting and emergency control:

- a. Hose handling and appliances
- b. Inspection, maintenance and use of portable fire extinguishers
- c. Agents and modes of extinguishment
- d. Tank fire fighting (pressure and atmospheric)
- e. Operation of mobile fire equipment
- f. Operation of fire pumps
- g. Use of protective clothing
- h. Use and inspection of breathing apparatus
- i. Control of hazardous materials
- j. Control of leaks (with or without fire)
- k. Control of spills (with or without fire)

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## I RESPONSIBILITIES

## OPERATING SHIFT SUPERVISOR

It is realized that the Operating Shift Supervisor has special knowledge of operating equipment and process flows and is generally most available at any time day or night. For this reason it will be the Operating Supervisor's responsibility to assume command of emergency control efforts and act as Fire Chief until arrival of a member of the Safety Department. The Shift Supervisor will then continue to assist the control effort as a member of the command team.

## SAFETY SUPERVISOR

Direct field command at emergency scene and assure all functions pertaining to the emergency operation are being carried out in an efficient manner. Later references in this order may signify this position by the title of "Fire Chief".

## SAFETY REPRESENTATIVE

Assist the direction of field command by establishing an Emergency Command Post to coordinate activities and establish lines of communication. In the absence of the Safety Supervisor the Safety Representative will assume duties required as Fire Chief.

## OPERATION DAY SUPERVISOR

Coordinate activities between emergency command post at emergency scene and process equipment control in control room.

## CHIEF OPERATOR

Maintain control of process unit(s) left operating and act as dispatch operator until an Emergency Control Center can be established. The Chief Operator is responsible for maintaining an updated list of employees and their phone numbers in a readily accessible location in the control room. It is also the Chief Operators responsibility to know the call out system and how to activate it on moments notice.

## OPERATORS

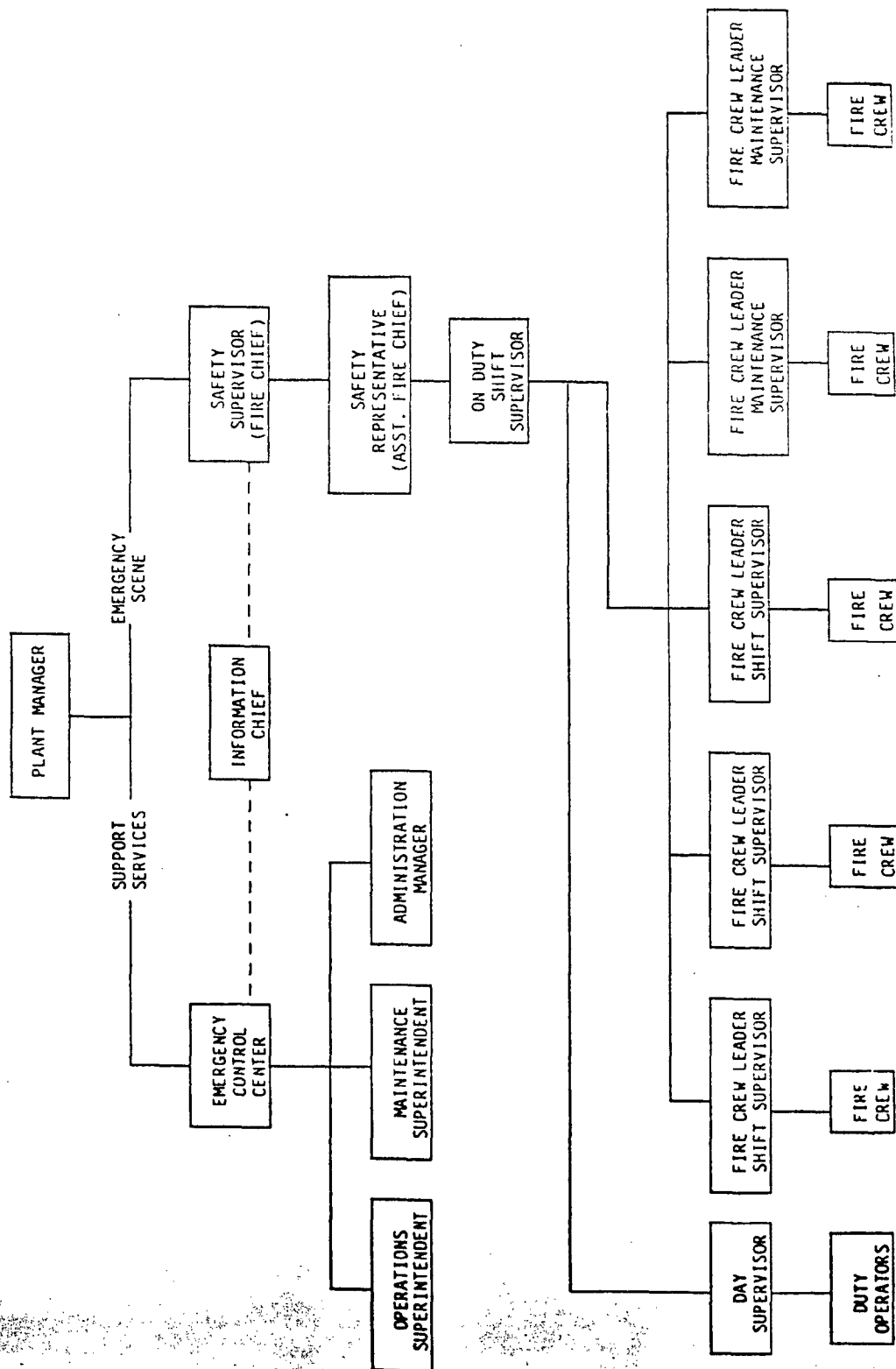
Perform necessary shut down of involved equipment as required by the situation and assist emergency control efforts as fire crew member.

## PUMPER/GAUGER

Assist as fire crew member until relieved by the Fire Chief to take command of gate guard duties as outlined in the



## ORGANIZATIONAL CHART



## II FIRE AND/OR EXPLOSION

## A. REPORTING THE FIRE

Upon discovering a fire, unless it is obvious that the fire is so small that it can be easily extinguished, proceed immediately to the alert sounding station south of the control room and signal the alarm. The alarm signals will determine the general location of the emergency by use of fire zones. (See Chart).

If the nearest alert station is not readily accessible, the alert should be communicated to the control room by radio or telephone, who will in turn sound the alert over the alarm system. When contact is made to the control room, give your name, the location of the fire, and the fire zone. Be calm; be sure that the person answering has received the proper information before discontinuing the conversation.

## B. FIRE ZONES

To make it possible to quickly designate the general area of a fire or emergency, the Bloomfield Complex has been divided into three fire zones. The fire alarms should be sounded in a manner to identify the general location of the emergency. The alarm should sound a long blast, followed by short blast(s) which indicate the fire zone and then repeated after a short time lapse. The following table lists the fire zones, location, and corresponding alarm.

Zone No.	Locations	Alarm Signal
Zone 1	Process Unit	1 long-1 short
Zone 2	Tank Farm	1 long-2 short
Zone 3	Term./Trans.	1 long-3 short

For Toxic Leaks or  
Gas Leaks Without Fire

2 longs & above coding

A recall or all clear signal will be sounded when requested by the Fire Chief and will be characterized by five short blasts of the fire alarm.

## C. IMMEDIATE CORRECTIVE ACTION

Most fires are relatively small when first ignited, but can spread very rapidly. Many serious fires and explosions have been prevented by taking immediate action to extinguish the

fire or prevent the escape of the flammable liquid, vapor or gas, yet not endangering personal safety. While the fire is being reported, operations and maintenance personnel at the scene should immediately proceed to block off the feed to the fire and put to use available emergency equipment as needed. Do not wait for the fire crews to arrive; in most instances, the fire can be extinguished or contained before fire crews arrive.

#### D. DIRECTION OF FIRE FIGHTING EFFORTS

The ultimate responsibility as Fire Chief rests with the Safety Supervisor. However, until he arrives, direction of the fire fighting effort must be assumed by others at the scene of the emergency. When the alarm is sounded the first Operating Shift Supervisor at the scene should assume responsibility for directing the fire fighting effort and isolating process equipment. Command should be transferred to a member of the safety department upon arrival and briefing, releasing the supervisor for fire crew leader duties.

#### E. FIRE WATER SUPPLY

Water for fire fighting purposes is provided by automatic start stand-by pumps, and a system of underground piping.

If long duration fire fighting is evident all possible water resources from in-plant storage and city water supplies shall be made available and periodic checks of the fire pumps should be made. The fire officer in charge shall make the determination when the above items become necessary and designate an available operator to assume the duties.

#### F. EMERGENCY CALL OUT PROCEDURE

An emergency occurring after normal working hours can pose serious manpower problems. To minimize these problems the following call out procedure should be followed.

Alert lists are provided to notify appropriate refinery personnel of an emergency in an orderly manner. Each list has a specific purpose and is designated as to who makes the call, who is called and at what times these lists are used.

##### ALERT LIST # 1

The following people should be contacted by the Shift Supervisor in the event of a bomb threat, suspected radiation accident or a fire or emergency that has been controlled by personnel on duty:

1. Safety Supervisor or Safety Representative
2. Operation Superintendent or Operation Day Supervisor

## ALERT LIST # 2

This call out list is designed to notify personnel of a major emergency situation that requires additional manpower. The Chief Operator, upon request of the Fire Chief, will call Contact of New Mexico at 327-4666 who will make the actual contact with our people. For reference purposes this list consists of:

1. Safety Department Personnel
2. Maintenance Supervisors
3. Operation Supervisors
4. Maintenance Employees
5. Operation Employees

## ALERT LIST # 3

To be called by Chief Operator when extended emergency control efforts are evident and the Fire Chief determines the necessity for an Emergency Control Center:

1. Plant Manager
2. Administrative Manager

The Administrative Manager will be responsible for contacting personnel to perform support services as necessary.

All phone calls made should calmly identify the caller and explain the situation as completely and briefly as possible. The desired course of action should be explained.

## G. EMERGENCY COMMAND POST

During a major emergency, it will be necessary to establish communication between members of management at the scene and the Emergency Control Center outside the immediate area of the fire.

This Emergency Command Post will be a base for the direction of all fire fighting activities as well as a communication post to all involved. All information from this post will be transmitted by way of radio or communicated directly by the Information Chief to the Emergency Control Center.

Outside aid organizations should report to this command post after arrival and clearance at the front gate.

All off duty employees should contact this post upon arrival for fire crew assignments.

#### H. EMERGENCY CONTROL CENTER

During a major emergency, it will be necessary to establish an Emergency Control Center where senior management have means of communication with the Emergency Command Post, with personnel outside the plant, with necessary corporate offices, and with press and news media personnel.

The maintenance office building has been designated as the Emergency Control Center. In anticipation of its use, a radio receive-transmitter will remain in this center at times of emergency.

When the necessity arises that requires establishing an Emergency Control Center, the Administration Manager or another member of this team will be responsible for contacting secretarial, purchasing and warehousing personnel to aid in the emergency effort through actions within their departmental control.

#### I. REQUESTS FOR OUTSIDE ASSISTANCE

In the event that outside assistance is needed, we can request this aid from the local fire departments-primarily the Bloomfield Department. It shall be the responsibility of the Chief Operator to request this aid, by telephone, upon the direction of the Fire Chief.

Mutual aid personnel and equipment will assemble outside the main refinery gate in the roadway southwest of the gate. The person in charge of each group should report to the main gate and stand by. Personnel and equipment will be admitted to the refinery only after specific authorization and instruction is given by the Emergency Command Post. Each responding Fire Chief or Officer is responsible for the specific safety of their personnel. Each responding fire chief will work with and under the direction of the Bloomfield Refinery Fire Chief at the scene.

#### J. RECALL

As soon as the emergency is under control and in a safe condition, the Fire Chief will ask for the recall signal to be sounded. After the recall signal is sounded the Chief Operator will repeat over the radio three times on each channel that all is clear and under control.

The fire equipment will then be cleaned and returned to its designated locations for future use. When all equipment is

returned to operable condition, fire crew members will return to their regular jobs, or may return home when released by the Fire Chief.

#### K. PUBLIC RELATIONS

A spectacular fire is a very newsworthy event, and we can expect visitations by members of the news media. It is quite important that factual information be made available as soon as possible.

This general policy is based on recognition that the press has a legitimate interest in any disaster that strikes a company facility. It is to the company's benefit to cooperate with news media when emergencies occur. This is the company's best guarantee that the resulting news reports are factual and accurately present the company's position. Only the facility manager or designee will release information to the news media.

A press waiting center will be set up in the main shop complex until such time as the Emergency Control Center is prepared to make a statement. A person designated by the Emergency Control Center team will remain with press personnel and assure them they will be furnished information and updates as soon as possible. Under no circumstances will news media personnel be allowed at the fire scene without explicit consent from the Fire Chief and never unaccompanied.

#### L. PLANT SECURITY

During a major emergency, the main entrance gate becomes an important center of activity. Entry of personnel and vehicles into the plant must be curtailed or stopped completely. Congestion of vehicles must be prevented to make it possible to bring in emergency equipment without delay.

The activities at the main gate will be supervised by the Pumper/Gauger when relieved of his fire crew duties by the Fire Chief. These activities should include closing the east entrance gates in the boneyard and at the roadway by the burnerfuel rack and taking station at the front gate to restrict and eliminate all unnecessary traffic.

If additional security is needed along the frontage road, contact will be made to the county sheriff's office at 334-6107. The gate guard will request this assistance through the Emergency Control Center if one has been established.

#### M. INJURIES AND FIRST AID

Injuries will be handled in accordance with Safety Order S-12. If a major explosion or fire results in multiple serious injuries the Office Staff is to coordinate first aid and

medical treatment of these individuals. The Shift Supervisor or Fire Chief should consider the injuries when requesting outside assistance. If ambulances or medical assistance is needed, it can be obtained from the Bloomfield Fire Department and the San Juan Emergency Center.

After medical treatment for the individuals has been taken care of, the first aid coordination group should see that contact is made with the injured parties families. A member of the Emergency Control Center will make this contact with the information supplied by the first aid group.

#### N. EMERGENCY SHUT DOWN PROCEDURE

A quick efficient shut down of equipment is a necessity in emergency action situations. Each situation will be different but the main objective is to eliminate flow to the involved area. This may include closing a suction valve to a pump for seal fires or may require complete unit shut down for more involved emergencies. Each operator should know the safe emergency shut down procedure for this unit.

Emergency shut down procedures are found in the unit operating manuals as laid down by the engineering department for your information.

#### III RELEASE OF FLAMMABLE VAPOR OR GAS

In general, releases of flammable vapors or gas are handled in much the same way as fires. The reporting of these emergencies, sounding of the alarm, and reporting of fire crews should be identical to the procedure outlined in the other sections of this emergency plan.

All sources of ignition near the release should be extinguished immediately. Large quantities of water should be directed upon the area of discharge to disperse the flammable material and isolate it from sources of ignition. Every effort should be made to quickly isolate and depressure the leaking equipment.

The formation of a flammable vapor cloud can be extremely hazardous. Every effort should be made to prevent personnel from entering the cloud, because they can be engulfed in the flame if ignition occurs.

#### IV RELEASE OF TOXIC VAPOR OR GAS

In the event of a major release of a toxic vapor or gas, it may be desirable to absorb or disperse the toxic material with large volumes of water. In this event, the regular alarm should be sounded, as outlined in other sections of this plan, and fire crews will respond.

When responding to a release of, or fire involving toxic material, all personnel should respond to the upwind side of the emergency. All personnel should be prepared to use the protective equipment required for such a case as directed by the supervisor in charge.

It should be remembered that water solutions of some chemical vapors are extremely corrosive (chlorine, HCl). For this reason, if water sprays are directed on the leak, the resulting corrosion could intensify the leak. However, a curtain of water spray may be played on the vapor cloud downwind of the leak, until such time as the equipment can be isolated and the leak stopped.

#### V INCIDENTS INVOLVING RADIATION SOURCES

Radiation is a form of energy and as such can be put to use for a variety of purposes. As with other forms of energy it can be dangerous when uncontrolled. To control radiation intelligently it is necessary to understand its seriousness and proceed in practical aspects with respect.

The radioactive elements in use at the refinery (i.e. precipitator hopper level indicators and "Princeton Gamma-Tech Chemical Analyzer in the lab) are sealed sources with controlled directional energy output and present no personnel physical danger under normal operating conditions. However, as with any other hazardous material, when one of these sources enters an uncontrolled state through physical damage to the sealed housing, proper precautions and definite action steps must be taken to rectify the situation.

No employee is to attempt operation or repairs on any equipment containing a radioactive source without specific authorization, instruction and training in the operation and handling of the equipment.

The following procedure is to be used in the case of suspected damage or leakage of a radiation device. (The cause for concern could be the result of physical evidence of damage, fire involving the area of the source housing or general surveys conducted using the portable radiation detection meter).

1. Clear the area of all personnel as quickly as possible, to distance of 15 feet from the source.
2. Contact the Shift Supervisor and the Safety



## Department.

3. A 2 mRem/hr boundary line will be established using radiation detection instruments.
4. Avoid confusion and assist in maintaining control of established boundaries.
5. A report or log will be established listing:
  - a. Time of suspected incident.
  - b. Names of personnel in the area and their exact location.
  - c. Incidental meter readings and their location taken while establishing boundaries.
  - d. Cause of disturbance of radioactive material (if known).
6. Contact Kay-Ray if additional assistance or information is needed.
7. All reports to governmental and other agencies will be made by the Safety Department.

## VI BOMB THREATS

It is the purpose of this section to establish a policy and procedure that will provide for personal safety of employees, protection of company property and products, and assure continuance of safe operations in the event that a threat of destruction is directed against a Bloomfield Refinery facility.

Action to be taken in response to these threats is the responsibility of the Operations Superintendent or Safety Supervisor. The Operations Superintendent also has the responsibility of:

- a. Communications with senior management.
- b. Requesting law enforcement assistance.
- c. Notifying other industry of a possible threat to their location.

Information concerning a threat of destruction should not be released to non-Bloomfield Refining persons or news media by anyone except the Operations Superintendent or Plant Manager.

## A. PROCEDURES

Threats would probably be received by the receptionist in the office during office hours or a shift operator in the control room after hours. However, a threat could be directed to any person working at the plant. Any person receiving a bomb threat should respond as follows:

1. Remain calm. DO NOT PANIC!!!
2. STALL. Keep the party talking and get as much information as possible.
3. Listen closely to the individual and any other background noises. If possible, have another person listen to the conversation from another phone.
4. Have available, and fill out, the accompanying phone call form with as much detail as possible.  
(Attachment II)
5. Immediately, upon completion of the telephone call, relay the information to the Operation Superintendent and Safety Department.

When a call is received, the Safety Department or available supervision will set up emergency headquarters to coordinate and direct the search, and address the following:

1. Only authorized personnel will be admitted to the refinery.
2. Designate someone to watch for suspicious persons or cars outside the plant and record any descriptions or license numbers of any such person.
3. If more help is needed, the Operation Superintendent is the only person authorized to call off duty employees to assist.
4. Two-way radios are to be left in the control room or offices and not to be used while the refinery is under alert.
5. In instituting a search for possible bomb location, each operator should perform a search of his unit paying special attention to column skirts, debris and cluttered areas, and areas around major pieces of equipment. Only general visual inspection will be conducted by in-house personnel. Contact will be made with the State Police for assistance and more extensive search efforts.
6. If a time of explosion was indicated by the caller, the search will continue to within ten minutes of the set time. At that time and until clearance is given, all personnel will be withdrawn, except those required in the control room.. The units will not be

shut down or left unattended. If a specific time was not given, contact the Operations Superintendent for direction. Operating units will not be shut down or left unattended.

7. If a bomb is discovered:

- a. Notify the emergency headquarters.
- b. Do not touch, attempt to remove, or disarm.
- c. "Bomb Removal" personnel (from the State Police Office) will be rushed to the site.

8. Outside agencies-Only after approval of Operations Superintendent or Safety Supervisor:

- a. New Mexico State Police.
- b. San Juan County Sheriff.

## VII RADIO SYSTEM

Two-way radios provide a valuable means of communication in an emergency situation. With the aid of a two channel system we are able to use number two channel only for direction of fire fighting efforts. When an alarm is sounded, channel two will be cleared except for emergency purposes. Channel one will be used for the activities involved in isolating the involved equipment by the operating department. All other use of the radios will be discontinued until such a time as the situation is in hand and the recall is given.

## VIII CONTRACTORS AND VISITORS

When an emergency alarm is sounded, all contractors and visitors are to be directed to leave the process area and assemble at the main shop area. Contract foreman is to account for each of their employees and report any missing to the Emergency Command Post with information to their assigned work area. Contractors and visitors are not to return into the plant without authorization from the Emergency Command Post.

## IX PIPELINE EMERGENCIES

Pipeline emergencies are to be handled in the same manner as any other fire or hydrocarbon release encountered at the refinery. Of prime concern to Bloomfield Refining Co. is

protection of exposures from a fire until such time as the feed can be isolated from the involved line(s) and final extinguishment is made. The responsibility for isolating the feed will be with the pipeline company whose facilities are involved.

If fire occurs involving the LACT unit or piping between our receiving point and storage tank we will take the responsibility for isolating the equipment as well as extinguishment.

More detailed information is given in the following summaries stating responsibilities, block valve location, emergency phone numbers, product identification and any special procedures.

#### SAN JUAN PIPELINE

Product Involved:	Crude Oil.
Origin:	Bisti Station near El Paso Chaco Plant.
Arrives Refinery:	Through the southwest gates by tank # 23 (CBI-2) Bloomfield Refining receiving surfaces at LACT unit.
On Site Destination:	Tank # 31 (GATX-1). North 8" valve on west side of tank, or tank # 28 (CBI-3) 8" valve on north side of tank.
Securing Responsibility:	On Site-Pumper/Gauger Off Site- San Juan Pipeline.
Block Valve Location:	6" plug valve immediately preceding the west meter (or) block valve located where line surfaces in right-of-way.
Telephone Numbers:	Bob McCoy 632-3425 or 325-1873 car 2385.

## EL PASO - ANGEL PEAK FIELD LINES

Product Involved: 20" on west in right-of-way; High Pressure Natural Gas.

8" center of right-of-way; Liquid Gas Product. (Drip)

34" east in right-of-way; High Pressure Natural Gas.

Origin: Right-of-way travels northeast to southwest between tank farm and process units.

On Site Destination: None.

Securing Responsibilities: El Paso Natural Gas Company.

Emergency Telephone Numbers: El Paso Natural Gas Dispatching: 325-1162.

## SOUTHERN UNION

Product Involved: Natural Gas.

Origin: Gas Company of New Mexico mainline.

Arrives: Southwest property corner by Warehouse

On Site Destination: Fuel Gas Drum.

Securing Responsibility: On Site-Pumper/Gauger  
Off Site-Gas Company of New Mexico.

Block Valve Location: 2" quarter turn plug valve at southwest property corner (or) 2" gate valves at control valve run behind shop.

Emergency Phone Numbers: Gas Company of New Mexico-325-2889.

**X EVACUATION OF BUILDINGS**

If the decision is made or an emergency requires evacuation of a building structure, each individual should follow the closest path of travel to an exit. Time should not be spent in trying to take any articles with you. Of prime importance is the safety of personnel, and article rescue should be left to trained personnel. Every individual should familiarize themselves with the exits (both primary and secondary) in the buildings that require their presence.

**XI COMMUNICATION CONTINGENCY**

Should an emergency arise that would damage or render inoperative the public telephone system at a location, alternative methods of communication should be used. This communication can be accomplished by the use of the terminals phones if the refinery was affected and the use of the refinery phones if terminals phones are affected. The operating crews in each area are responsible for aiding in this manner should the need arise.

## EMERGENCY PLAN

S-1

### ATTACHMENT I

#### EMERGENCY PHONE NUMBERS

Bloomfield Fire Department. . . . . 632-8011  
Bloomfield Police Department. . . . . 632-8011  
San Juan County Sheriff . . . . . 334-6107  
State Police. . . . . 325-7547  
Ambulance (dispatched through Farmington Fire). . . 325-3501  
County Fire Departments (through Farmington Fire) . 325-3501  
Poison Control. . . . . 1-800-432-6866  
Bomb Personnel (State Police Office). . . . . 325-7547  
ETHYL CORP. (T.E.L. Emergencies). . . . . 504-344-7147  
CHEMTREC (Chemical Emergencies) . . . . . 1-800-424-9300  
City of Farmington (Electric Utility) . . . . . 327-7701  
Kay-Ray . . . . . 312-259-5600  
E.I.D. Radiation Protection Bureau . . . . . 505-984-0020  
Mobile Inspection (Radiography Assistance). . . . 327-9473  
Contact of New Mexico (Call out Assistance) . . . 327-4666  
HED Environmental Improvement Division. . . . . 505-827-9329

#### EQUIPMENT RESOURCES

##### Water Tankers & Vacuum Trucks

Chief Transport. . . . . 325-2396  
C & J Trucking . . . . . 325-7770  
Delgarno . . . . . 327-0461 or 327-6871  
Sunco Trucking . . . . . 327-0416 or 326-2266  
LAD Tankers. . . . . 334-3508  
Three Rivers Trucking. . . . . 325-1225  
Triple S Trucking Co. . . . . 334-6193

##### Earth Moving Equipment

Adobe Construction (Ernie Motto) . . . . . 334-6696  
Coffey Construction. . . . . 632-3663  
Atchison Construction. . . . . 327-6276  
Gas Company of New Mexico. . . . . 325-2889

##### Welding & Cutting

Henry Vigil. . . . . 632-3045  
Floyd Garcia . . . . . 632-9293

##### Wrecker or Rig Up Trucks

Sandia Detroit . . . . . 325-5071  
B. F. Walker . . . . . 325-4539  
Drake Well Service . . . . . 327-7301  
ODECO Inc. . . . . 632-3392

EQUIPMENT RESOURCES (cont.)

Aerial Ladder or Basket

City of Farmington Utility . . . . .	.327-7701
Farmington Fire. . . . .	.325-3501

Foam Supplies

Seagull Roosevelt Refinery . . . . .	.801-722-5128
Thunderbird Sales. . . . .	.505-881-6222
F & M Chemical . . . . .	.714-983-9551



## ATTACHMENT II

## THREATENING PHONE CALL FORM

Time call received \_\_\_\_\_ Time caller hung up \_\_\_\_\_

Exact words of person placing call: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Questions to ask:

1. When is bomb going to explode? \_\_\_\_\_

2. Where is bomb right now? \_\_\_\_\_  
\_\_\_\_\_3. What kind of bomb is it? \_\_\_\_\_  
\_\_\_\_\_4. What does it look like? \_\_\_\_\_  
\_\_\_\_\_5. Why did you place the bomb? \_\_\_\_\_  
\_\_\_\_\_

Person (receiving) (monitoring) call \_\_\_\_\_

Department \_\_\_\_\_ Telephone \_\_\_\_\_

Home Address \_\_\_\_\_

Home Telephone No. \_\_\_\_\_ Date \_\_\_\_\_

## DESCRIPTION OF CALLER'S VOICE

Male \_\_\_\_\_ Female \_\_\_\_\_ Tone of Voice \_\_\_\_\_

Young \_\_\_\_\_ Middle Aged \_\_\_\_\_ Old \_\_\_\_\_

Accent \_\_\_\_\_ Background Noise \_\_\_\_\_

Voice Familiar? \_\_\_\_\_ If so, who did it sound like? \_\_\_\_\_  
\_\_\_\_\_Remarks: \_\_\_\_\_  
\_\_\_\_\_Immediately notify following persons when call is complete:  
Operations Superintendent and Safety Department.

# SPILL PREVENTION CONTROL & COUNTERMEASURE PLAN

## PART I GENERAL INFORMATION

1. Name of facility Bloomfield Refining Company, Inc.
2. Type of facility Onshore Facility - Petroleum Refinery
3. Location of facility One mile south of Bloomfield on Sullivan Road  
off New Mexico Highway 44.

4. Name and address of owner or operator:

Name Bloomfield Refining Company, Inc.

Address P. O. Box 159

Bloomfield, New Mexico 87413

5. Designated person accountable for oil spill prevention at facility:

Name and title Chad King, Operations Manager

6. Facility experienced a reportable oil spill event during the twelve months prior to Jan. 10, 1974 (effective date of 40 CFR, Part 112). (If YES, complete Attachment #1.) No

### MANAGEMENT APPROVAL

This SPCC Plan will be implemented as herein described.

Signature \_\_\_\_\_

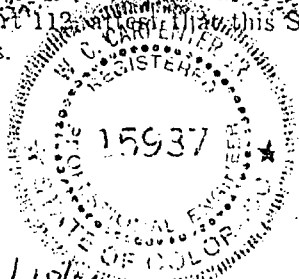
Name Richard Traylor

Title Refinery Manager

### CERTIFICATION

I hereby certify that I have examined the facility, and being familiar with the provisions of 40 CFR, Part 112, this SPCC Plan has been prepared in accordance with good engineering practices.

(Seal)



William Charles Carpenter, Jr.

Printed Name of Registered Professional Engineer

William Charles Carpenter Jr.  
Signature of Registered Professional Engineer

Date 2/18/86

Registration No. #15937 State COLO.

# **PART I** **GENERAL INFORMATION**

## **7. Potential Spills — Prediction & Control:**

<u>NO.</u>	<u>Source</u>	<u>Major Type of Failure</u>	<u>Total Quantity (bbls)</u>	<u>Rate (bbls/hr)</u>	<u>Direction of Flow*</u>	<u>Secondary Containment</u>
3	Unleaded	Rupture	10,000	See (1)	See Blueprints	Yes
4	Unleaded	"	10,000	"	"	"
5	Unleaded	"	10,000	"	"	"
8	Crude Slop	"	500	"	"	"
9	Crude Slop	"	500	"	"	"
10	Spent Caustic	"	400	"	"	"
11	Basegas	"	55,000	"	"	"
12	Cat gas	"	55,000	"	"	"
17	Reduced Crude	"	40,000	"	"	"
18	Regular Gasoline	"	55,000	"	"	"
19	Diesel	"	36,000	"	"	"
20	FCC Slop	"	5,000	"	"	"
21	FCC Slop	"	3,000	"	"	"
22	Gasoline Slop	"	1,500	"	"	"
23	Reformate	"	40,000	"	"	"
24	Reformer Feed	"	10,000	"	"	"
25	Sweet Naphtha	"	10,000	"	"	"
26	Kerosene	"	4,000	"	"	"
27	Heavy Burner	"	10,000	"	"	"
28	Crude	"	80,000	"	"	"
29	Regular Gasoline	"	17,000	"	"	"
30	Regular Gasoline	"	17,000	"	"	"
31	Crude	"	110,000	"	"	"
B1	LPG Slop	"	300	"	"	"
B2	LPG Slop	"	400	"	"	"
B12	Lt. Natural	"	700	"	"	"
B13	Lt. Natural	"	500	"	"	"
B14	Lt. Natural	"	500	"	"	"
B15	Propane	"	700	"	"	"
B16	Propane	"	700	"	"	"
B17	Propane	"	700	"	"	"
B18	Butane	"	700	"	"	"
B19	Butane	"	700	"	"	"
B20	Butane	"	700	"	"	"
B21	Butane	"	700	"	"	"
	FCC	"		"	"	"
	Crude	"		"	"	"
	Reformer	"		"	"	"
	Loading	Overflow	200	"	"	"
41	Crude Treating	Rupture	800	"	"	"
42	Crude Treating	"	800	"	"	"
43	Crude Treating	"	800	"	"	"

SEE TEXT OF REPORT  
FOR CURRENT  
TANK STATUS

### Discussion:

(1) Rate Variable, Depending Upon Nature and Extent of Failure.

Name of facility Bloomfield Refining Company

Operator Same

PART I  
GENERAL INFORMATION

[Response to statements should be: YES, NO, or NA (Not Applicable).]

8. Containment or diversionary structures or equipment to prevent oil from reaching navigable waters are practicable. (If NO, complete Attachment #2.)

Yes

9. Inspections and Records

- A. The required inspections follow written procedures.

Yes

- B. The written procedures and a record of inspections, signed by the appropriate supervisor or inspector, are attached.

No

Discussion: Inspections are done by plant employees.

10. Personnel Training and Spill Prevention Procedures

- A. Personnel are properly instructed in the following:

(1) operation and maintenance of equipment to prevent oil discharges, and

Yes

(2) applicable pollution control laws, rules, and regulations.

Yes

Describe procedures employed for instruction: On the job training of new personnel by experienced personnel and instructions by the Supervisors of critical aspects of the job.

Applicable training by the Safety Supervisor and the Environmental Engineer is given for pollution control laws, rules, and regulations.

- B. Scheduled prevention briefings for the operating personnel are conducted frequently enough to assure adequate understanding of the SPCC Plan.

Yes

Describe briefing program: Periodic non-scheduled briefings will be conducted by plant supervision concerning various operating procedures pertinent to the implementation of the SPCC Plan.

Spill incident reports are prepared for all spills that occur within the refinery. Supervision discusses the incident with the responsible party and determines a course of action to avoid future occurrences. Small incidences are considered serious and the briefings are instrumental in avoiding major reportable spills.

Name of facility Bloomfield Refining Company

Operator Same



PART II. ALTERNATE A  
DESIGN AND OPERATING INFORMATION  
ONSHORE FACILITY (EXCLUDING PRODUCTION)

[Response to statements should be: YES, NO, or NA (Not Applicable).]

B. Bulk Storage Tanks

1. Describe tank design, materials of construction, fail-safe engineering features, and if needed, corrosion protection: Circular tanks above grade, welded and bolted steel plate tanks, Tanks 10 and 11 are on a tank ring and sand cushion, all others are on sand cushion only. Corrosion protection has been applied to the external surfaces.
2. Describe secondary containment design, construction materials, and volume: Secondary containment consists of earthen dikes with adequate volume to handle catastrophic failure of the tanks.
3. Describe tank inspection methods, procedures, and record keeping: Tanks throughout the plant are manually gauged each day. The gauger is on the alert for any leaks or tank disorders. Daily inventory logs are checked to detect any disorders. Inventory balances are done to determine losses. When a problem is detected or during cleaning turnarounds, tanks are carefully inspected for leaks, corrosion, etc. and not put back into service until necessary repairs are made.
4. Internal heating coil leakage is controlled by one or more of the following control factors:
  - (a) Monitoring the steam return or exhaust lines for oil. Yes  
Describe monitoring procedure: Daily product sampling and continuous lookout for oil in the steam return lines.
  - (b) Passing the steam return or exhaust lines through a settling tank, skimmer, or other separation system. Yes
  - (c) Installing external heating systems. N/A
5. Disposal facilities for plant effluents discharged into navigable waters are observed frequently for indication of possible upsets which may cause an oil spill event. N/A  
Describe method and frequency of observations: \_\_\_\_\_

Name of facility Bloomfield Refining Company

Operator Same

PART II. ALTERNATE A  
DESIGN AND OPERATING INFORMATION  
ONSHORE FACILITY (EXCLUDING PRODUCTION)

(Response to statements should be: YES, NO, or NA (Not Applicable).)

C. Facility Transfer Operations, Pumping, and In-plant Process

1. Corrosion protection for buried pipelines:

- (a) Pipelines are wrapped and coated to reduce corrosion. Yes
- (b) Cathodic protection is provided for pipelines if determined necessary by electrolytic testing. N/A
- (c) When a pipeline section is exposed, it is examined and corrective action taken as necessary. Yes

2. Pipeline terminal connections are capped or blank-flanged and marked if the pipeline is not in service or on standby service for extended periods. Yes

Describe criteria for determining when to cap or blank-flange: We are eliminating buried lines as we change the service. All abandoned lines are plugged or capped.

3. Pipe supports are designed to minimize abrasion and corrosion and allow for expansion and contraction. Yes

Describe pipe support design: Supports are steel and concrete structures of various shapes. Shoes are provided on process piping. Fireproofing has been applied to some critical, vertical steel members.

4. Describe procedures for regularly examining all above-ground valves and pipelines (including flange joints, valve glands and bodies, catch pans, pipeline supports, locking of valves, and metal surfaces): Daily visual inspections are done by plant personnel.

5. Describe procedures for warning vehicles entering the facility to avoid damaging above-ground piping: A rigid permitting procedure is followed to authorize vehicles in the process area. Roads in the tank farm area cross over the pipes. The one overhead piperack is very high at the road crossing to allow clearance for all types of vehicles.

Name of facility Bloomfield Refining Company

Operator Same

PART II. ALTERNATE A  
DESIGN AND OPERATING INFORMATION  
ONSHORE FACILITY (EXCLUDING PRODUCTION)

[Response to statements should be: YES, NO, or NA (Not Applicable).]

**D. Facility Tank Car & Tank Truck Loading/Unloading Rack**

Tank car and tank truck loading/unloading occurs at the facility. (If YES, complete 1 through 5 below.)

Yes

1. Loading/unloading procedures meet the minimum requirements and regulations of the Department of Transportation.

Yes

2. The unloading area has a quick drainage system.

Yes

3. The containment system will hold the maximum capacity of any single compartment of a tank truck loaded/unloaded in the plant.

Yes

Describe containment system design, construction materials, and volume:

The truck product loading area controls spills with a concrete slab and curbing. The slab is designed to drain spills to a sump which is then pumped to Tank 22 from which the material is blended back into leaded gasoline.

The truck crude unloading area controls spills with a concrete slab and curbing. The slab is designed to drain spills to a sump which can then be pumped to the crude treating tanks or the API separator.

Both areas have secondary containment in the event of sump overfilling.

4. An interlocked warning light, a physical barrier system, or warning signs are provided in loading/unloading areas to prevent vehicular departure before disconnect of transfer lines.

Yes

Describe methods, procedures, and/or equipment used to prevent premature vehicular departure: Warning signs are provided in the area. New drivers are trained in the proper operation of the loading/unloading equipment.

Instruction signs are provided. Company personnel are present in the area to provide assistance when needed.

5. Drains and outlets on tank trucks and tank cars are checked for leakage before loading/unloading or departure.

Yes

Name of facility Bloomfield Refining Company

Operator Same



PART II, ALTERNATE A  
DESIGN AND OPERATING INFORMATION  
ONSHORE FACILITY (EXCLUDING PRODUCTION)

[Response to statements should be: YES, NO, or NA (Not Applicable).]

**E. Security**

1. Plants handling, processing, or storing oil are fenced. Yes
2. Entrance gates are locked and/or guarded when the plant is unattended or not in production. Yes
3. Any valves which permit direct outward flow of a tank's contents are locked closed when in non-operating or standby status. No
4. Starter controls on all oil pumps in non-operating or standby status are:  
(a) locked in the off position; No  
(b) located at site accessible only to authorized personnel. Yes

5. Discussion of items 1 through 4 as appropriate: All process valves on active tanks or vessels are tied to a closed piping system. The refinery is operated on a 24-hour basis with all valves operated by trained, authorized personnel.

Water draw-off piping is routed to tank sumps. The valves for water draw-off are operated only by authorized personnel and are attended constantly when in operation. If piping is disconnected for maintenance reasons, blind flanges are bolted to the valves.

6. Discussion of the lighting around the facility: Adequate for a 24-hour operation.

Name of facility Bloomfield Refining Company

Operator Same

SPCC PLAN, ATTACHMENT #1  
SPILL HISTORY

Complete this form for any reportable spill(s) which has (have) occurred from this facility during the twelve months prior to January 10, 1974 into \_\_\_\_\_  
\_\_\_\_\_ navigable water.)

1. Date \_\_\_\_\_ Volume \_\_\_\_\_ Cause: \_\_\_\_\_

Corrective action taken: \_\_\_\_\_

Plans for preventing recurrence: \_\_\_\_\_

2. Date \_\_\_\_\_ Volume \_\_\_\_\_ Cause: \_\_\_\_\_

Corrective action taken: \_\_\_\_\_

Plans for preventing recurrence: \_\_\_\_\_

3. Date \_\_\_\_\_ Volume \_\_\_\_\_ Cause: \_\_\_\_\_

Corrective action taken: \_\_\_\_\_

Plans for preventing recurrence: \_\_\_\_\_

Name of facility \_\_\_\_\_

Operator \_\_\_\_\_

## WASTE DESCRIPTION

### RCRA Part 262 - Standards Applicable to Generators of Hazardous Waste

#### Applicability

Bloomfield Refining Company is subject to the requirements of RCRA Part 262 as a generator of hazardous waste only. As a generator only, Bloomfield Refining Company accumulates hazardous waste on-site for 90 days or less. The waste is placed in containers pursuant to the requirements of RCRA Part 262 Subpart C and shipped offsite to an approved disposal site.

#### Applicable Hazardous Waste

##### 1. K-050-Heat Exchanger Bundle Sludges

Heat exchanger bundle sludges, which are generated when exchangers are cleaned, are listed hazardous wastes. The refinery generates approximately 5,000 pounds of the waste during a major refinery turnaround. Major turnarounds are done approximately every three years. An exchanger, on the average, will generate 100 pounds of waste per cleaning.

##### 2. K-051-API Separator Sludge

Sludges that accumulate in the API separator are considered a hazardous waste when they are removed from the separator. The separator is cleaned approximately every two years. The method of cleaning is to filter press the entire contents of the separator. An outside contractor performs the work. Approximately 250,000 pounds of waste is generated.

##### 3. K-052-Lead Tank Bottoms

Sludges that accumulate in the bottom of leaded gasoline storage tanks are considered a hazardous waste when they are removed from the tank. A tank is cleaned approximately every five years. Approximately 8,000 pounds of waste is generated with each tank cleaning.

##### 4. F-002, D-001 - 1,1,1 Trichloroethane & Methanol in Naphtha

Spent 1,1,1 Trichloroethane and methanol in naphtha from the reformer is a hazardous waste when the filled 55-gallon waste drum is removed from the process area to storage. Approximately one drum is generated per quarter year.

##### 5. D-002-Spent Caustic

Spent caustic is a hazardous waste if the material is discarded. The material is currently sold as a supplement to a commercial product and is, therefore, exempt from the RCRA regulations at this time. Approximately 613,000 pounds or 70,000 gallons is generated per year.

## MANIFEST SYSTEM

### RCRA Part 262 Subpart B - The Manifest

A generator of hazardous waste must prepare a manifest for the offsite shipment of hazardous waste. The Environmental Engineer has the responsibility to ensure that the manifest use meets the requirements of the regulation. A copy of a blank manifest and a properly completed manifest are included here.

The generator must:

1. Sign the manifest certification by hand.
2. Obtain the handwritten signature of the initial transporter and date of acceptance on the manifest.
3. Retain one copy and give the transporter the remaining copies and original. The receiving facility will return the original after completion of disposal.

# UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.

U.M.D.089416416

Manifest Document No.

BM.0.7

2. Page 1 of 1

Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address

BLOOMFIELD REFINING COMPANY  
PO BOX 159  
BLOOMFIELD, NM 87413

4. Generator's Phone (505) 632-2013

5. Transporter 1 Company Name

USPCI

6. US EPA ID Number

UTD.980635890

7. Transporter 2 Company Name

8. US EPA ID Number

10. US EPA ID Number

9. Designated Facility Name and Site Address

U.S. POLLUTION CONTROL INC  
FOREST MOUNTAIN FACILITY  
CLIVE, UTAH

UTD.991301748

A. State Manifest Document Number

B. State Generator's ID

C. State Transporter's ID

D. Transporter's Phone

E. State Transporter's ID

F. Transporter's Phone

G. State Facility's ID

H. Facility's Phone

801 268-8168 or 266-3708

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)

12. Containers

13. Total Quantity

14. Unit Wt/Vol

15. Waste No.

a. X HAZARDOUS WASTE SOLID RES, ORM-E, NA9139

49 DRUM

32700 LBS

K-051

b. X HAZARDOUS WASTE SOLID RES, ORM-E, NA9139

4 DR

3300 LBS

K-052

c. X HAZARDOUS WASTE SOLID RES, ORM-E, NA9139

7 DR

4680 LBS

K-050

d.

J. Additional Descriptions for Materials Listed Above

K-051 API SEPARATOR SLUDGE

K-052 LEADED TANK BOTTOMS

K-050 HEAT EXCHANGER BUNDLE CLEANING SLUDGE

K. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

IN CASE OF SPILL, CONTAIN & NOTIFY AUTHORITIES.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Unless I am a small quantity generator who has been exempted by statute or regulation from the duty to make a waste minimization certification under Section 3002(b) of RCRA, I also certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment.

Printed/Typed Name

CHRIS HAWLEY

Signature

CHRIS HAWLEY

Month Day Year

02 07 06

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name

C.B. LUPTON

Signature

C.B. LUPTON

Month Day Year

02 07 06

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name

Signature

Month Day Year

.

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name

Signature

Month Day Year

.

GENERATOR'S COPY

# UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.

Manifest  
Document No.

2. Page 1  
of

Information in the shaded areas is  
not required by Federal law.

3. Generator's Name and Mailing Address

A. State Manifest Document Number

4. Generator's Phone ( )

B. State Generator's ID

5. Transporter 1 Company Name

6. US EPA ID Number

C. State Transporter's ID

D. Transporter's Phone

7. Transporter 2 Company Name

8. US EPA ID Number

E. State Transporter's ID

F. Transporter's Phone

9. Designated Facility Name and Site Address

10. US EPA ID Number

G. State Facility's ID

H. Facility's Phone

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)

12. Containers

13. Total  
Quantity

14. Unit  
Wt/Vol

I. Waste No.

HM

a.

b.

c.

d.

J. Additional Descriptions for Materials Listed Above

K. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

Unless I am a small quantity generator who has been exempted by statute or regulation from the duty to make a waste minimization certification under Section 3002(b) of RCRA, I also certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment.

Printed/Typed Name

Signature

Month Day Year

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name

Signature

Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name

Signature

Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name

Signature

Month Day Year

ORIGINAL-RETURN TO GENERATOR

## CLOSURE REQUIREMENTS

Bloomfield Refining Company, as a generator only of hazardous waste, complies with the requirements of RCRA Part 262.34 and is, therefore, not required to comply with RCRA Part 265 Subpart G - Closure and Post-Closure. However, in the event that the refinery is closed, certain closure activities will be required to remain in compliance with RCRA Part 262.34.

### RCRA Part 262.34 Requires:

1. A generator may accumulate hazardous waste on-site for 90 days or less without a permit.
2. The waste is placed in proper containers.
3. The date upon which each period of accumulation begins is clearly marked and visible for inspection on each container.
4. While being accumulated on-site, each container and tank is labeled or marked clearly with the words, "Hazardous Waste".

The hazardous wastes and closure activities specific to Bloomfield Refining Company are as follows:

### K-050 Heat Exchanger Bundle Cleaning Sludge

Approximately 100 exchangers will be taken out of service in the event of a refinery shutdown. They will require hydroblast cleaning and will generate about 10,000 pounds of sludge. Approximately 100 manhours will be required to pull and replace each exchanger bundle.

#### Cost Estimate

Pull and Replace Each Bundle	
100 ea. x 100 MH/ea. x \$20/MH	\$200,000
Hydroblasting	30,000
Waste Disposal	
15 drums x \$600/drum	<u>9,000</u>
K-050 TOTAL	\$239,000

### K-051 API Separator Sludge

The separator will require cleaning and will generate approximately 250,000 pounds of waste.

#### Cost Estimate

Cleaning/Processing	\$ 38,000
Waste Disposal	<u>24,000</u>
K-051 TOTAL	\$ 62,000

K-052 Leaded Tank Bottoms

Three tanks, numbers 18, 29, and 30, will require the removal of hazardous tank bottoms in the event of a shutdown. Approximately 24,000 pounds (30 drums) of hazardous waste will be generated.

Cost Estimate

Cleaning	\$ 50,000
Waste Disposal	
30 ea. x \$600/ea.	<u>18,000</u>
K-052 TOTAL	\$ 68,000

TOTAL Cost of Closure Activities for Hazardous Waste Associated with a Shutdown	<u>\$369,000</u>
--	------------------



PERSONNEL RECORDS

Richard Traylor - Refinery Manager

Chris Hawley - Environmental Engineer

Chad King - Operations Manager

Don Wimsatt - General Maintenance Supervisor

The people named above are responsible for the management of the hazardous waste generated at the refinery. Chris Hawley has attended several seminars and has extensive on-the-job training in the management of hazardous waste. He has relayed the pertinent information and training to the others. Since the actual handling of hazardous waste is done on an infrequent basis, the employees and contractors that are directly involved are briefed by the responsible person on how to perform their duties to ensure the facility's compliance with the requirements of training.



Attachment 7

Pond Liner Specifications

SCHLEGEL LINING TECHNOLOGY, INC.



MINIMUM SPECIFICATIONS FOR SCHLEGEL® SHEET - POLYETHYLENE

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>VALUE</u>
Density	ASTM D792	0.930 gm/cc
Tensile strength @ yield	ASTM D638	1500 psi
Tensile strength @ break	ASTM D638	1500 psi
Elongation @ yield	ASTM D638	10 %
Elongation @ break	ASTM D638	500 %
Stress crack	ASTM D1693	500 hours
Low temperature	ASTM D746	-40 °C
120 day soil burial	ASTM D3083	±10 % of original tensile
Bonded seam strength	ASTM D3083	90 % of material breaking factor
Dimensional stability	ASTM D1204	±3 %

# Chemical Resistance

## Chemical Resistance Table.

Shown here are the results of tests reported by the supplier of high density polyethylene granulate used to manufacture Schlegel® sheet. The high density polyethylene is resistant to the chemicals listed. The degree of chemical attack on any material is influenced by a number of variable factors and their interaction, including temperature, pressure, size of area under attack, exposure duration, and the like. Where sheet will be exposed to a mixture of chemicals it is recommended that tests be carried out for sheet resistance to that chemical mixture. Therefore, these ratings are offered as a guide only.

### Abbreviations

S = Satisfactory

U = Unsatisfactory

L = Limited application possible

— = Not tested

### Concentration

sat. sol. = Saturated aqueous solution, prepared at 20° C (68° F)

sol. = aqueous solution with concentration above 10% but below saturation level

dil. sol. = diluted aqueous solution with concentration below 10%

cust. conc. = customary service concentration

Medium	Concentration	Resistance at		Medium	Concentration	Resistance at	
		20° C (68° F)	60° C (140° F)			20° C (68° F)	60° C (140° F)
<b>A</b>							
Acetic acid	100%	S	L	Carbon tetrachloride	100%	L	U
Acetic acid	10%	S	S	Chlorine, aqueous solution	sat. sol.	L	U
Acetic acid anhydride	100%	S	L	Chlorine gaseous dry	100%	L	U
Acetone	100%	L	L	Chloroform	100%	U	U
Adipic acid	sat. sol.	S	S	Chromic acid	20%	S	L
Allyl alcohol	96%	S	S	Chromic acid	50%	S	L
Aluminum chloride	sat. sol.	S	S	Citric acid	sat. sol.	S	S
Aluminum fluoride	sat. sol.	S	S	Copper chloride	sat. sol.	S	S
Aluminum sulfate	sat. sol.	S	S	Copper nitrate	sat. sol.	S	S
Alums	sol.	S	S	Copper sulphate	sat. sol.	S	S
Ammonia, aqueous	dil. sol.	S	S	Cresylic acid	sat. sol.	L	—
Ammonia, gaseous dry	100%	S	S	Cyclohexanol	100%	S	S
Ammonia, liquid	100%	S	S	Cyclohexanone	100%	S	L
Ammonium chloride	sat. sol.	S	S	<b>D</b>			
Ammonium fluoride	sol.	S	S	Decahydronaphthalene	100%	S	L
Ammonium nitrate	sat. sol.	S	S	Dextrine	sol.	S	S
Ammonium sulfate	sat. sol.	S	S	Diethyl ether	100%	L	—
Ammonium sulfide	sol.	S	S	Diethylphthalate	100%	S	L
Amyl acetate	100%	S	L	Dioxane	100%	S	S
Amyl alcohol	100%	S	L	<b>E</b>			
Aniline	100%	S	L	Ethane diol	100%	S	S
Antimony trichloride	90%	S	S	Ethanol	40%	S	L
Arsenic acid	sat. sol.	S	S	Ethyl acetate	100%	S	U
Aqua regia	HCl-HNO <sub>3</sub> 3/1	U	U	Ethylene trichloride	100%	U	U
<b>B</b>							
Barium carbonate	sat. sol.	S	S	<b>F</b>			
Barium chloride	sat. sol.	S	S	Ferric chloride	sat. sol.	S	S
Barium hydroxide	sat. sol.	S	S	Ferric nitrate	sol.	S	S
Barium sulfate	sat. sol.	S	S	Ferric sulfate	sat. sol.	S	S
Barium sulfide	sol.	S	S	Ferrous chloride	sat. sol.	S	S
Benzaldehyde	100%	S	L	Ferrous sulfate	sat. sol.	S	S
Benzene	—	L	L	Fluorine, gaseous	100%	U	U
Benzoic acid	sat. sol.	S	S	Fluosilicic acid	40%	S	S
Beer	—	S	S	Formaldehyde	40%	S	S
Borax	sat. sol.	S	S	Formic acid	50%	S	S
Boric acid	sat. sol.	S	S	Formic acid	98-100%	S	S
Bromine, gaseous dry	100%	U	U	Furfuryl alcohol	100%	S	L
Bromine, liquid	100%	U	U	<b>G</b>			
Butane, gaseous	100%	S	S	Gasolene	—	S	L
Butanol	100%	S	S	Glacial acetic acid	96%	S	L
Butyric acid	100%	S	L	Glucose	sat. sol.	S	S
<b>C</b>				Glycerine	100%	S	S
Calcium carbonate	sat. sol.	S	S	Glycol	sol.	S	S
Calcium chlorate	sat. sol.	S	S	<b>H</b>			
Calcium chloride	sat. sol.	S	S	Heptane	100%	S	U
Calcium hydroxide	sat. sol.	S	S	Hydrochloric acid	10%	S	S
Calcium hypochlorite	sol.	S	S	Hydrobromic acid	50%	S	S
Calcium nitrate	sat. sol.	S	S	Hydrobromic acid	100%	S	S
Calcium sulfate	sat. sol.	S	S	Hydrochloric acid	10%	S	S
Calcium sulfide	dil. sol.	L	L	Hydrochloric acid	concentrated	S	S
Carbon dioxide, gaseous dry	100%	S	S	Hydrocyanic acid	10%	S	S
Carbon disulfide	100%	L	U	Hydrofluoric acid	60%	S	L
Carbon monoxide	100%	S	S	Hydrofluoric acid	4%	S	S
Chloroacetic acid	sol.	S	S	Hydrogen	100%	S	S

Medium	Concentration	Resistance at		Medium	Concentration	Resistance at		
		20° C (68° F)	60° C (140° F)			20° C (68° F)	60° C (140° F)	
Hydrogen peroxide	30%	S	S	<b>S</b>	Salicylic acid	sat. sol.	S	S
Hydrogen peroxide	90%	S	U		Silver acetate	sat. sol.	S	S
Hydrogen sulfide, gaseous	100%	S	S		Silver cyanide	sat. sol.	S	S
<b>L</b>					Silver nitrate	sat. sol.	S	S
Lactic acid	100%	S	S		Sodium benzoate	sat. sol.	S	S
Lead acetate	sat. sol.	S	—		Sodium bicarbonate	sat. sol.	S	S
<b>M</b>					Sodium biphosphate	sat. sol.	S	S
Magnesium carbonate	sat. sol.	S	S		Sodium bisulfite	sol.	S	S
Magnesium chloride	sat. sol.	S	S		Sodium bromide	sat. sol.	S	S
Magnesium hydroxide	sat. sol.	S	S		Sodium carbonate	sat. sol.	S	S
Magnesium nitrate	sat. sol.	S	S		Sodium chlorate	sat. sol.	S	S
Maleic acid	sat. sol.	S	S		Sodium chloride	sat. sol.	S	S
Mercury	100%	S	S		Sodium cyanide	sat. sol.	S	S
Mercuric chloride	sat. sol.	S	S		Sodium ferricyanide	sat. sol.	S	S
Mercuric cyanide	sat. sol.	S	S		Sodium ferrocyanide	sat. sol.	S	S
Mercuric nitrate	sol.	S	S	Sodium fluoride	sat. sol.	S	S	
Methanol	100%	S	S	Sodium fluoride	sat. sol.	S	S	
Methylene chloride	100%	L	—	Sodium hydroxide	40%	S	S	
Milk	—	S	S	Sodium hydroxide	sat. sol.	S	S	
Molasses	cust. conc.	S	S	Sodium hypochloride	15% active chlorine	S	S	
<b>N</b>				Sodium nitrate	sat. sol.	S	S	
Nickel chloride	sat. sol.	S	S	Sodium nitrite	sat. sol.	S	S	
Nickel nitrate	sat. sol.	S	S	Sodium orthophosphate	sat. sol.	S	S	
Nickel sulfate	sat. sol.	S	S	Sodium sulfate	sat. sol.	S	S	
Nicotinic acid	dil. sol.	S	—	Sodium sulfide	sat. sol.	S	S	
Nitric acid	25%	S	S	Sulfur dioxide, dry	100%	S	S	
Nitric acid	50%	S	U	Sulfur trioxide	100%	U	U	
Nitric acid	75%	U	U	Sulfuric acid	10%	S	S	
Nitric acid	100%	U	U	Sulfuric acid	50%	S	S	
<b>O</b>				Sulfuric acid	98%	S	U	
Oils and Grease	—	S	L	Sulfuric acid	fuming	U	U	
Oleic acid	100%	S	L	Sulfurous acid	30%	S	S	
Orthophosphoric acid	50%	S	S	<b>T</b>				
Orthophosphoric acid	95%	S	L	Tannic acid	sol.	S	S	
Oxalic acid	sat. sol.	S	S	Tartaric acid	sol.	S	S	
Oxygen	100%	S	L	Thionyl chloride	100%	L	U	
Ozone	100%	L	U	Toluene	100%	L	U	
<b>P</b>				Triethylamine	sol.	S	L	
Petroleum	—	S	L	<b>U</b>				
Phenol	sol.	S	S	Urea	sol.	S	S	
Phosphorus trichloride	100%	S	L	Urine	—	S	S	
Photographic developer	cust. conc.	S	S	<b>W</b>				
Picric acid	sat. sol.	S	—	Water	—	S	S	
Potassium bicarbonate	sat. sol.	S	S	Wine vinegar	—	S	S	
Potassium bisulfate	sat. sol.	S	S	Wines and liquors	—	S	S	
Potassium bisulfide	sol.	S	S	<b>X</b>				
Potassium bromate	sat. sol.	S	S	Xylene	100%	L	L	
Potassium bromide	sat. sol.	S	S	<b>Y</b>				
Potassium carbonate	sat. sol.	S	S	Yeast	sol.	S	S	
Potassium chlorate	sat. sol.	S	S	<b>Z</b>				
Potassium chloride	sat. sol.	S	S	Zinc carbonate	sat. sol.	S	S	
Potassium chromate	sat. sol.	S	S	Zinc chloride	sat. sol.	S	S	
Potassium cyanide	sol.	S	S	Zinc (II) chloride	sat. sol.	S	S	
Potassium dichromate	sat. sol.	S	S	Zinc (IV) chloride	sat. sol.	S	S	
Potassium ferricyanide	sat. sol.	S	S	Zinc oxide	sat. sol.	S	S	
Potassium ferrocyanide	sat. sol.	S	S	Zinc sulfate	sat. sol.	S	S	
Potassium fluoride	sat. sol.	S	S					
Potassium hydroxide	10%	S	S					
Potassium hydroxide	sol.	S	S					
Potassium hypochloride	sol.	S	L					
Potassium nitrate	sat. sol.	S	S					
Potassium orthophosphate	sat. sol.	S	S					
Potassium perchlorate	sat. sol.	S	S					
Potassium permanganate	20%	S	S					
Potassium persulfate	sat. sol.	S	S					
Potassium sulfate	sat. sol.	S	S					
Potassium sulfite	sol.	S	S					
Propionic acid	50%	S	S					
Propionic acid	100%	S	L					
Pyridine	100%	S	L					
<b>Q</b>								
Quinol (Hydroquinone)	sat. sol.	S	S					

Specific immersion testing should be undertaken to ascertain the suitability of chemicals not listed above with reference to special requirements.

Specific immersion testing should be undertaken to ascertain the suitability of chemicals not listed above with reference to special requirements.

Attachment 8

Final Closure Plan for RCRA

**FINAL CLOSURE PLAN FOR THE  
API WASTEWATER PONDS, LANDFILL,  
AND LANDFILL POND AT THE  
BLOOMFIELD REFINERY**

**PREPARED FOR**  
**BLOOMFIELD REFINING COMPANY**  
**Bloomfield, New Mexico**

**PREPARED BY**

**ENGINEERING-SCIENCE**  
AUSTIN, TEXAS 78722 - 512/477-9901

**ES**





Bloomfield Refining  
Company

A Gary Energy Corporation Subsidiary

August 20, 1986

**CERTIFIED MAIL - RETURN RECEIPT REQUESTED**

Ms. Denise Fort, Director  
Environmental Improvement Division  
New Mexico Health and Environment Department  
P. O. Box 968  
Santa Fe, NM 87504-0968

**RE: Bloomfield Refining Company**

Dear Ms. Fort:

Enclosed is the final closure plan for certain waste management units at our petroleum refinery in Bloomfield, New Mexico. This plan provides information that was unavailable in our November 22, 1985, closure plan submittal. Also enclosed is a recent letter from our accounting firm which establishes that the company's working capital is far in excess of the anticipated closure cost, thus proving our financial responsibility for closure.

This plan is being submitted in accordance with the November 26, 1985, USEPA Consent Agreement and Final Order, Docket No. RCRA VI-501-H and nothing herein should be construed as an admission of liability in connection with that action or any other proceeding.

We are prepared to begin the specified activities within thirty (30) days of final NMEID approval. We look forward to receipt of this approval in the near future.

Sincerely,

David J. Younggren  
Vice President Finance  
and Administration

enclosure

cc: William Rhea  
U.S. Environmental Protection Agency  
Hazardous Waste Management Division  
Interfirst II Building, 28th Floor  
1201 Elm Street  
Dallas, TX 75270

DJY:dam

bcc: Joe Warr  
Richard Traylor  
Chris Hawley  
Joe Guida  
Harry Mason

FINAL CLOSURE PLAN FOR THE  
API WASTEWATER PONDS, LANDFILL, AND  
LANDFILL POND AT THE BLOOMFIELD REFINERY

Prepared for

BLOOMFIELD REFINERY  
Bloomfield, New Mexico

by

Engineering-Science, Inc.  
2901 North Interregional  
Austin, Texas 78722

July 1986

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FINAL CLOSURE PLAN FOR THE  
API WASTEWATER PONDS, LANDFILL, AND  
LANDFILL POND AT THE BLOOMFIELD REFINERY

## INTRODUCTION

This final closure plan has been prepared to ensure that the API wastewater ponds, landfill, and landfill pond are closed in a manner consistent with the interest of human health and the environment. This plan provides information that was promised but that was unavailable in the November 22, 1985 closure plan submittal. Consequently, this closure plan supercedes the closure plan submitted to EPA and NMEID on November 22, 1985.

The subjects addressed in the plan include:

- (a) general facility information;
- (b) sampling and analytical techniques preceding closure activities;
- (c) documentation and recordkeeping of sampling and closure activities; and
- (d) an estimate of the quantity of waste material to be removed and the closure costs.

## GENERAL FACILITY INFORMATION

The Bloomfield refinery, currently owned and operated by Bloomfield Refining Company (BRC), is located in the northwest corner of the State of New Mexico. The Bloomfield refinery was reportedly constructed in the late 1950s and operated approximately 5 years before being sold to Suburban Propane Corporation in the early 1960s. Plateau, Inc., a subsidiary of Suburban Propane, operated the refinery prior to its sale to the current owner in the fall of 1984. The refinery processes a combination of low sulfur crudes and petroleum which are transported to the refinery by pipeline and truck. Major refinery products include gasoline and diesel fuel, although fuel gas, heavy burner fuel, propane, butane, and other petroleum products are produced in smaller quantities.

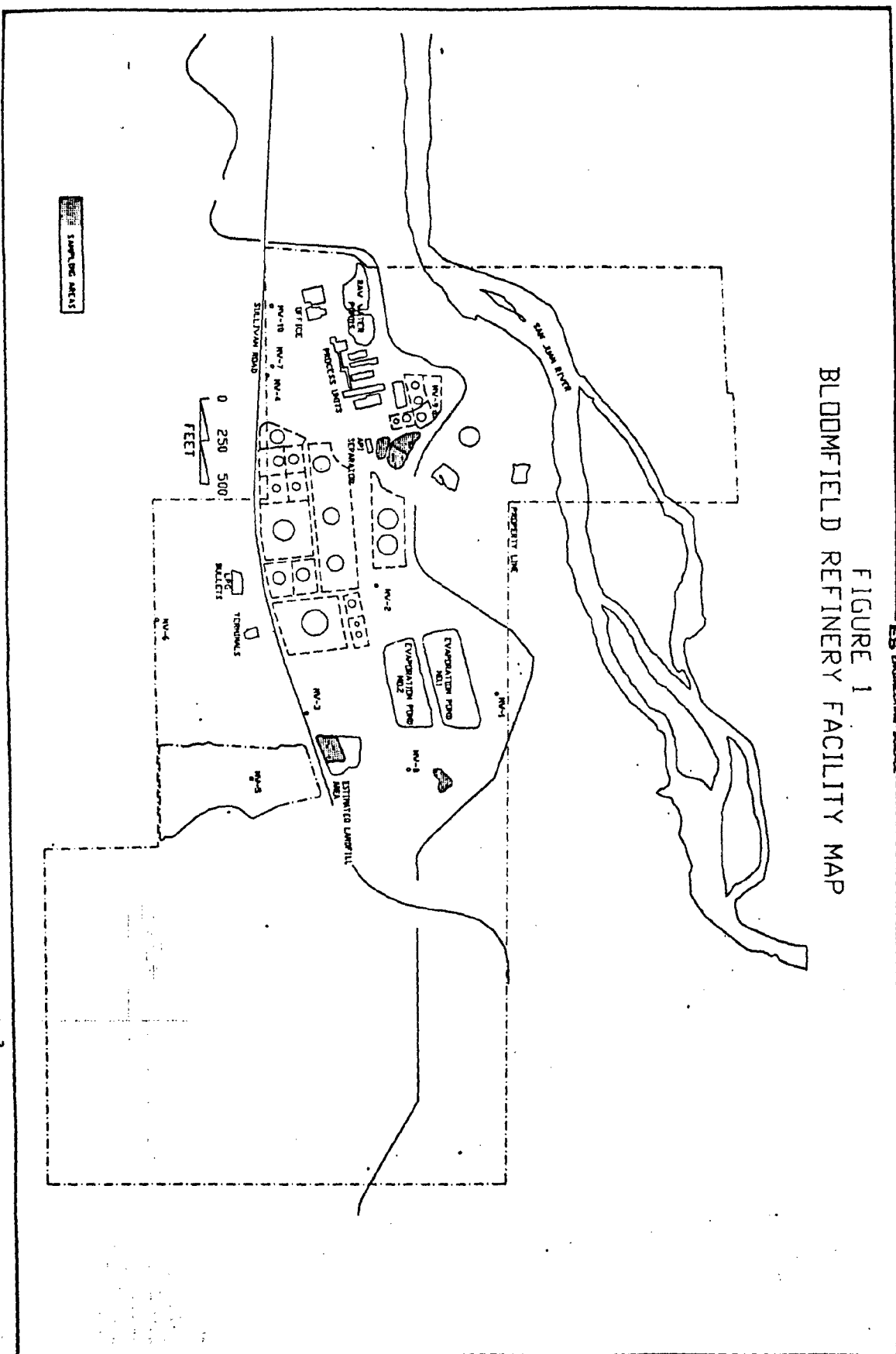
The refinery is situated on a bluff adjacent to the San Juan River, south and slightly east of the town of Bloomfield. Although the refinery owns land on both sides of the San Juan River, all process units and storage areas are located south of the river. Approximate refinery property boundaries are shown on the plot plan presented as Figure 1. The plot plan indicates the locations of the process and tank storage areas, surface waters, and elements of the wastewater treatment system. The areas addressed by the closure plan (API wastewater ponds (designated the NOWP and SOWP by EPA), landfill, and landfill pond) are also indicated. These areas are discussed in the following paragraphs.

Refinery process wastewater is treated for primary oil removal in an API separator located east of the major refinery process units. Following the API separator, wastewater flows to two API wastewater ponds located north of the API separator and south of the Hammond Ditch. The north API wastewater pond is divided by a concrete wall into two sections. In 1983, these ponds were lined with a 100-mil high-density polyethylene liner by Permanent Lining Systems of Odessa, Texas. A french drain collection system consisting of 4-inch PVC perforated pipe also was installed at this time to detect any leakage through the pond liner at a common observation well.

Prior to the installation of the pond liners, residual solids from the API wastewater ponds were removed and tested for the EP-toxicity characteristic based on leachable lead and chromium concentrations. The samples also were tested for total lead and chromium concentrations. The solids were found to be nonhazardous and were disposed of on-site in a depression (designated the "landfill by EPA) located southeast of the solar evaporation ponds and north of the spray irrigation area and Sullivan Road.

The area designated by EPA as the "landfill pond" is a natural depression resulting from blockage of an existing arroyo during construction of the Hammond Ditch. The landfill pond is located approximately 200 feet due east of the solar evaporation ponds and northeast of the landfill. Water in the landfill pond is believed to originate primarily in the Hammond Ditch, which is located just north and east of the area. The solar evaporation pond may also contribute to the water in the pond.

FIGURE 1  
BLOOMFIELD REFINERY FACILITY MAP



## CLOSURE ACTIVITIES

In accordance with the consent agreement with EPA and NMEID Bloomfield Refining Company will close the API wastewater ponds, landfill, and land-fill pond. This closure plan outlines the steps which will be undertaken to adequately close these facilities. Following approval of this plan by the New Mexico Environmental Improvement Division (NMEID), Bloomfield Refining Company will initiate closure activities within 30 days and complete closure within a 6-month time frame. Upon completion of closure, Bloomfield Refining Company will submit to the NMEID Director certification that the facilities have been closed out in accordance with this plan.

Pursuant to the Consent Agreement and Final Order dated November 26, 1985, the following provisions are incorporated into this closure plan:

### Storage of Hazardous Waste

BRC shall not store any hazardous waste on site, including its transportation terminal, except to the extent that such storage is authorized for up to ninety (90) days pursuant to 40 CFR Part 262 and corresponding New Mexico regulations at HWMR-2. BRC shall not treat or dispose of any hazardous waste on site, including its transportation terminal.

### Discharge of Hazardous Waste

BRC shall not introduce any 1,1,1-trichloroethane, or any other hazardous waste listed at 40 CFR Part 261, Subpart D, into its Bloomfield Refinery sewer system.

### API Separator Operation

BRC shall insure that API Separator Sludge (Waste Code K051) is not "re-suspended and carried over" from the Bloomfield Refinery API Separator, as described in the Memorandum of the Director, Office of Solid Waste, U.S. EPA, dated December 7, 1984. In order to effect this requirement, BRC shall clean out the facility's API Separator not less frequently than every two years, or whenever the API Separator Sludge level reaches a height of 2.5 feet above the base of the API Separator, whichever occurs first. Any sludge removed from the API Separator will be properly manifested and handled as a hazardous waste. This procedure will be documented in the facility's operating record.

#### Slop Oil Tank Operation

BRC shall discharge only wastewater from the Slop Oil tank to the API Separator without oily emulsion solids, and shall document its efforts as performed, to insure the same in the facility operating record. Any slop oils in the tank shall be returned to the refinery process and commingled with normal process streams; and any slop oil emulsion solids removed from the tank will be properly handled as hazardous waste, including manifesting if taken off-site.

#### Spent Caustic Tank

BRC shall promptly repair any leaks that should occur in the caustic tank or caustic tank piping and shall install a containment dike around the base of the caustic tank. When removed from the spent caustic tank, material shall be properly handled as a hazardous waste. This may include transportation off-site for legitimate recycling, provided that the material is properly manifested as a hazardous waste, if required, and all other applicable regulatory requirements are met, including documentation in the facility operating record.

#### North and South Evaporation Ponds

In the event that materials are removed from the north evaporation pond (NEP), or the south evaporation pond (SEP), at any time, BRC shall analyze such material prior to any removal to determine whether said material is a hazardous waste in accordance with Subpart C of 40 CFR Part 261 and its New Mexico equivalent regulations at HWMR-2, including specifically, with respect to the characteristic of "reactivity", whether such removal, or subsequent handling, may result in the generation of toxic gases in sufficient quantities, to present a danger to human health or the environment. Said reactivity analysis shall be conducted in accordance with the method set forth in the July 12, 1985, memorandum addressed from Eileen Claussen, Director of the Characterization and Assessment Division, U.S. EPA, to Solid Waste Branch Chiefs, Regions I to X, U.S. EPA, entitled: "Interim Thresholds for Toxic Gas Generation Reactivity ( 261.23(1)(5))". In the event such material would be characterized as hazardous waste following the guidelines of said memo after such analysis, or meet the definition of any other hazardous waste characteristic, BRC shall properly



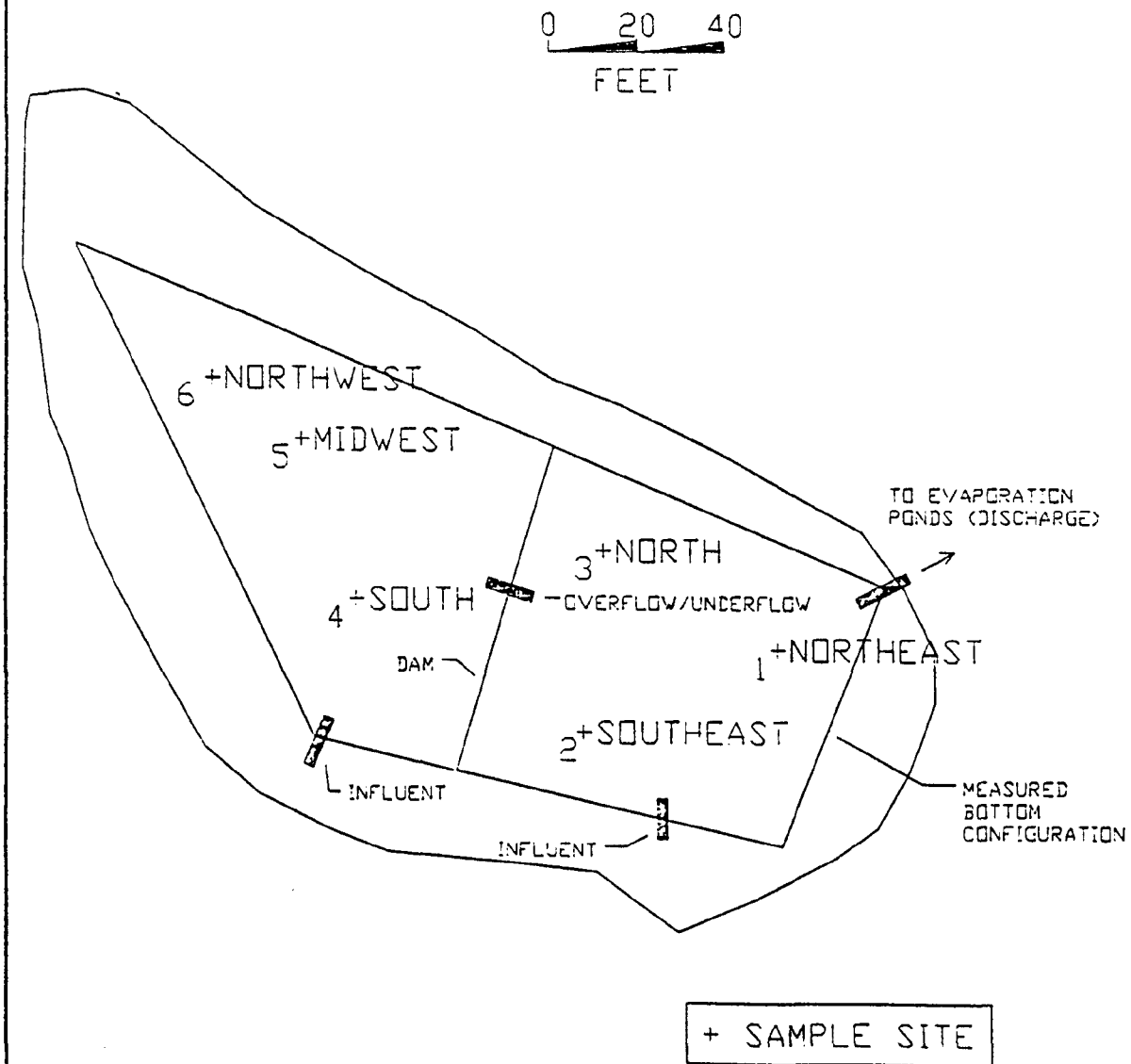
handle such material as hazardous waste. BRC shall also comply with 40 CFR 262.11 and the equivalent New Mexico regulations at HWMR-2, and other requirements when and where applicable.

#### API Wastewater Ponds

Although all visible contaminated soil was removed from the API wastewater ponds when the pond liners were installed, EPA and NMEID expressed concern that some residual contamination remained. Therefore, the subsurface soils beneath the pond liners were tested for residual contamination during the week of October 14, 1985, after the removal of all hazardous waste from the ponds. Appendix A includes a closure certification by the sampler, a registered professional engineer. These materials were handled as hazardous wastes.

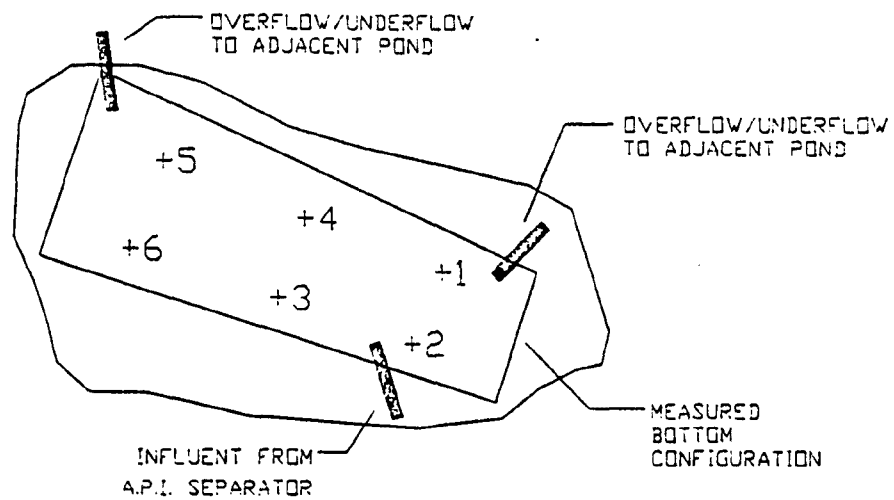
A total of 12 samples were collected by penetrating the liner at six approximately equally spaced locations in each pond and collecting two samples in each location with a clean split-spoon sampler. Sampling site locations are shown on Figures 2 and 3. The pond liner was penetrated for sampling purposes by cutting a clean hole of sufficient size to admit the split-spoon sampler. Following the collection of samples, the liner was repaired with a high-density polyethylene patch, joined to the existing liner with a hot (approximately 460°F) polyethylene resin weld. The sampling and liner repair was not conducted under wet conditions or inclement weather which could affect the integrity of the analytical results or weld. Each split-spoon sampler was cleaned prior to sampling with a detergent wash, followed by a distilled water rinse, acetone wash, and final distilled water rinse. The two samples in each location were collected at depths of 0-6 inches and 6-12 inches, respectively. Three samples were composited at each depth from pairs of the closest adjacent grab samples. The six total composite samples in each pond (three at each depth) were analyzed for the indicator parameters benzene, toluene, xylene, phenols, total lead, and total chromium. The analytical results for these parameters are included in Appendix B. Although small concentrations of xylenes were detected in a single composite sample in the south API pond, none of these data indicate significant residual BTX or phenolic contamination beneath the pond liners.

FIGURE 2  
NORTH API POND



# FIGURE 3 SOUTH API POND

0 20 40  
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In the south API wastewater pond, a single grab sample collected in the top 6 inches near the influent end of the pond was analyzed for the "Skinner List" of compounds expected to be present in petroleum refinery wastes. This list and the analytical methods being used are presented in Table 1. None of the "Skinner List" constituents were present at detectable concentrations in this sample.

The analytical data presented in Appendix B indicates no appreciable residual contamination in the top 12 inches immediately beneath the ponds. Based on this finding, and the removal of material from the ponds as documented in Appendix A, closure of the API wastewater ponds should be deemed complete.

#### Landfill

The landfill area alleged to have been utilized for disposal of residual solids from the API wastewater ponds was divided into four quadrants for subsequent soil testing. Small excavations were made at two locations in a backhoe trench in each quadrant, that penetrated all visible waste material. Grab samples were collected during the week of October 14 with clean split-spoon samplers at depths of 0-6 and 6-12 inches below this zone and were composited into two composite samples in each quadrant (one at each depth). Prior to sampling, each split-spoon sampler was cleaned with a detergent wash, followed by a distilled water rinse, acetone wash, and final distilled water rinse. All eight composite samples were analyzed for the following indicator parameters: phenols, benzene, toluene, xylene, total lead, and total chromium. Data on soil benzene, toluene, xylene, and phenolic concentrations included in Attachment B indicate none of these parameters were detectable in any of the soil samples collected immediately below visible waste material. Therefore, closure activities for this area will consist of removal and disposal of all visible contaminated material.

Sampling and laboratory analyses will be required to determine classification of the material to be disposed. Appropriate guidelines for health and safety precaution will be developed pending receipt of laboratory results. If the material is determined to be hazardous, a site-specific health and safety plan will be produced to address requisite worker attire and necessary decontamination procedures for both workers and equipment. Disposal of the material will be at an approved landfill

TABLE 1

PROPOSED CONSTITUENTS AND ANALYTICAL METHODS  
FOR SELECTED SOIL SAMPLES

Skinner List Volatile Organics  
Method 8240

Acrolein  
Acrylonitrile  
Benzene  
Carbon Disulfide  
Carbon tetrachloride  
Chlorobenzene  
Chloromethane  
1,2 Dibromoethane  
Chloroform  
Dichloromethane  
1,1-Dichloroethane  
1,2-Dichloroethane  
1,1-Dichloroethylene  
Dichloropropane  
Methyl ethyl ketone  
Styrene  
1,1,2,2-Tetrachloroethane  
Tetrachloroethylene  
Toluene  
1,2-trans-Dichloroethylene  
1,1,1-Trichloroethane  
1,1,2-Trichloroethane  
Trichloroethylene

Skinner List Acid Organics  
Method 8270

2-Chlorophenol  
o-Cresol  
m/p-Cresol  
2,4-Dimethylphenol  
4,6-Dinitro-o-phenol  
2,4-Dinitrophenol  
2-Nitrophenol  
4-Nitrophenol  
p-Chloro-m-cresol  
Pentachlorophenol  
Phenol  
2,4,6-Trichlorophenol

Indicator Parameters

Benzene - Method 8240  
Toluene - Method 8240  
Xylene - Method 8240  
Phenolics - Method 9065  
Lead - Method 3050 followed by ICP  
Chromium - Method 3050 followed by ICP

Skinner List Base/Neutral Organics  
Method 8270

Anthracene  
Benzidine  
Benz(c)acridine  
Benzo(a)anthracene  
Benzo(a)pyrene  
Benzo(b)fluoranthene  
Benzo(k)fluoranthene  
Bis(2-chloroethyl)ether  
Bis(2-chloroisopropyl)ether  
Bis(2-ethylhexyl)phthalate  
Butyl Benzyl phthalate  
2-Chloronaphthalene  
Chrysene  
Dibenz(a,h,)acridine  
Dibenz(a,j)acridine  
7,12-DimethylBenz(a)anthracene  
Dibenz(a,h)anthracene  
7H Dibenzo(c,g)carbazole  
1,2-Dichlorobenzene  
1,3-Dichlorobenzene  
1,4-Dichlorobenzene  
Diethyl phthalate  
Dimethyl phthalate  
Di-n-butyl phthalate  
1,2-Diphenylhydrazine  
Fluoranthene  
Indene  
Indeno(1,2,3-cd)pyrene  
Methyl Benz(c)phenanthrene  
3-Methylcholanthrene  
Methyl Chrysene  
Naphthalene  
Nitrobenzene  
n-Nitrosodiethylamine  
5-Nitrosodiethylamine  
Quinoline  
Phenanthrene  
Pyrene  
1,2,4-Trichlorobenzene  
Trimethyl Benz(a)anthracene

via standard chain-of-custody manifesting procedures. Likewise, if the material is found to be nonhazardous, no health and safety work plan will be generated and manifesting of the disposal of contaminated material will not be required.

#### Landfill Pond

The landfill pond was sampled using a flat-bottom boat. Sample locations are summarized on Figure 4. Sediment samples of the landfill pond were collected at two sediment depths (0-6 and 6-12 inches) with clean split-spoon samplers at six approximately equally spaced locations in the pond. Each split-spoon sampler was cleaned prior to sampling with a detergent wash, followed by a distilled water rinse, acetone wash, and final distilled water rinse. Soil samples at each depth were composited into three composite samples of the closest pairs, resulting in six total composite samples. These samples were analyzed for the indicator parameters benzene, toluene, xylene, phenols, total lead, and total chromium. In addition, a single grab sample was collected along the bank at a depth of 0-6 inches in the area of the pond nearest the south evaporation pond and the landfill. This sample was analyzed for the list of compounds shown in Table 1, and no compounds were found at detectable levels. As shown in Appendix B, data on benzene, toluene, xylene, and phenolics in the pond sediments do not indicate significant organic contamination. In only one sample, a composite of the top 6 inches at stations 3 and 4, was an indicator compound found at a detectable concentration. In this sample, benzene was detected at a 1.3 ug/kg concentration, barely above the detection limit. BTX compounds and phenolics were not found in any other landfill pond sediment samples.

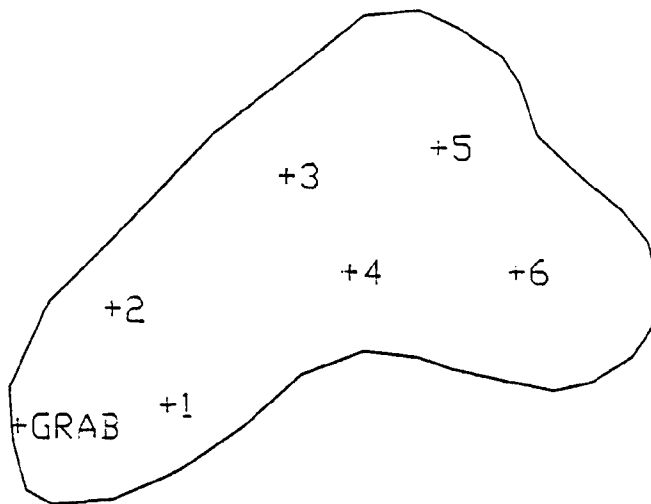
Based on the analytical results of sediment samples collected in the landfill pond, there is no significant residual contamination in the top 12 inches of sediments. Therefore, closure of the landfill pond should be deemed complete.

#### Chain of Custody Procedures

All samples were preserved on ice and delivered to the laboratory in an insulated cooler. The chain of custody record was maintained to document that no unauthorized handling of the samples occurred enroute to

# FIGURE 4 LANDFILL POND

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the laboratory. It also contains a record of parameters requested for analysis. The form was signed and dated by the individual who actually collected the sample.

#### CLOSURE COST ESTIMATES

Based on the size of the areas addressed, assumed depth of contamination, and the mobility of the compounds believed to be present, a total closure cost of \$290,950, including contingencies, was estimated. A detailed breakdown of these estimated costs is presented in Table 2. The major costs are associated with the disposal of waste material from the landfill. Removal and disposal of an estimated 2,500 cubic yards of material from the landfill area was assumed. Actual amounts could be higher or lower, depending on the areal extent of the visually contaminated material.

#### CLOSURE SCHEDULE

Implementation of this closure plan will be initiated within 30 days of final approval by NMEID. Specific closure activities have been identified below with respect to estimated time for completion:

Item	Time
(1) Contractor bidding/contract negotiation, excavation	4 weeks
(2) Landfill sampling and laboratory analyses	2 weeks
(3) Contractor mobilization	1 week
(4) Material disposal	2 weeks
(5) Contractor demobilization	1 week
(6) Contingencies	<u>2 weeks</u>
Total time	12 weeks

The 12-week period should be sufficient to complete all closure activities. However, this timeframe is exclusive of any time that may be required for regulatory input.

#### DOCUMENTATION AND RECORDKEEPING

The Facility Coordinator will maintain records of all closure activities, including the dates and nature of all work conducted during the



TABLE 2  
ITEMIZED ESTIMATED CLOSURE COSTS

Activity	Estimated Cost
API Wastewater Pond Closure	
Soil sampling and analysis	\$ 3,500
Landfill Closure	
Soil sampling and analysis	2,000
Contaminated soil removal and disposal (as necessary)	250,000
Backfilling and grading (as necessary)	5,000
Landfill Pond Closure	
Soil sampling and analysis	2,000
Miscellaneous Costs	
Closure Certification	2,000
Contingencies (10 percent)	<u>26,450</u>
Total Estimated Closure Costs	\$290,950

closure process. All manifests or other documentation of off-site shipment of waste material or contaminated soil will be maintained.

Following the successful completion of on-site closure activities, both Bloomfield Refining Company and an independent registered professional engineer will certify that the facilities have been closed in accordance with the approved closure plan. This documentation will be maintained by the Facility Coordinator, and a copy of the closure certification will be provided to NMEID.

**LETTER OF TRANSMITTAL**

DATE <u>7/21/86</u>	JOB NO. <u>46424.00</u>
ATTENTION _____	
RE <u>Bloomfield Refining Co.</u>	
_____	
_____	
_____	

Mr. Harry Mason  
Mr. Joe Guida  
Mr. Chris Hawley

GENTLEMEN:

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via \_\_\_\_\_ the following items:

- ☐ Shop drawings    ☐ Prints    ☐ Plans    ☐ Samples    ☐ Specifications  
☐ Copy of letter    ☐ Change order    ☒ The Appendix to final closure report for Bloomfield Ref.

Dated \_\_\_\_\_

COPIES	DATE	NO.	DESCRIPTION

THESE ARE TRANSMITTED as checked below:

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| <input type="checkbox"/> As requested            | <input type="checkbox"/> Approved as noted        | <input type="checkbox"/> Return _____ corrected prints      |
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REMARKS:

Evidently, the Appendix was deleted in the  
building of the final report. Therefore, the attached  
copies have been enclosed to supplement the  
original report.

COPY TO \_\_\_\_\_

SIGNED: Jim Lumbha

If enclosures are not as noted, please notify us at once.