Appendix G
Phase 2 Site Characterization Report

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Mr. Matt McClincy
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Dear Mr. McClincy:

Subject: Phase 2 Site Characterization Report
Acid Plant Project
Elf Atochem, Portland, Oregon

On behalf of Elf Atochem North America, Inc., CH2M HILL is submitting two copies of the above-titled report for your review. As you requested, we have sent one bound copy of the report, and one copy that is neither bound nor punched.

Elf Atochem is interested in continuing its cooperative relationship with DEQ and moving forward with the next phase of work at the Acid Plant Area. Please call either Larry Patterson at 225-7210 or Ken Shump at 235-5000 if you have any questions or need clarification during the course of your review.

Sincerely,

CH2M HILL

Ken Shump

Ken Shump, P.G.
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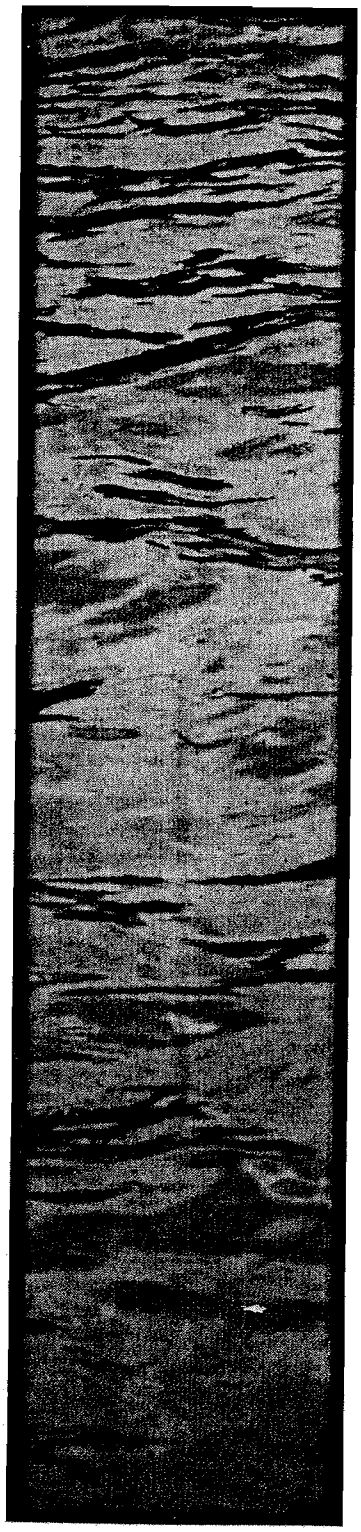

Phase 2 Site Characterization Acid Plant Project

Prepared for

Elf Atochem North America

Portland, Oregon

JUNE 1997

CH2MHILL

Portland, Oregon

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Executive Summary

Elf Atochem North America (Elf Atochem) owns and operates a chlor-alkali manufacturing plant adjacent to the Willamette River in Portland, Oregon. Products of the chlor-alkali plant are chlorine, caustic soda, hydrogen, hydrochloric acid, and sodium chlorate. The plant also produced the pesticide dichlorodiphenyltrichloroethane (DDT) from the late 1940s to approximately 1954. The DDT production process, which occurred in an area of the facility now referred to as the General Acid Plant Area, used the following raw materials:

- Chloral (trichloroacetaldehyde)
- Chlorobenzene (also referred to as monochlorobenzene)
- Oleum-104 percent (fuming sulfuric acid)

Manufacturing process residues from DDT production were conveyed to a chlorobenzene recovery unit and subsequently to a shallow residue pond (now referred to as the Former Residue Pond). Before DDT production ceased in 1954, the pond's capacity was increased by excavating a shallow (approximately 5-foot-deep) trench (now referred to as the overflow trench) extending plant north (parallel to the Willamette River) from the pond's northeast corner. The trench and pond subsequently were filled to permit construction of other plant operations.

A Phase 1 investigation of soil and groundwater conditions in the General Acid Plant Area was conducted in 1994. This investigation found that the lateral extent of the Former Residue Pond is approximately 60 feet by 56 feet in the shallow subsurface. DDT process residues, specifically DDT and chlorobenzene, were detected in soil and groundwater in the immediate vicinity of the Former Residue Pond. DDT process residues in the Former Residue Pond were found to have a distinctive pink color. Lower concentrations of DDT process residues were present in surface soil samples collected in the General Acid Plant Area. After the Phase 1 investigation was completed and the data summarized, a Phase 2 work plan was prepared, and Elf Atochem contacted the Oregon Department of Environmental Quality (DEQ) and entered its voluntary cleanup program to obtain agency concurrence with the proposed Phase 2 investigation work.

The Phase 2 investigation described in this report was conducted between October 1996 and April 1997. It involved the following work tasks in the General Acid Plant Area:

- Collecting a total of 93 soil samples at various depths
- The use of a cone penetrometer at three locations to identify subsurface stratigraphy
- Collecting 14 groundwater samples with a Geoprobe direct-push sampler
- Installing four monitoring wells to depths of between 30 and 35 feet below ground surface (bgs) in the shallow unconfined water-bearing zone
- Collecting two sets of groundwater samples (a total of 10 samples including duplicates) from the monitoring wells
- Conducting slug tests to estimate aquifer properties near the monitoring wells

- Monitoring groundwater and river stage elevations on a monthly basis

Depending on location and depth, soil samples were analyzed for one or more of the following constituents: organochlorinated pesticides, volatile organic compounds (VOCs), total organic carbon, and total petroleum hydrocarbons (TPH). Depending on location, groundwater samples were analyzed for organochlorinated pesticides, volatile organic compounds and/or total petroleum hydrocarbons.

The shallow water-bearing lens beneath the facility lies in an interbedded alluvial silt/sand zone. The shallow water-bearing lens is overlain by fill near the Willamette River, where a zone of imported fill containing silt, sand, gravel, and demolition rubble was placed in the past to extend the river bank eastward. Where saturated, the fill constitutes part of the shallow water-bearing lens. On the basis of information from subsurface explorations at other sites in the vicinity of the Elf Atochem facility, the shallow water-bearing lens is underlain by a local lower-permeability silt zone. The depth of this zone beneath the facility is unknown; however, a silt zone encountered at a depth of about 47 feet bgs in the deepest cone penetrometer exploration probably represents the top of this local silt zone.

Groundwater occurs at depths ranging from 13 to 24 feet bgs. Groundwater typically discharges eastward to the Willamette River, a regional groundwater discharge feature. During high river stage conditions, as those observed in the January 1997 flood, the river stage rose above groundwater levels and caused a temporary gradient reversal in the shallow water-bearing lens. The magnitude and duration of such reversals are limited and likely have no influence on long-term average groundwater flow directions at the site.

The Phase 2 investigation supplemented Phase 1 findings concerning the effect historical DDT production activities have had on soil and groundwater in the shallow water-bearing lens. Key findings regarding the presence and distribution of constituents of concern associated with the former DDT production process are as follows:

- DDT was detected in the shallowest soil sample (generally less than 2 feet deep) at each sample location in the General Acid Plant Area (the area surrounding the Former Residue Pond). Concentrations of DDT process residues decrease with depth beneath ground surface in the General Acid Plant Area.

- The near-surface areal extent of the Former Residue Pond is approximately 56 by 60 feet. The extent of affected soil appears to extend approximately 20 to 30 feet beyond the limits of the former pond in the unsaturated zone. DDT in soil is known to extend to at least the 20 feet depth (the maximum depth sampled). Low levels of chlorobenzene are correlated with DDT in soil. Higher levels of chlorobenzene detected in soil at the west edge of the Former Residue Pond may be attributable to past operations of the former chlorobenzene recovery unit.

- The location and dimensions of the former overflow trench was confirmed. The zone of affected soil associated with the overflow trench was found to be a maximum of 15 feet wide, extending approximately 270 feet northward from the edge of the Former Residue Pond. The affected soil within and beneath the overflow trench, which was similar in appearance to that beneath the Former Residue Pond, reached its greatest depth (the water table) immediately adjacent to the Former Residue Pond, where the zones of affected subsurface soil associated with the pond and the end of the trench appear to merge. The depth of affected soil gradually decreases with distance away from the

pond, reaching a minimum depth of about 5 feet near the north end of the overflow trench.

- Chlorobenzene and DDT were detected in groundwater samples from the shallow water-bearing lens at the site. The extent of DDT detections and the magnitude of reported concentrations in groundwater samples decreased between the first and second sets of samples, suggesting that the detection of DDT in groundwater could be associated with formation disturbance from well installation.

- The distribution of chlorobenzene in groundwater samples collected in October 1996 (with Geoprobes) was consistent with expected conditions: concentrations were highest east (downgradient) of the Former Residue Pond near the river, and chlorobenzene was not detected in the western (upgradient) well. The two sets of samples collected from the monitoring wells in January and March 1997, however, indicated an almost opposite distribution of chlorobenzene, suggesting that unusual water levels and groundwater gradients associated with flood conditions along the Willamette River in early 1997 influenced the distribution of chlorobenzene in groundwater at the site.

Future groundwater sampling planned for June and September 1997 will provide additional information regarding the presence and distribution of constituents of concern associated with the former DDT manufacturing process at the site.

SECTION 1

Introduction

SECTION 1

Introduction

This report describes the Phase 2 investigation at the Elf Atochem North America, Inc. (Elf Atochem), chlor-alkali manufacturing plant located at 6400 N.W. Front Avenue, Portland, Oregon (Figure 1-1). It also includes a brief summary of the Phase 1 investigation conducted at the facility during 1994. The scope of the Phase 2 investigation was based primarily on the results of the Phase 1 investigation.

1.1 Purpose and Scope of the Investigation

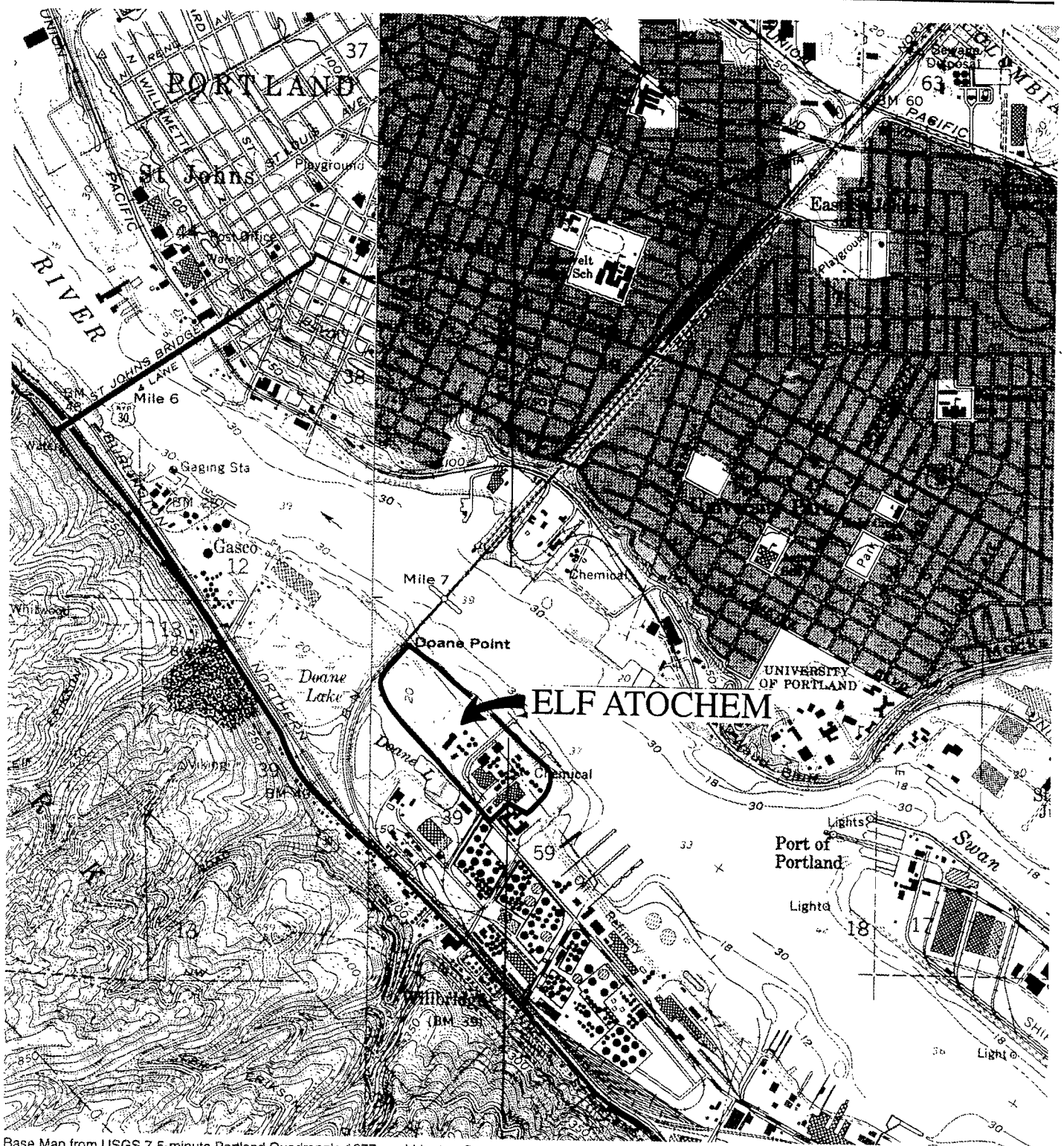
The area included in the investigation is referred to as the Acid Plant Area (Figure 1-2). The Acid Plant Area is divided into three subareas: the General Acid Plant Area, the Former Manufacturing Process Residue Pond (Former Residue Pond), and the Former Residue Pond overflow trench (overflow trench). Figure 1-3 presents the approximate locations of these areas.

The goal of this investigation was to gather information on the nature and extend of DDT process residues and related compounds in the General Acid Plant Area to support a future assessment of potential risk posed by these materials.

The Phase 2 investigation had the following specific objectives:

- Evaluate the vertical and lateral extent of DDT process residue and related compounds in soil in the General Acid Plant Area.
- Further delineate the lateral and vertical extent of the affected soil around the Former Residue Pond.
- Assess the presence and, if appropriate, the extent of the affected soil around the overflow trench.
- Evaluate the presence and extent of DDT process residue and related compounds, if any, in the uppermost water-bearing lens.
- Characterize the local stratigraphy, including determination of the presence or absence of a silt layer underlying the uppermost water-bearing lens.
- Assess flow direction and gradient in the uppermost water-bearing lens.
- Collect data necessary to develop remedial action objectives.

The tasks performed during the investigation included soil sampling, groundwater sampling with a Geoprobe, cone penetrometer testing, installation and sampling of shallow monitoring wells, and laboratory analysis of soil and groundwater samples.



Base Map from USGS 7.5-minute Portland Quadrangle,1977, and Linnton Quadrangle, 1984

NORTH

0 1000 2000 FEET

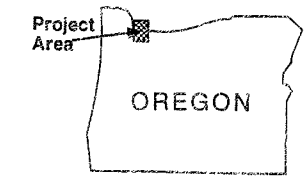


Figure 1-1
Site Location Map
ELF ATOCHEM
PORTLAND, OREGON

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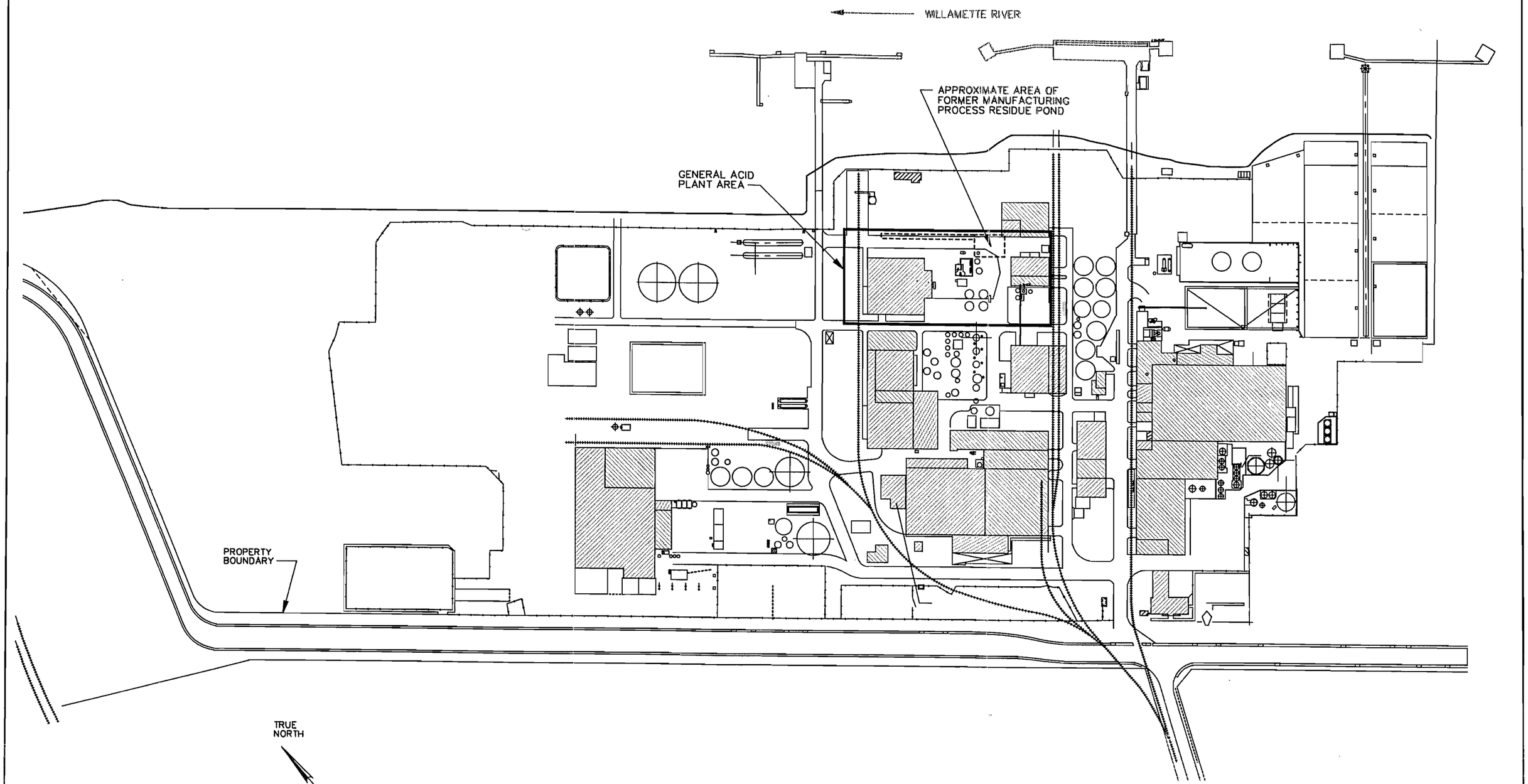

Figure 1-2
Elf Atochem
Site Map
ELF ATOCHEM
PORTLAND, OREGON

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\ATOCHEM\115946\CAD\74G023.DWG

SRB 7449G22A
25-Feb-1997

TRUE NORTH
PLANT NORTH
0 25 50
SCALE IN FEET

NO. 2 DOCK
NO. 1 DOCK
B 4+94
Willamette River
General Acid Plant Area
Approximate Area of Former Manufacturing Process Residue Pond
NO. 3 WAREHOUSE
Approximate Location of Overflow Trench
ACID PLANT
NO. 2 WAREHOUSE
CONTROL HOUSE
IDLE PROCESS BLDG.

Figure 1-3
Approximate Locations of Investigation Areas
ELF ATOCHEM
PORTLAND, OREGON

CH2M HILL

ATOCHEM\115946\CAD\7449G22A.DWG

1.2 Site Background

1.2.1 Site Description

The Elf Atochem facility is located at 6400 N.W. Front Avenue in Portland, Oregon. The plant is located along the west bank of the Willamette River at approximately river mile 7.5. The plant is bordered on the east by the Willamette River, on the south by Genstar Roofing Products Company, and on the north and west by Front Avenue. The plant site is fairly flat. The facility is surrounded by steel security fencing, and security personnel attend the main gate 24 hours a day.

The facility occupies approximately 50 acres. The northern portion of the property, which encompasses approximately 15 to 20 acres, currently is undeveloped. The facility, which is located in an industrial-zoned area, uses electrolytic cells to reduce concentrated sodium chloride brine to produce chlorine, caustic soda, hydrogen, hydrochloric acid, and sodium chlorate.

1.2.2 Site History

Elf Atochem staff provided the following site history information. The pesticide DDT was manufactured in the present Acid Plant Area of the facility from approximately the late 1940s until approximately 1954. The following raw materials were used to manufacture DDT:

- Chloral (trichloroacetaldehyde)
- Chlorobenzene (also referred to as monochlorobenzene)
- Oleum-104 percent (fuming sulfuric acid)

According to available information, manufacturing process waste was discharged from the former process building to a chlorobenzene recovery system and then into a shallow manufacturing process residue pond. Reportedly, for a short period of time (approximately 1 to 2 years), an overflow trench extended from the northeastern (plant north) corner of the Former Residue Pond.

The area designated as the General Acid Plant Area was selected to address all materials-handling operations associated with the manufacture and handling of DDT-manufacturing process waste and related compounds.

The actual production of DDT occurred inside the process building (see Figure 1-3). Raw materials for the process consisted of 98 percent sulfuric acid, oleum, monochlorobenzene, and chloral. Each of these materials, with the exception of chloral, was stored in above-ground tanks located immediately adjacent to the east side (plant east) of the process building. The chloral tank apparently was located aboveground inside the process building on a concrete floor. Reactions to form DDT occurred inside the building. Portable metal pans several feet square were filled with hot DDT in the process building. After the DDT cooled, the material in the pans was broken with a jackhammer to form large fragments of crystalline material. Crystalline DDT was temporarily stored on an asphalt slab located in the General Acid Plant Area.

The DDT at the storage slab was periodically moved into the southwest corner of the No. 2 warehouse for milling and grinding inside the warehouse. Dry-processed DDT was loaded

into bags and transported from the plant by railcar. The railcar loading area was located inside the General Acid Plant Area on the north side of the Idle Process Building. A small amount of material was dissolved in diesel fuel and loaded into railcars as a solution. The aboveground dissolving tanks were located immediately adjacent to the west (plant west) side of the Idle Process Building. This building has expanded westward since DDT operations ceased, so the area formerly occupied by tanks is under the current building footprint.

Wastes from the process were conveyed through piping to a chlorobenzene recovery system. The system apparently was located immediately west (plant west) of the Former Residue Pond. The recovery system consisted of a steam stripping system in which chlorobenzene was stripped from the waste and returned to the process. The entire system was located on a curbed concrete slab. Wastes from the system apparently were drained periodically to the Former Residue Pond.

1.3 Report Organization

This report is organized into the following sections:

Section 1: Introduction. This section introduces the purpose and scope of the investigation and the applicable site background.

Section 2: Regional Physical Setting. This section describes the physical setting of the facility, including climate, surface water, geology, hydrology, land use, and beneficial use of groundwater.

Section 3: Phase 1 Investigation. This section summarizes the Phase 1 investigation previously conducted in the Acid Plant Area of the facility.

Section 4: Field Investigation Methods. This section describes the methods used to complete the investigation, including the soil characterization, groundwater characterization, and hydrogeologic investigation.

Section 5: Investigation Physical Results. This section describes the site stratigraphy, groundwater occurrence, and hydraulic properties of the areas investigated.

Section 6: Nature and Extent of Constituents of Concern. This section describes the nature and extent of constituents of concern based on the chemical results of the soil and groundwater investigations in the General Acid Plant Area, the Former Residue Pond, and the overflow trench.

Section 7: Mobility Properties of Constituents of Concern. This section describes the physical and chemical properties of the potential constituents of concern identified at the facility.

Section 8: Conclusions and Recommendations. This section summarizes the findings of the investigation and recommends additional characterization work.

Section 9: Works Cited. This section lists the documents cited in the text.

The following documents are included as appendices to the report:

- Appendix A. Willamette River Stage Data

- Appendix B. Well Logs for Wells Located within a 1-Mile Radius
- Appendix C. Field Methods
- Appendix D. Soil Boring Logs and Well Completion Diagrams
- Appendix E. Well Development and Groundwater Sampling Field Sheets
- Appendix F. Cone Penetrometer Testing Results
- Appendix G. Aquifer Test Data
- Appendix H. Laboratory Data Summary Tables
- Appendix I. Data Validation Reports

SECTION 2

Regional Physical Setting

SECTION 2

Regional Physical Setting

2.1 Climate

The climate in the Portland area is temperate with dry, moderately warm summers and wet, mild winters. January and February receive 40 to 50 percent of the annual precipitation, and the summer months receive only 25 percent of the annual precipitation (National Oceanic Atmospheric Administration and U.S. Department of Commerce, 1974).

The average annual precipitation in Portland is 37.6 inches. The average lake evaporation is 24 to 26 inches annually (U.S. Department of Commerce, 1968). The monthly average relative humidity ranges from 65 to 84 percent. Monthly average temperatures range from 41°F in the winter to approximately 70°F in the summer. Daily minimum temperatures in January average 32°F; daily maximum temperatures in July average 79°F. Winds are generally aligned with the Willamette River Valley.

2.2 Surface Water

The Elf Atochem facility is located along the west bank of the Willamette River at approximately river mile 7.5. The Willamette River flows at a rate ranging from 8,300 cubic feet per second (cfs) in the summer to 73,000 cfs in the winter. It joins the Columbia River approximately 7.5 miles north of the site. The Willamette River is not used as a drinking water source downstream of the site.

The Willamette River is gauged at the Morrison Street Bridge at river mile 12.8 (referred to as the Portland Station), approximately 4.8 miles upstream from the Elf Atochem facility. The datum at the Portland Station is 1.55 feet, National Geodetic Vertical Datum (NGVD) (U.S. Army Corps of Engineers, 1991). Thus Willamette River data from the Morrison Street Bridge can be converted to NGVD by adding 1.55 feet.

For water years 1973 through 1990, the minimum, mean, and maximum monthly stage for the Willamette River at the Portland Station is summarized in Appendix A. Appendix A also presents the minimum and maximum daily stages for the Portland Station. The minimum monthly stage typically occurs between July and October. Maximum monthly stages usually occur in the winter (December through February) and the spring (March through June) (U.S. Army Corps of Engineers, 1991).

The Willamette River stage is influenced by upstream reservoir regulation and by tidal effects. Tidal effects are pronounced when the river stage is between 0 and 5 feet, moderate in the 5 to 12 foot range, and diminished above a stage of 12 feet. Tidal influences are most pronounced during the summer and fall when flows are low (U.S. Army Corps of Engineers, 1991).

During the water years 1973 through 1990, a minimum daily stage of 1.1 feet was recorded in November 1979 and a maximum daily stage of 23.8 feet was recorded in January 1974 (Appendix A).

The average daily river stage at the Portland Station from September 1995 until February 1997 is shown in Figure 2-1. Two extreme daily stage levels were recorded on February 9, 1996, when the river stage reached more than 28 feet and on January 2, 1997, when the river stage reached almost 23 feet.

2.3 Regional Geology

The facility lies on a river terrace of the Willamette River. The terrace is bounded by the Tualatin Mountains to the west and the Willamette River to the east. The area bordering the Willamette River has been filled with river dredge spoils and other fill material. On the basis of aerial photos, it appears that the bank adjacent to the Acid Plant Area has been filled out toward the Willamette River approximately 200 feet since the 1950s.

Fill in the area is underlain by unconsolidated sediments comprising recent fill and Quaternary Age alluvial deposits. Below the unconsolidated sediments, the Tertiary Age Troutdale Formation, composed of sandstone and conglomerate, occurs only to a limited extent and is laterally discontinuous throughout the area (Geraghty & Miller, 1991).

The entire area is underlain by Tertiary Age Columbia River Basalt. The basalt has been encountered at variable depths in the area, ranging from 45 to 100 feet below ground surface (bgs). Available data indicate that a trough or basin feature exists in the upper basalt surface near and possibly passing beneath the Elf Atochem facility. The limited occurrence of the Troutdale Formation and the trough-shaped feature of the basalt surface are probably attributable to erosion by the ancestral Willamette River.

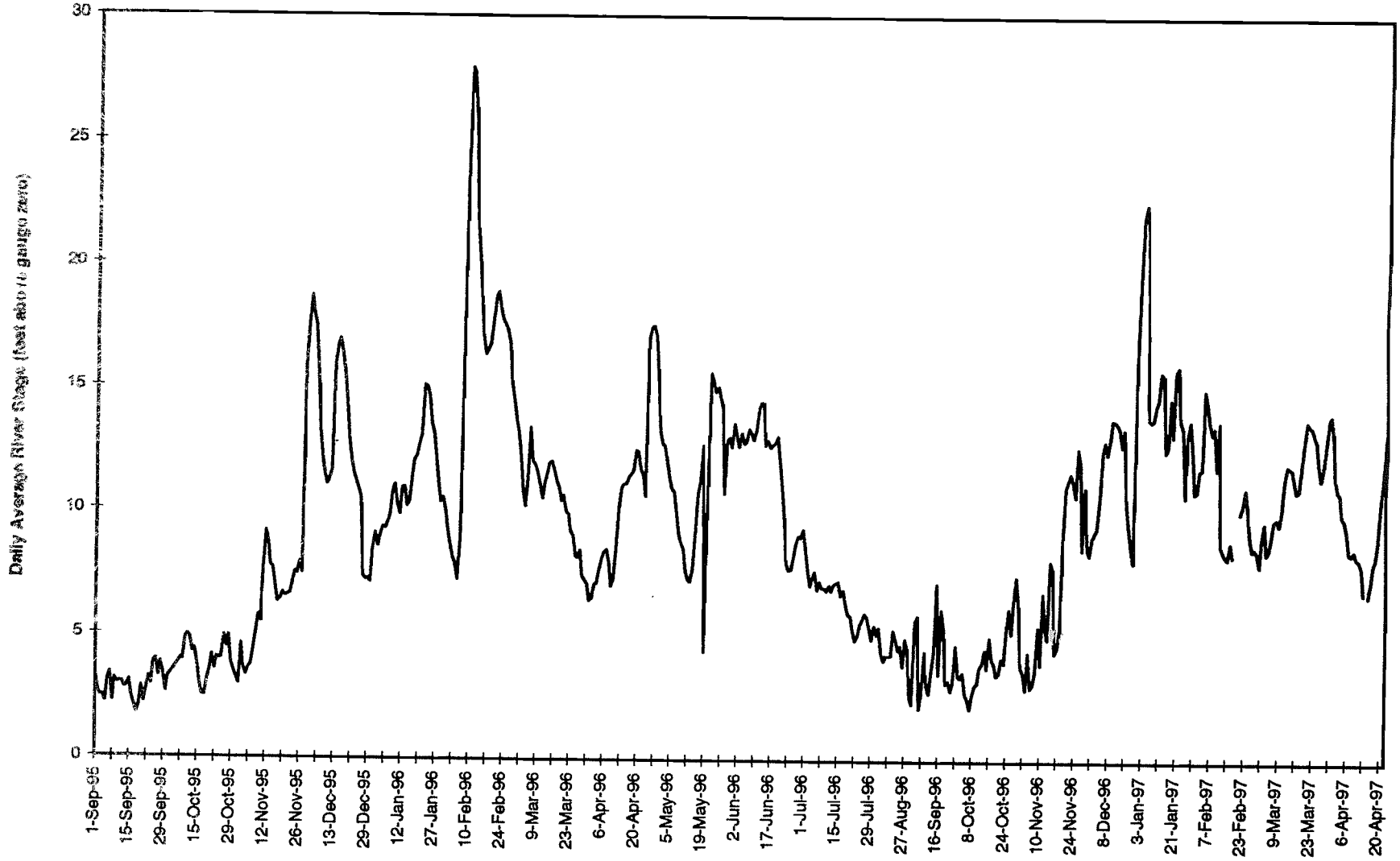
2.4 Regional Hydrogeology

This section generally describes the regional hydrogeology near the Elf Atochem facility. Site-specific hydrogeology is described in Section 5.

Four general hydrostratigraphic units may be present beneath the area: sand, silt, the Troutdale Formation, and Columbia River Basalt. The sand unit includes fill as well as alluvial deposits and consists of both sand and silty sand. The silt unit consists of silt and clayey silt within the alluvial deposits. Because of its discontinuous nature in the area, the Troutdale Formation is probably not a significant hydrogeologic unit in the vicinity of the Elf Atochem facility.

Depth to groundwater in the area appears to range from approximately 10 to 30 feet (Geraghty & Miller, 1991). Groundwater in the shallow zone generally flows to the northeast. Groundwater in the deeper zones tends to flow to the north. Water level data from wells screened in or near the basalt indicate that there is an upward groundwater gradient (Geraghty & Miller, 1991). Hydrogeological data indicate that the area is a closed groundwater flow system in which recharge occurs from the Tualatin Mountains and groundwater discharges to the Willamette River. Groundwater flow beneath the river is unlikely (Geraghty & Miller, 1991).

Figure 2-1
Willamette River Average Daily Stage Levels
(September 1, 1995 through April 22,1997)



* River Stage located at the Morrison Bridge, gauge zero equals 1.55 feet NGVD.

2.5 Land Use

The Elf Atochem facility is zoned heavy industrial and is bordered on the east by the Willamette River, on the south by Genstar Roofing Products Company, and on the north and west by Front Avenue. The area surrounding the facility within approximately a 1,500-foot radius is zoned heavy industrial. As shown in Figure 2-2, the property directly across the river also is zoned heavy industrial. A small residential area is located approximately 1,500 feet southwest of the facility. Surrounding the small residential-zoned area is heavy industrial property and Forest Park, which is zoned as parks and open space.

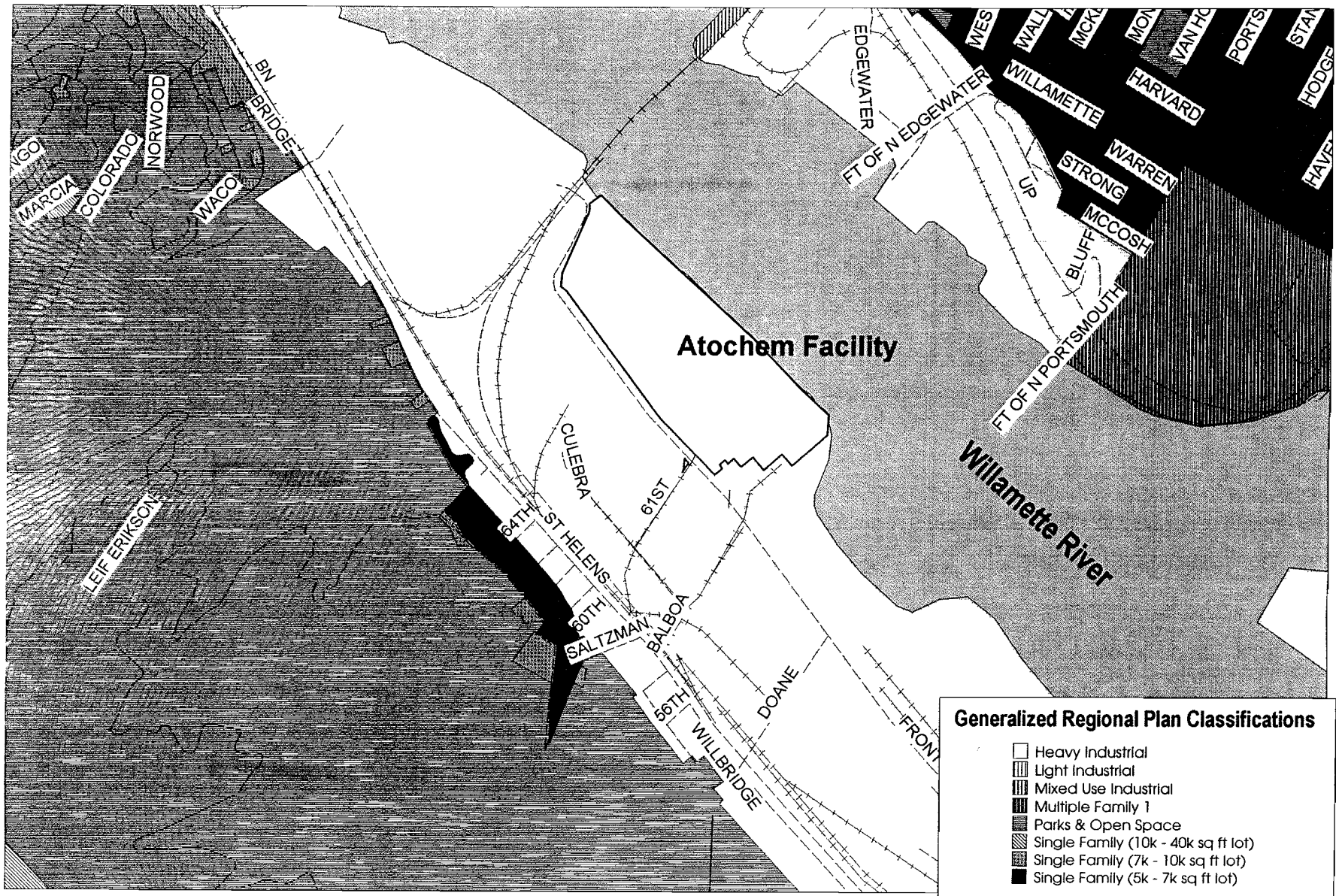
2.6 Groundwater Beneficial Use

The Oregon Water Resources Department (OWRD) provided available well record logs for the area within a 1-mile radius of the facility. Table 2-1 summarizes the well inventory. Copies of state well records for the area are provided in Appendix B. Approximate well locations are shown in Figure 2-3.

A total of 22 wells was identified within a 1-mile radius of the site (Table 2-1). Seven of these wells (wells 577, 939, 940, 941, 942, 943, and 987) are located on the other side of the Willamette River from the site and are, therefore, not hydraulically connected to the groundwater beneath the site. Of the 15 wells located on the same side of the Willamette River as the site, one well is known to be abandoned (well 803), two wells were temporary dewatering wells installed in 1969 and are likely to have been abandoned (wells 805 and 806), two wells are known not to be used (wells 807 and 808), and four wells are used for cathodic protection rather than groundwater withdrawal (wells 801, 996, 997, and 998). The remaining six wells identified from OWRD files are located upgradient or cross-gradient of the site and, therefore, are unlikely to either influence or be influenced by groundwater at the site. Four of these six wells are industrial wells owned by Fibreboard Paper Products Co. (wells 989 and 990), Chevron USA (well 991), and Liquid Air, Inc. (well 804).

One well (868) installed in 1958 is a domestic well. However, its location is known only to be somewhere within Section 24, and it may not be located within a 1-mile radius of the site (Figure 2-3). The current status of this well is unknown, but its location south and uphill of the site indicates that the well would not be affected by site activities. Well 802, installed in 1948 by Portland Gas & Coke Co., is marked as a municipal well on the well log form (Appendix B). Given that Portland Gas & Coke (now Northwest Natural Gas) is a private industry that formerly operated an oil gasification plant northwest (cross-gradient) of the Elf Atochem facility, it is likely that the well record was mismarked and the well is industrial. The current status of the well is unknown, although it is known that the oil gasification plant has been demolished.

In summary, no water supply wells were identified downgradient of the site.



Data Source: Metro Regional Land Information System July 1996

NORTH

0 550 1100 FEET

Figure 2-2
Land Use Map

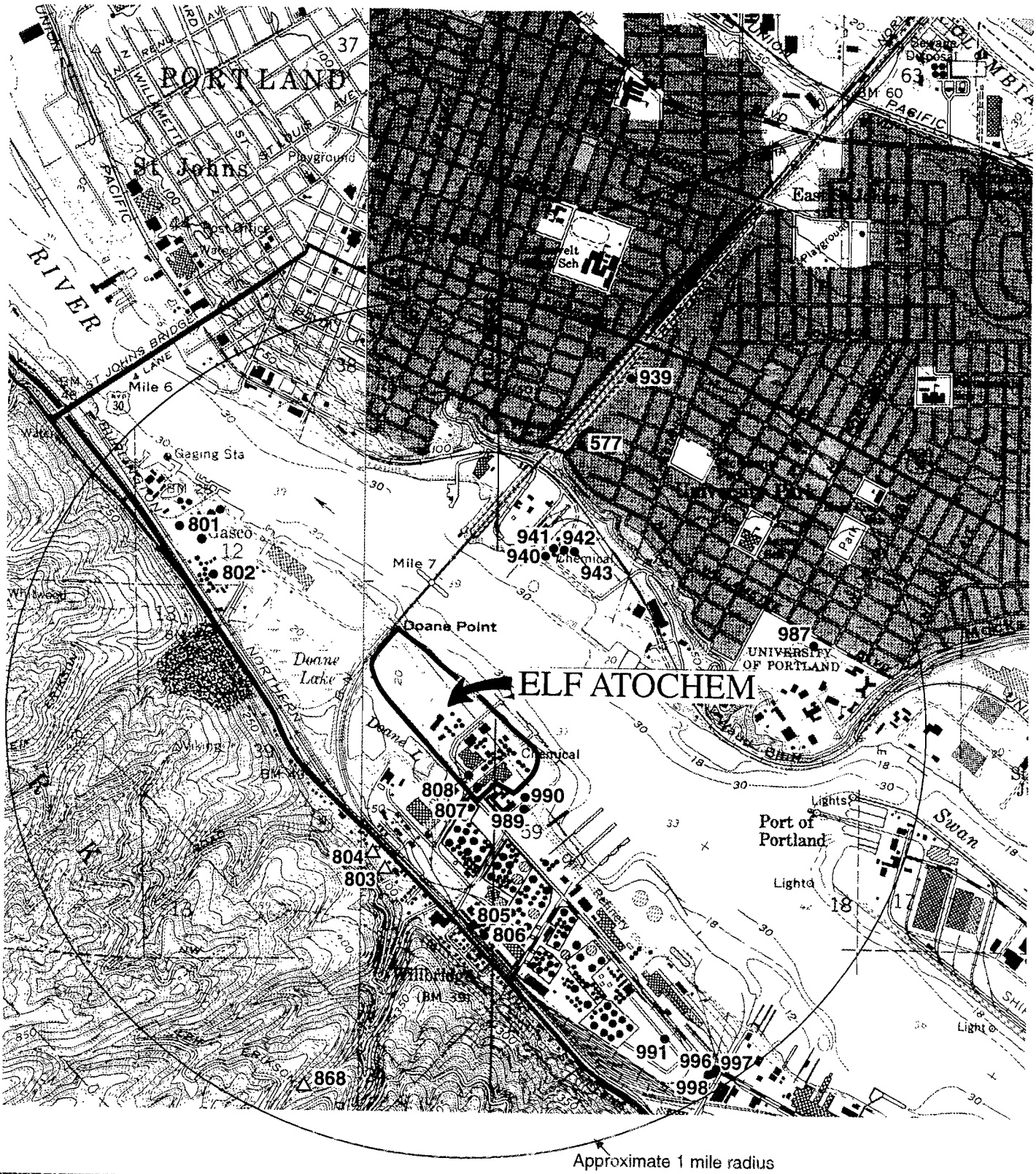
TABLE 2-1
Well Inventory within a 1-Mile Radius

Multnomah County ID	State Well No.	Owner	Use	Well Completion Date	Well Location	Status	Total Well Depth	Screened Interval (feet)	Depth Water First Encountered (feet)	Static Water Level (feet bgs)	Comments
T1N R1W Section 12											
801	1N/1W-12	NW Natural Gas	Cathodic protection	10/22/85	SW of SW	Unknown	400	Not applicable	-	-	
802	1N/1W-12N	Portland Gas & Coke Co.	Municipal (?)	1948	SW of SW	Unknown	382	-	-	48	Marked as municipal on well log, but likely an industrial well
T1N R1W Section 13											
803	1N/1W-13	Liquid Air, Inc.	Industrial	8/9/73	-	Abandoned	102	-	-	-	
804	1N/1W-13	Liquid Air, Inc.	Industrial	8/15/73	-	Unknown	302	-	200	18	
805	1N/1W-13dd	Pennsalt Chemical Co.	Temporary dewatering well	1/14/69	SE of SE	Abandoned	15	4 to 12	-	6.5	
806	1N/1W-13dd	Pennsalt Chemical Co.	Temporary dewatering well	1/16/69	SE of SE	Abandoned	15	4 to 12	-	6.5	
807	1N/1W-13J1	Pennsalt Chemical Co.	Industrial	1949	NE of SE	Abandoned	420	-	-	35	
808	1N/1W-13J2	Pennsalt Chemical Co.	Industrial	1953	NE of SE	Abandoned	760	-	-	58	
T1N R1W Section 24											
868	1N/1W-24	Thomas R. Winn Sr.	Domestic	7/20/58	-	Unknown	175	-	-	105	Located only within section, therefore, unknown if within a 1-mile radius of site
T1N R1E Section 7											
577	1N/1E-7cb	NW Natural Gas Co.	Cathodic protection	12/6/91	NW of SW	Unknown	400	Not applicable	-	-	

TABLE 2-1
Well Inventory within a 1-Mile Radius

Multnomah County ID	State Well No.	Owner	Use	Well Completion Date	Well Location	Status	Total Well Depth	Screened Interval (feet)	Depth Water First Encountered (feet)	Static Water Level (feet bgs)	Comments
939	1N/1E-7F	Fred Meyer, Inc	Other	8/27/62	SE of NW	Unknown	248	184-194 and 228-240	-	143	
940	1N/1E-7N	McCormick and Baxter, Co.	Industrial	1/17/68	SW of SW	Abandoned	219	-	-	-	
941	1N/1E-7N	McCormick and Baxter, Co.	Industrial	2/6/68	SW of SW	Unknown	95	71-91		25	
942	1N/1E-7N	McCormick and Baxter, Co.	Industrial	1945	SW of SW	Unknown	130	65-124	-	23	
943	1N/1E-7N1	McCormick and Baxter, Co.	Industrial	1945	SW of SW (?)	Unknown	130	65-84, 94-104, 116-124	-	23	
T1N R1E Section 18											
987	1N/1E-18	Univ. of Portland	Irrigation	9/30/65	NE of NE	Unknown	247	193-235	-	160	
989	1N/1E-18M(1)	Fibreboard Paper Products, Co.	Industrial	-	NW of SW	Unknown	425	-	-	-	
990	1N/1E-18M(2)	Fibreboard Paper Products, Co.	Industrial	1945	NW of SW	Unknown	240	-	-	-	
T1N R1E Section 19											
991	1N/1E-19bd	Chevron USA	Industrial	4/26/89	SE of NW	Unknown	310	-	94	27	
996	1N/1E-19a	NW Natural Gas Co.	Cathodic protection	10/22/82	NE	Unknown	100	-	-	-	
997	1N/1E-19a	NW Natural Gas Co.	Cathodic protection	10/21/82	NE	Unknown	100	-	-	-	
998	1N/1E-19a	NW Natural Gas Co.	Cathodic protection	10/20/82	NE	Unknown	100	-	-	-	

bgs = Below ground surface.



Base Map from USGS 7.5-minute Portland Quadrangle,1977, and Linnton Quadrangle, 1984

Figure 2-3
Approximate Well Locations within a One-Mile Radius
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SECTION 3

Phase 1 Investigation

SECTION 3

Phase 1 Investigation

Elf Atochem conducted a preliminary soil and groundwater investigation (Phase 1) in the Acid Plant Area during 1994. The purpose of the Phase 1 investigation was to establish the presence or absence of DDT residue and related compounds in the soil in the General Acid Plant Area and the Former Residue Pond and to evaluate the quality of the groundwater in the vicinity of the Former Residue Pond.

The results of the investigation indicated the presence of DDT process residue in the soil in the General Acid Plant Area and DDT process residue and related compounds in the soil and groundwater in the Former Residue Pond area. Details regarding the results of the Phase 1 investigation are available in *Work Plan, Phase 2 Soil and Groundwater Investigation, Acid Plant Project* (CH2M HILL, 1995).

The following findings summarize the results of the Phase 1 soil and groundwater investigation in the Acid Plant Area of Elf Atochem's Portland facility:

- The areal extent of soil affected by the Former Residue Pond, delineated on the basis of visible observations of pink residue and supported with analytical results, is estimated to be approximately 60 feet by 56 feet (approximately 3,360 square feet) in the near surface. Pink residue was observed to the bottom of boring SB-1 (15 feet). Consequently, the vertical extent is confirmed to a depth of 15 feet within certain areas of the Former Residue Pond.

- Soil samples collected from within the inferred boundaries of the Former Residue Pond and from areas with visible pink residue had detected DDT concentrations ranging from 5,000 to 150,000 milligrams per kilogram (mg/kg). Samples collected 5 to 10 feet laterally beyond the visible pink material had DDT concentrations well below samples collected from similar zones within the visibly affected soil, ranging from not detected to 29 mg/kg.

- Volatile organic compounds (VOCs) detected in soil samples from the Former Residue Pond area included chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and total xylenes. Chlorobenzene, the most prevalent VOC, was detected in 12 of the 13 samples analyzed at concentrations ranging from 0.006 to 200 mg/kg.

- In the General Acid Plant Area, DDT was detected in 12 of the 13 soil samples analyzed at concentrations ranging from 0.25 to 2,700 mg/kg.

- DDT was detected in four of the groundwater samples (three unfiltered and one filtered) collected with a Geoprobe in the Former Residue Pond area. Concentrations ranged from 0.00036 to 0.500 milligrams per liter (mg/L). Three of these four samples had DDT levels exceeding the solubility limit of DDT in water (approximately 0.0012 to 0.0055 mg/L), indicating that the levels may be associated with DDT that is adsorbed to suspended sediment. The presence of chlorobenzene in the groundwater may have

dissolved DDT because of cosolvency. The solubility of DDT is substantially greater in some organic solvents, such as chlorobenzene, than in water.

- Chlorobenzene was detected in the groundwater samples collected from the Former Residue Pond, with concentrations ranging from 0.870 to 370 mg/L. The highest chlorobenzene concentrations were detected in the samples collected from GW-4. The assumed groundwater flow direction in the area suggests that GW-4 is located downgradient of the Former Residue Pond.

SECTION 4

Field Investigation Methods

SECTION 4

Field Investigation Methods

Field activities during the Phase 2 investigation included locating utilities; drilling soil borings and sampling soil; collecting groundwater samples with a Geoprobe; drilling, installing, developing, and sampling groundwater monitoring wells; and conducting aquifer tests. Field activities were conducted between October 1996 and April 1997.

The following tasks were completed in October and November 1996:

- Five soil borings were advanced in the General Acid Plant Area to evaluate the lateral and vertical extent of DDT process residue and related compounds.
- Two soil borings were advanced along the railroad tracks south of the process building and north of Warehouse #3 where DDT or a DDT/diesel mixture may have been loaded onto railcars.
- Five soil borings were advanced around the inferred edges of the Former Residue Pond to delineate the subsurface extent of the affected soil.
- Three soil borings were advanced to assess the presence and, if found, the extent of the overflow trench of the Former Residue Pond.
- Three cone penetrometer surveys were conducted to characterize the local subsurface conditions.
- Groundwater samples were collected from 14 Geoprobe locations.

The following tasks were completed in December 1996:

- Four soil borings were advanced in the General Acid Plant Area.
- Fourteen soil borings were advanced to further delineate the horizontal and vertical extent of the overflow trench.
- Four shallow monitoring wells were installed in the vicinity of the Former Residue Pond to characterize groundwater flow and groundwater quality and to evaluate local hydrogeology.

The following tasks were performed from January through April 1997:

- Four shallow monitoring wells were developed, and groundwater from the four wells was sampled in January and March.
- Aquifer tests were conducted on the four shallow monitoring wells.

A summary of the tasks performed in each area appears below. A description of the sampling and analysis conducted in each area is included in Appendix C.

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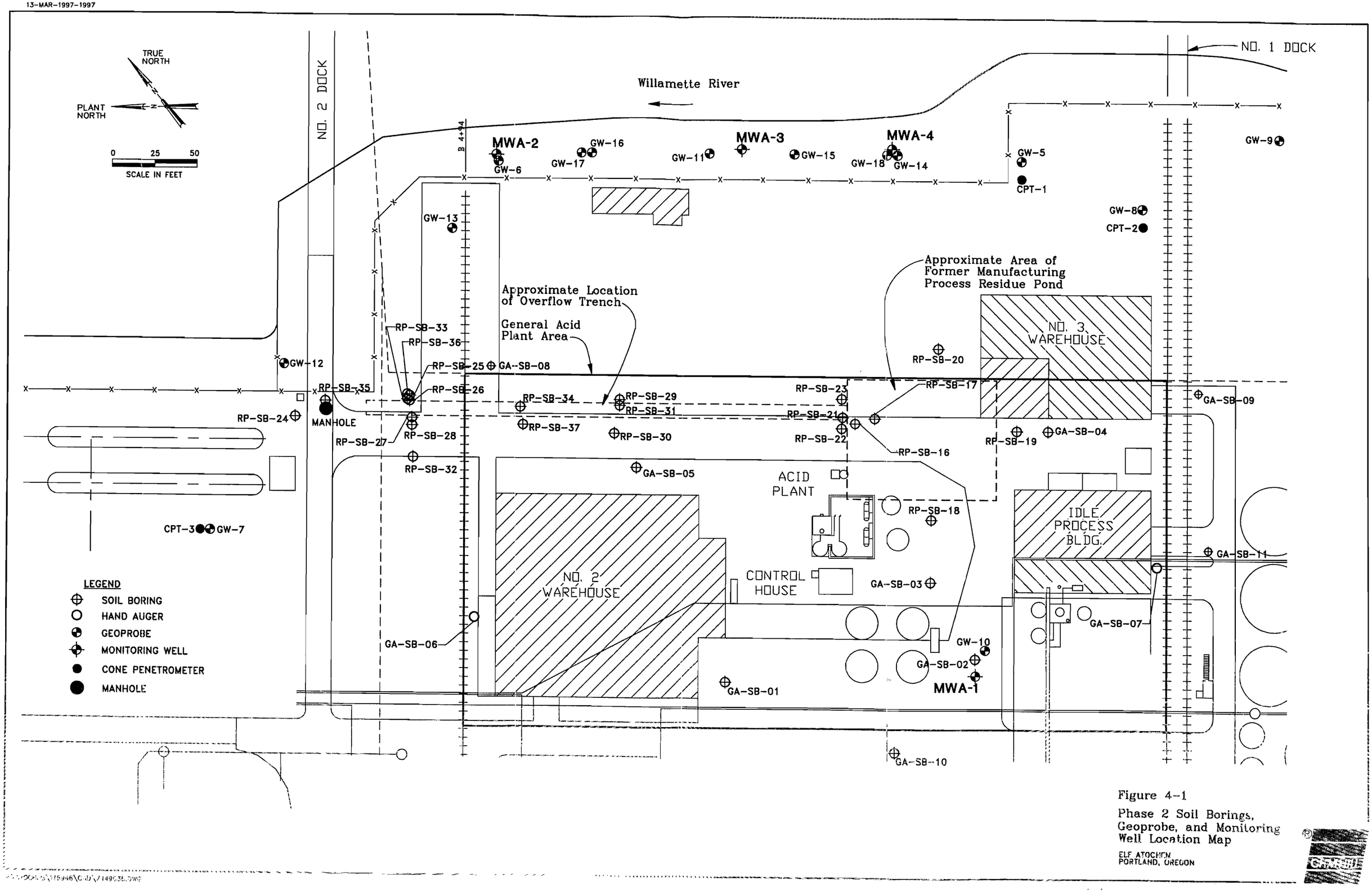

Figure 4-1

Phase 2 Soil Borings, Geoprobe, and Monitoring Well Location Map

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PORTLAND, OREGON

The field investigation was performed in accordance with CH2M HILL's Health and Safety Plan (HSP) and Sampling and Analysis Plan (SAP) (Appendixes D and F of the Phase 2 Work Plan). In addition, Elf Atochem conducted a site health and safety meeting that addressed hazards associated with plant operations.

The possible presence of subsurface utilities at sampling locations was reviewed with an Elf Atochem employee before the work was initiated.

4.1 Soil Characterization

In October 1996, 15 soil borings were advanced in the General Acid Plant Area (identified with the sample prefix GA) and in the Former Residue Pond and overflow trench areas (sample prefix RP) to further evaluate the vertical and lateral extent of DDT process residue in the unsaturated zone. Based on analytical results of the October sampling event, an additional 18 borings were advanced in December 1996 to further delineate the overflow trench boundaries and the extent of DDT process residue in the General Acid Plant Area. Sampling locations are shown in Figure 4-1. Locations were measured in the field with tape to the nearest ½ foot, and some locations were later surveyed to a local horizontal datum. Sampling locations, depths, and methods are summarized in Appendix C.

A direct correlation between affected soil and pink-colored soil was supported by analytical results during the Phase 1 investigation of the Former Residue Pond. The presence of pink-colored soil, therefore, was used as a field indicator in the Phase 2 investigation to delineate the Former Residue Pond and overflow trench boundaries. If pink-colored soil was identified in a soil boring, the boring was advanced to a depth of approximately 5 feet below the visibly affected soil or to first-encountered groundwater, whichever was shallower. A new boring was then advanced approximately 5 to 10 feet farther from the inferred pond or trench area to define the lateral boundaries of the Former Residue Pond and overflow trench areas.

4.1.1 Areas of Investigation

4.1.1.1 General Acid Plant Area

Nine soil borings were advanced within the General Acid Plant Area to an approximate depth of 10 feet (GA-SB01 through GA-SB05 and GA-SB08 through GA-SB11). The purpose of these borings was to evaluate the lateral and vertical extent of DDT process residue in the General Acid Plant Area. Soil samples were collected at depths of approximately ½, 2, 4, 6, 8, and 10 feet.

Two hand-augered samples (GA-SB06 and GA-SB07) were also advanced along the railroad tracks at the north and south boundaries of the General Acid Plant Area. GA-SB07 is located near where a DDT/diesel mixture may have been loaded onto railcars. Soil samples were collected at the bottom of each hand-augered boring (approximately 2 and 4 feet).

4.1.1.2 Former Residue Pond

The objective of the soil sampling program in the Former Residue Pond area was to further delineate the subsurface extent of the affected soil in the unsaturated zone. Five borings

were advanced around the inferred edges of the Former Residue Pond (RP-SB16 through RP-SB20). The borings were advanced to depths ranging from 21 to 25.5 feet.

4.1.1.3 overflow trench of the Former Residue Pond

The overflow trench is reported to have been approximately 5 to 6 feet wide, 5 to 6 feet deep, and extending northward from the northeastern corner (plant north) of the Former Residue Pond. The trench reportedly was used for only 1 to 2 years, receiving overflow occasionally. The purpose of the overflow trench is believed to have been to increase the total storage capacity of the Former Residue Pond.

As shown in Figure 4-1, a total of 17 soil borings were advanced to a depth of approximately 10 to 23 feet to evaluate the presence and extent of soil affected by the overflow trench (RP-SB21 through RP-SB37). The inferred southern trench boundary was identified by soil borings RP-SB21, RP-SB22, and RP-SB23 in October 1996. However, because the location of an 18-inch steel water line appeared to coincide with the alignment of the former trench, additional investigation was not conducted at that time to prevent damage to the line. In December 1996, the water line was exposed by a backhoe prior to advancing the remaining boreholes. Two 5-foot-deep trenches were excavated approximately 40 feet north of the inferred Former Residue Pond boundary and 75 feet south of the northern boundary of the General Acid Plant area to expose the water line. Four transects were then advanced with a Geoprobe across the assumed trench axis between the Former Residue Pond and northern boundary of the General Acid Plant area.

4.2 Groundwater Characterization

4.2.1 Geoprobe Sampling

A Geoprobe was used to collect groundwater samples at 14 locations in the General Acid Plant Area. Geoprobe locations are shown in Figure 4-1. The sampling and analysis program and the field investigation findings are summarized in Appendix C.

Seven shallow groundwater samples were collected at depths of approximately 30 to 32 feet bgs (GW-5 through GW-11) in October 1996. On the basis of the analytical results of the seven samples, five additional shallow samples (GW-12 through GW-16) and two deeper samples (GW-17 and GW-18) were collected at a depth of approximately 45 feet bgs in November 1996. The November samples were collected to further investigate the presence and extent of VOCs in the uppermost groundwater to aid in selecting the locations of the monitoring wells. The deeper samples were collected to assess groundwater quality in the lower part of the uppermost aquifer to evaluate the possible effects of a thin silt/clay layer on groundwater quality.

4.2.2 Monitoring Well Installation and Sampling

The objectives of the Phase 2 groundwater characterization included characterizing the shallow hydrostratigraphy, evaluating the presence or absence of a silt layer below the overlying sand and silt, assessing the shallow groundwater flow direction and gradient, and confirming the groundwater quality results collected during Phase 1. Field methods for monitoring well installation and sampling are described in Appendix C.

4.3 Hydrogeologic Investigation

4.3.1 Cone Penetrometer Testing

Cone penetrometer testing (CPT) was conducted to gain information regarding subsurface conditions at the site for use in evaluating the design and depth of groundwater monitoring wells. CPT was performed at the three locations shown in Figure 4-1. The methods used to conduct the CPT survey are described in Appendix C.

4.3.2 Aquifer Testing

Aquifer tests were conducted on the four monitoring wells to estimate the hydraulic conductivity of the shallow water-bearing lens in which the monitoring wells are screened. The aquifer tests consisted of slug insertion and slug withdrawal tests in which the rate of water level recovery in the well was monitored before and after a solid slug of known volume was placed in and subsequently removed from the well. At least four separate tests were conducted at each well to provide multiple data sets for analysis. The slug test data were analyzed with the Bouwer and Rice (1976) analytical model. Test methods are described in Appendix C, and data are provided in Appendix G.

4.4 Analytical Data Management and Validation

The data management process used during the Phase 2 investigation was based on EDMS, a Microsoft Access 2.0 database application developed by CH2M HILL.

As samples were collected, an inventory of expected samples was created in EDMS. As electronic data were received from the laboratory, EDMS verified and uploaded the results in accordance with those analyses identified in the inventory. A minimum of 20 percent of the electronic results were verified against hard-copy laboratory reports. Inconsistencies were communicated to the laboratory, which corrected and reissued the data.

After the analytical results were received and loaded, they were ready for validation modifications. Validation modifications were applied to the hard-copy analytical results in red ink. Modifications made to hard-copy results were then applied to the database through a series of menu-driven requests in the EDMS validation module.

Project-related electronic data were backed up nightly onto 4 millimeter (4 mm) data cartridges. Upon completion of the project, the final project database will be backed up onto 4 mm data cartridges and stored at CH2M HILL's offsite record management area.

4.5 Management of Investigation-Derived Waste

Investigation-derived waste (IDW) generated included soil from drilling, decontamination water from field sampling activities, and groundwater produced during well development and sampling. Soil and water were stored separately, to the extent possible, in 55-gallon drums approved by the U.S. Department of Transportation. The drums were closed and labeled with identification number, contents, owner, source, and date of generation. Drums were temporarily placed in an onsite staging area until waste characterization was completed.

IDW was transported to Waste Management's Subtitle C facility in Arlington, Oregon. IDW was separated into three profiles: state waste X004, Resource Conservation and Recovery Act (RCRA) characteristic waste, and RCRA listed waste (U061). The majority of the IDW was designated as state waste X004. A small quantity (less than 5 gallons) of decontamination water generated from the hand auger borings along the railroad tracks was designated as a RCRA listed waste (U061) in accordance with Atochem's agreement with the Oregon Department of Environmental Quality (DEQ). One drum of sludge from the decontamination trailer used during the field investigation and three drums of soil cuttings from the chlorobenzene recovery unit area were managed as RCRA characteristic waste because of the potential to exceed the RCRA toxicity characteristic level for chlorobenzene. The remaining drums were managed as state waste X004.

SECTION 5

Investigation Results —Physical Characteristics

SECTION 5

Investigation Results—Physical Characteristics

Physical characteristics of the soil and groundwater encountered during the Phase 2 investigation are described below.

5.1 Shallow Site Stratigraphy

The shallow stratigraphy beneath the site was interpreted from the cone penetrometer results, the material penetrated during the soil investigation, and monitoring well drilling results. Generalized stratigraphic cross sections of the area, shown in Figure 5-1, were developed. The results are presented in Figures 5-2 and 5-3.

In general, the subsurface profile from the surface downward, as interpreted from the cone penetrometer investigation, is as follows:

- Fine-grained material of variable composition consisting of sandy to clayey silt with localized clay lenses from the ground surface to a depth of 21 to 24 feet bgs in CPT-1 and CPT-2 toward the eastern plant boundary. The surficial material northwest of this area is more uniform sandy to clayey silt with clay lenses from the surface to 21 feet bgs, based on the log of CPT-3.
- Sand to silty sand from 24 to up to 47 feet bgs, including two silt clay layers from approximately 30 to 32 feet bgs and 36.5 to 37.5 feet bgs.
- Silt/clay below 47 feet bgs.

Aerial photographs from 1948 show that the Willamette River bank was situated along the eastern edge of the Former Residue Pond. The plant property was extended approximately 200 feet eastward from the Former Residue Pond area to the present-day river bank by adding fill material. The source of the fill material is unknown, but it includes rubble such as pavement and bricks. On the basis of the erratic CPT parameters recorded in the upper 21 to 24 feet bgs (see Appendix F), it is likely that CPT-1 and CPT-2 were advanced through the fill material. In contrast, the parameters are less variable in the upper 24 feet bgs of CPT-3, suggesting that this CPT may have penetrated only native material.

Subsurface material encountered in the upper 25 feet bgs during the soil investigation primarily included sand, silty sand, sand with gravel, and silt. The upper 0.5 to 2 feet bgs consisted of asphalt, gravel fill, or concrete rubble. Fill material including dark-brown sand with gravel and occasional wood debris was generally encountered to a depth of 3 to 5 feet. Underlying the sand with gravel was dark-brown, olive-brown, yellow, or light-gray silty sand and silty sand with localized lenses of silt.

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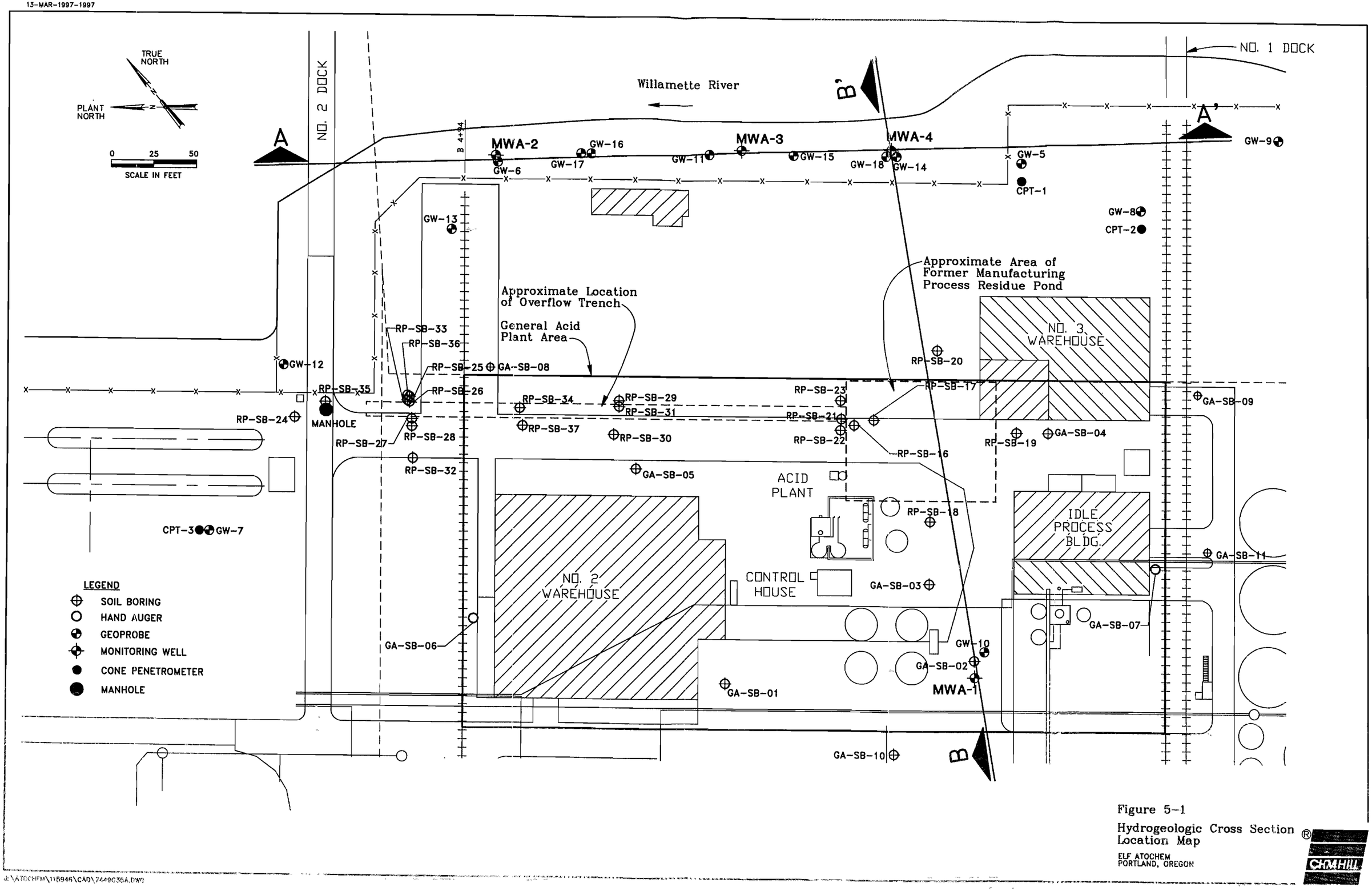

Figure 5-1
Hydrogeologic Cross Section Location Map
ELF ATOCHEM
PORTLAND, OREGON

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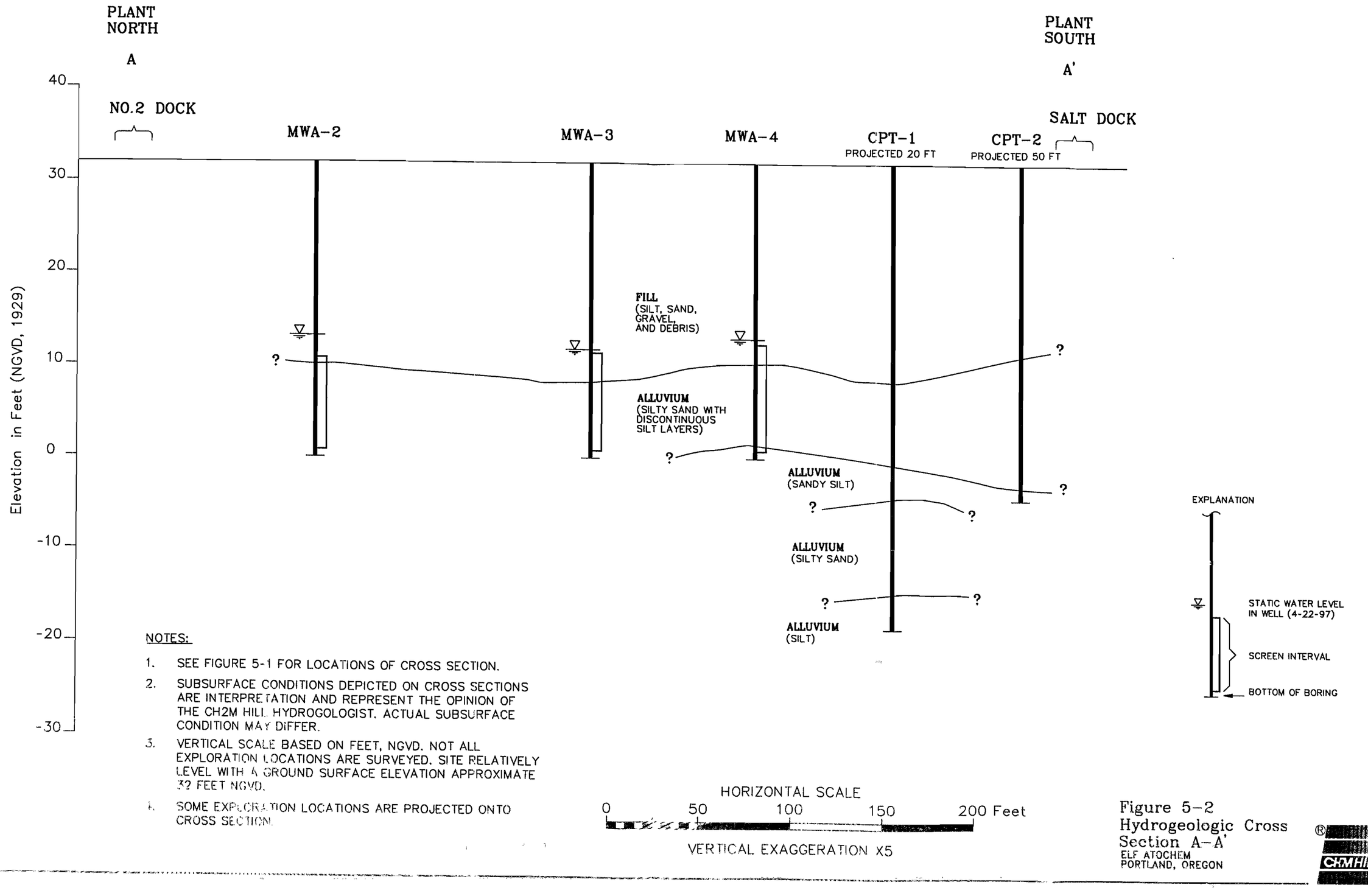

NOTES:

1. SEE FIGURE 5-1 FOR LOCATIONS OF CROSS SECTION.
2. SUBSURFACE CONDITIONS DEPICTED ON CROSS SECTIONS ARE INTERPRETATION AND REPRESENT THE OPINION OF THE CH2M HILL HYDROGOLOGIST. ACTUAL SUBSURFACE CONDITION MAY DIFFER.
3. VERTICAL SCALE BASED ON FEET, NGVD. NOT ALL EXPLORATION LOCATIONS ARE SURVEYED. SITE RELATIVELY LEVEL WITH A GROUND SURFACE ELEVATION APPROXIMATE 32 FEET NGVD.
4. SOME EXPLORATION LOCATIONS ARE PROJECTED ONTO CROSS SECTION.

HORIZONTAL SCALE
0 50 100 150 200 Feet

VERTICAL EXAGGERATION X5

Figure 5-2
Hydrogeologic Cross Section A-A'
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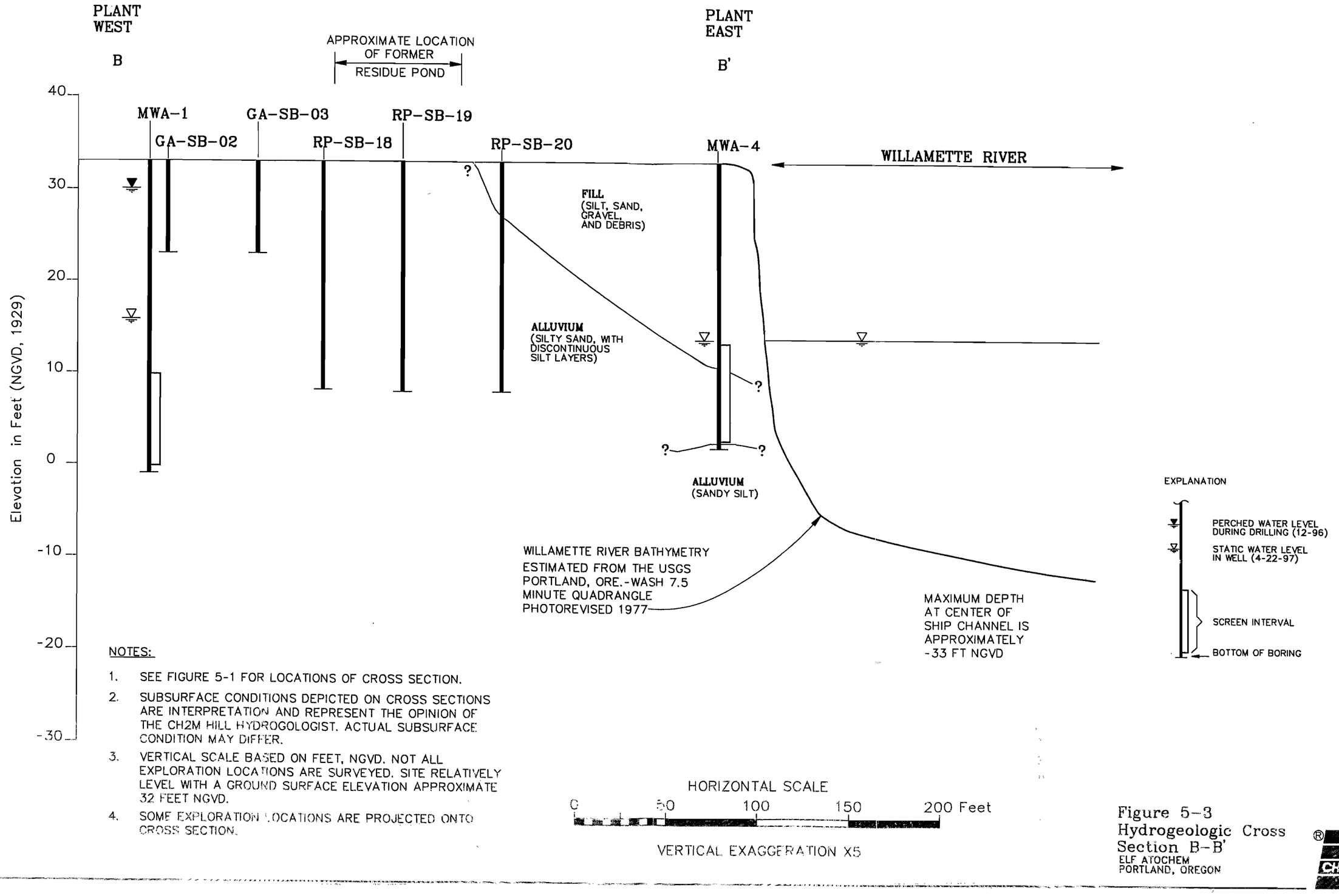
PORTLAND, OREGON

CH2MHILL

22-May-1997 5946G002.DWG



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4. SOME EXPLORATION LOCATIONS ARE PROJECTED ONTO CROSS SECTION.

Figure 5-3
Hydrogeologic Cross Section B-B'
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5.2 Groundwater Occurrence

Groundwater at the Elf Atochem facility occurs in a shallow, unconfined water-bearing lens that responds to precipitation events and Willamette River stage changes. Table 5-1 summarizes groundwater level measurements taken in the four shallow monitoring wells on seven occasions between December 1996 and April 1997. The measured depth to water ranged from a high of 13.44 feet (MWA-1 on January 2, 1997) to a low of 23.61 feet (MWA-3 on April 22, 1997). The maximum change in groundwater elevation observed to date in an individual well was 8.84 feet between January 2, 1997, and March 3, 1997, in well MWA-2.

TABLE 5-1
Groundwater Elevation Data Summary
December 12, 1996, to April 22, 1997

Well ID	PVC Elevation (feet)	12/16/96 (feet)	1/2/97 (feet)	2/7/97 (feet)	3/3/97 (feet)	3/12/97 (feet)	4/8/97 (feet)	4/22/97 (feet)
Depth to Water								
MWA-1	34.14	17.82	13.44	14.97	18.15	17.46	17.44	17.46
MWA-2	36.48	22.25	14.00	19.74	22.84	21.77	22.58	22.26
MWA-3	37.46	22.95	16.51	20.95	23.45	23.04	22.55	23.61
MWA-4	36.46	22.00	15.51	19.92	22.44	21.92	21.53	22.06
Elevation								
MWA-1	34.14	16.32	20.70	19.17	15.99	16.68	16.70	16.68
MWA-2	36.48	14.23	22.48	16.74	13.64	14.71	13.90	14.22
MWA-3	37.46	14.51	20.95	16.51	14.01	14.42	14.91	13.85
MWA-4	36.46	14.46	20.95	16.54	14.02	14.54	14.93	14.40
Willamette River**		9 - 10	22 - 23.5	13 - 13.5	9 - 10	12 - 12.5	8.5-9	14

Depth to water in feet below top of PVC casing (north side).
Elevations referenced to City of Portland datum. (To convert from City of Portland datum to NGVD 1929 datum, subtract 1.375 feet.)
*Morrison Bridge gauge readings; approximate elevation ranges reported to account for daily fluctuations.

Groundwater elevation maps for December 16, 1996, January 2, 1997, and February 7, 1997, are presented in Figures 5-4, 5-5, 5-6, and 5-7, respectively. Under typical river stage conditions, groundwater appears to flow to the north or northeast toward the Willamette River with gradients ranging from approximately 0.006 foot per foot to 0.009 foot per foot (Figures 5-4 and 5-6).

During periods of high river stage such as in January 1997, groundwater levels near the river can rise higher than groundwater levels farther inland. This situation changes the groundwater gradient from its usual direction toward the river to a reversed gradient away from the river. Typically, this reversed gradient is temporary and limited to a thin strip of aquifer along the river. Its inland extent is controlled by the duration of the high river stage

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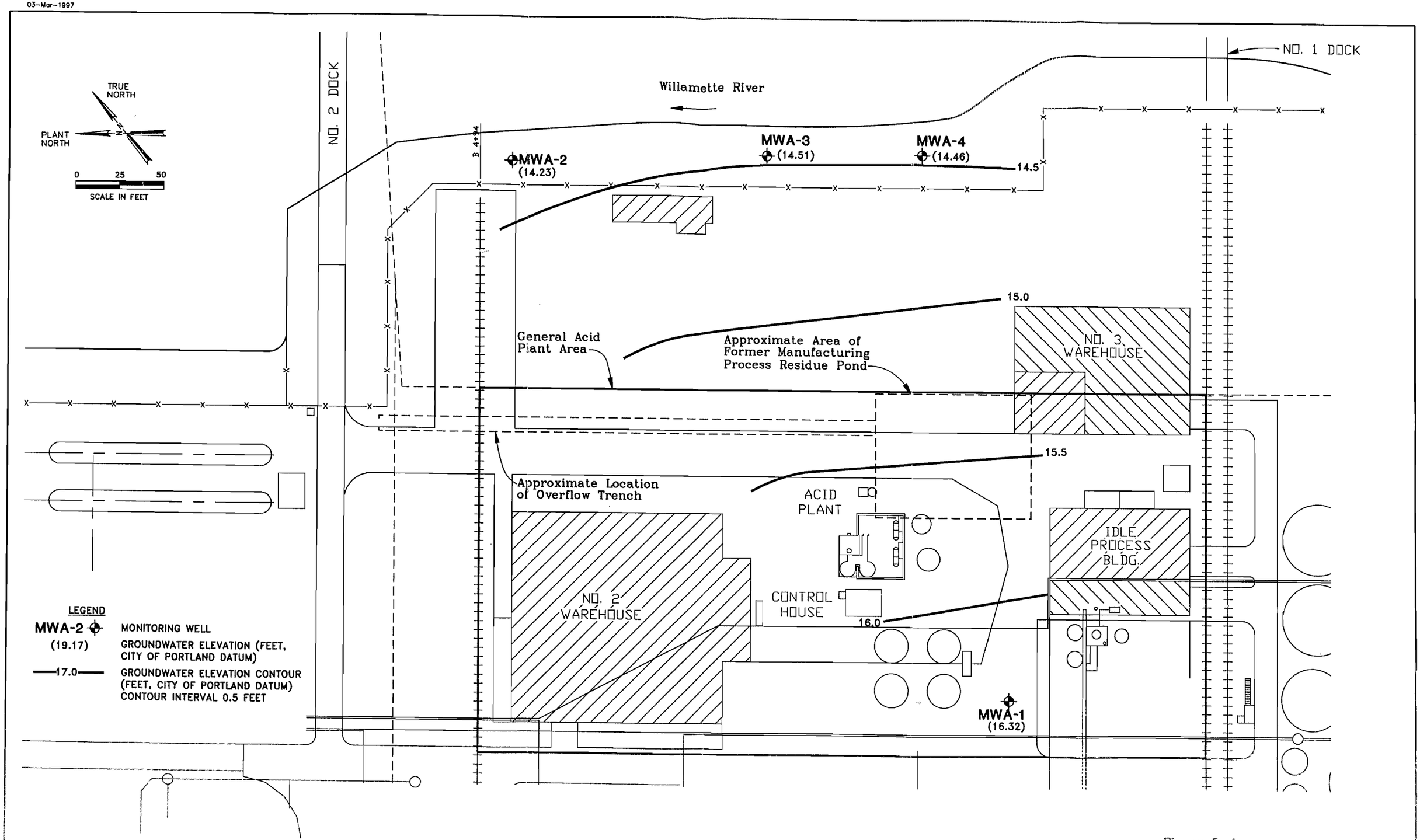

Figure 5-4
Groundwater Contour Map
December 16, 1996
ELF ATOCHEM
PORTLAND, OREGON

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ALR 7449G32
26-Feb-1997

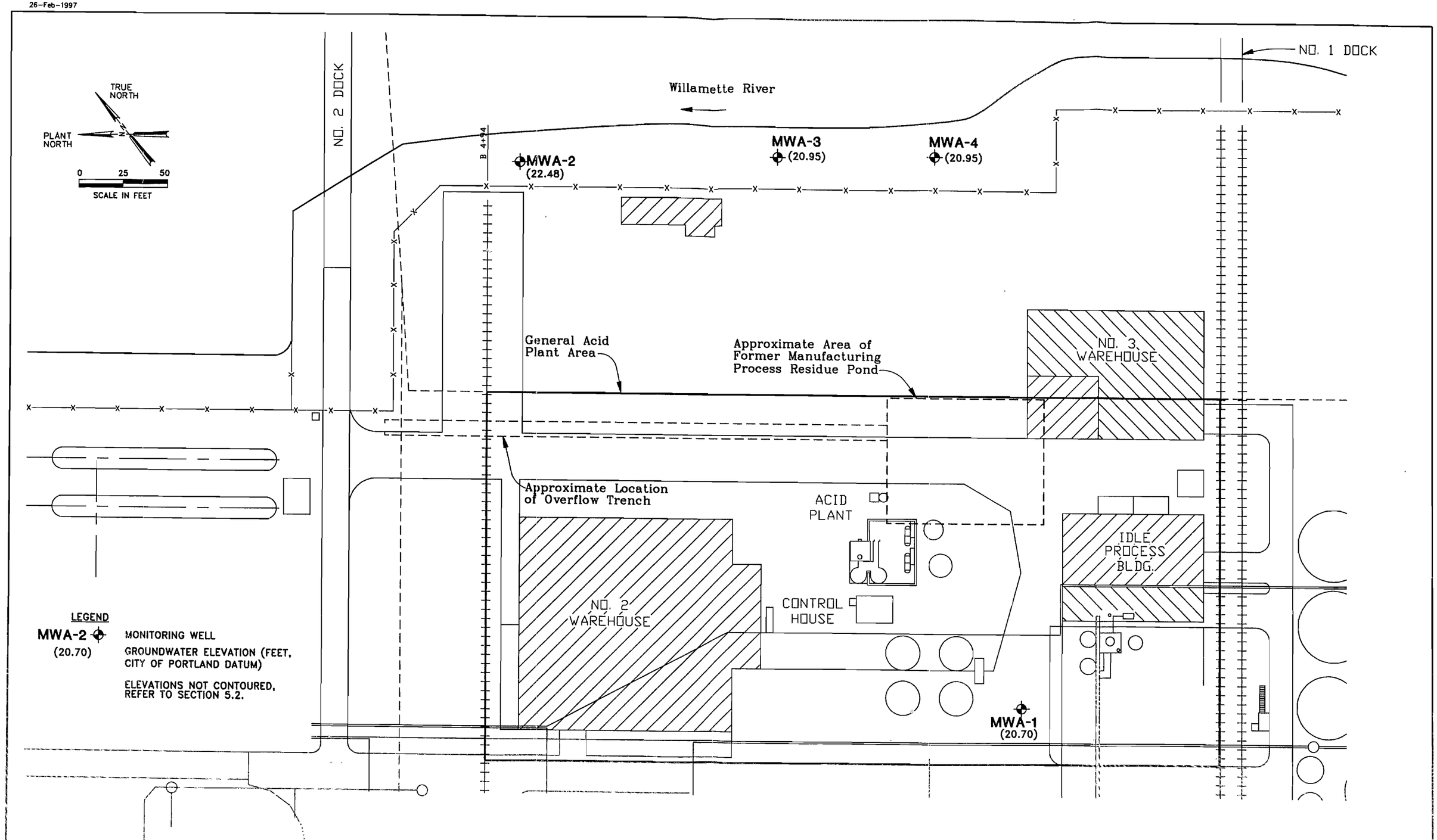

Figure 5-5
Groundwater Elevations
January 2, 1997
ELF ATOCHEM
PORTLAND, OREGON

ALR 7449G30
03-Mar-1997

TRUE NORTH
PLANT NORTH
0 25 50
SCALE IN FEET

NO. 2 DOCK
NO. 1 DOCK
Willamette River
B 4+94
MWA-2 (16.74)
MWA-3 (16.51)
MWA-4 (16.54)
16.5
17.0
17.5
General Acid Plant Area
Approximate Area of Former Manufacturing Process Residue Pond
NO. 3 WAREHOUSE
18.0
Approximate Location of Overflow Trench
ACID PLANT
18.5
IDLE PROCESS BLDG.
NO. 2 WAREHOUSE
CONTROL HOUSE
19.0
MWA-1 (19.17)

LEGEND

MWA-2 (19.17) — MONITORING WELL; GROUNDWATER ELEVATION (FEET, CITY OF PORTLAND DATUM)

17.0 — GROUNDWATER ELEVATION CONTOUR (FEET, CITY OF PORTLAND DATUM) CONTOUR INTERVAL 0.5 FEET

Figure 5-6
Groundwater Contour Map
February 7, 1997
ELF ATOCHEM
PORTLAND, OREGON

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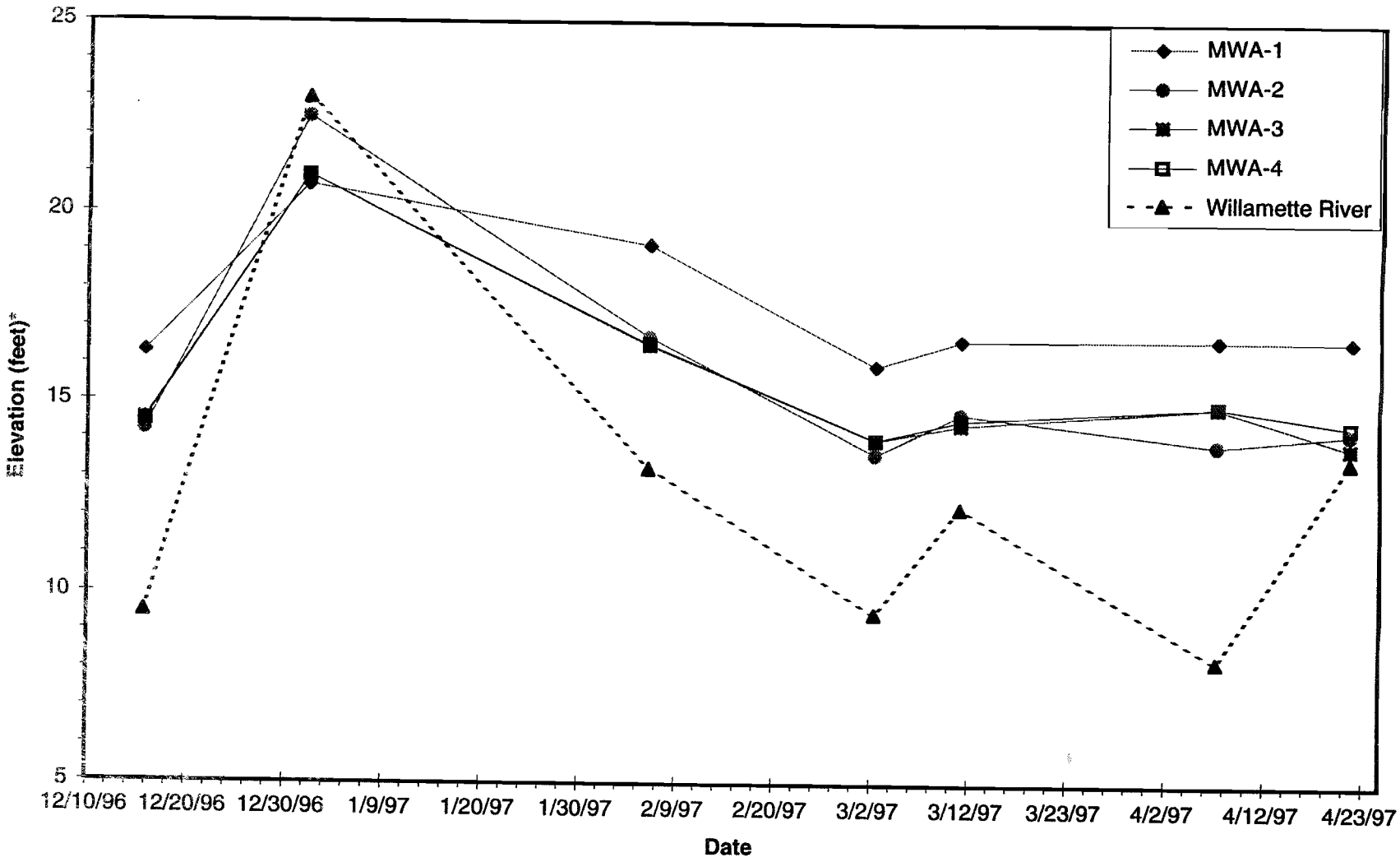

* River elevations are approximate.
A river gauge elevation of zero is equivalent to 1.55 feet National Geodetic Vertical Datum (NGVD).
Groundwater elevations are referenced to City of Portland datum (subtract 1.375 feet for NGVD)

Figure 5-7
Comparison of Groundwater Elevations and Willamette River Stage
ELF ATOCHEM NORTH AMERICA, INC.
PORTLAND, OREGON

and the hydraulic conductivity of the aquifer near the river. Where the reversed gradient caused by a high river stage is overcome by the natural hydraulic gradient toward the river, a stagnation boundary, or trough, occurs in the water table. Farther inland, the normal gradient toward the river persists throughout the high river stage event.

The specific location of the stagnation point that forms at Elf Atochem under high river stage conditions is unknown. At sites in similar geologic settings such as the McCormick & Baxter facility across the Willamette River, the inland extent of the reversed gradient is on the order of 100 feet. If a similar situation existed at the Elf Atochem facility, the reversed gradient would have extended a little more than halfway from the river to the Former Residue Pond. Because the location of the stagnation boundary that existed under January high-water conditions is not known, groundwater elevations are presented in Figure 5-5 without contours.

During drilling of the monitoring wells, the water table was encountered at depths ranging from 18 to 19 feet bgs. Because of variations in vertical hydraulic conductivity with depth, localized perched zones of groundwater may exist in the unsaturated zone above the water table. A discontinuous zone of perched groundwater was encountered at a depth of 9 feet while drilling MWA-1. Results of pore water pressure tests at CPT-1 and CPT-3 confirmed the presence of a localized perched groundwater lens (Appendix F). In CPT-1, pore pressure values suggest that perched zones are present at approximately 20 and 23 feet bgs. In CPT-3, pore pressure values suggest that a perched zone is present at approximately 19 feet bgs. Given the potential uncertainty in cone penetrometer hydraulic pressure measurements, these deeper perched zones may correlate to the water table.

5.3 Aquifer Properties

5.3.1 Total Organic Carbon Results

Total organic carbon (TOC) was analyzed in soil samples from both above and below the water table to determine organic carbon content in the subsurface at Elf Atochem. Table 5-2 summarizes analytical results from EPA Method 9060. The TOC data were reasonably consistent regardless of depth or soil type, with values ranging from 0.043 to 0.197 percent and an average value of 0.12 percent.

TABLE 5-2
Summary of Total Organic Carbon Analytical Results

Sample ID	Soil Type	Sample Depth (feet)	TOC Results (percent)
GA-SB-01-0060	Sand (SP)	6	0.165
GA-SB-02-0040	Sand (SP)	4	0.109
GA-SB-05-0020	Sand (SP)	2	0.180
RP-SB-19-0250	Medium sand (SW)	25	0.052
RP-SB-20-0200	Medium sand (SW)	20	0.043
RP-SB-22-0100	Silt (ML)	10	0.096
MWA1-0-0190	Sand with silt (SM)	19	0.197
MWA2-0-0220	Silty gravel (GM)	22	0.063
MWA3-0-0240	Sand (SP)	24	0.153
MWA4-0-0300	Sand (SP)	30	0.133
Average organic carbon content for soil			0.12

5.3.2 Aquifer Test Results and Estimated Groundwater Velocity

Aquifer tests were conducted on April 22, 1997, in the four monitoring wells to estimate the hydraulic conductivity of the shallow water-bearing lens in the vicinity of the wells. Multiple tests were run on each well to improve the chances that at least one data set from each well could be analyzed. The tests successfully generated at least two data sets per well that could be analyzed.

The Bouwer and Rice (1976) method was used to analyze the slug test data. A plot of each data set analyzed is included in Appendix G. The well casing radius for MWA-4 was adjusted using Bouwer's (1989) method to account for the partial drainage of the sand pack that occurred after the water level dropped below the top of the screen upon slug withdrawal.

The slug withdrawal (rising head) tests for well MWA-3 could not be analyzed because the "noise" induced by slug withdrawal, which is manifested by erratic water level fluctuations for the first several seconds of the test, was too large in magnitude relative to the residual drawdown to dissipate before the water level fully recovered. The slug insertion (falling head) tests for MWA-3 appear to provide reasonable results.

Mean hydraulic conductivity values for the four wells range from 11 feet per day (ft/d) at well MWA-2 to 37 ft/d at well MWA-3. The average hydraulic conductivity for the shallow water-bearing lens, calculated by using the mean value for each well, is 21 ft/d (7.4×10^{-3} centimeter per second [cm/s]). These values are consistent with hydraulic conductivities reported for unconsolidated fine sand (Domenico and Schwartz, 1990). As shown in Table 5-3, the results of withdrawal and insertion tests generally were similar to each other.

SECTION 6

Investigation Results —Nature and Extent

SECTION 6

Investigation Results—Nature and Extent

6.1 Soil Characterization

6.1.1 General Acid Plant Area

6.1.1.1 Summary

The results of soil sampling and analysis in the General Acid Plant Area indicate that the concentrations of DDT process residue and related compounds decrease with depth beneath the ground surface and with distance at the periphery of the General Acid Plant Area in the northern and southern directions. The near surface soil in the eastern direction consists of fill placed after DDT manufacturing ceased and, therefore, is unlikely to contain significant concentrations of DDT and related compounds. The area to the west of the General Acid Plant Area is occupied by buildings and process tanks and contains little exposed soil.

6.1.1.2 Discussion

During Phase 2, a total of 11 soil borings were advanced in the General Acid Plant Area. Soil samples from depths of approximately 0.5, 2, 4, and 6 feet were analyzed for organochlorinated pesticides by using EPA Method 8080. Analytical results are summarized in Table 6-1 and Figure 6-1. Figure 6-1 also includes the analytical results of 13 soil samples collected from six test pits sampled during Phase 1.

The shallower soil samples typically had higher concentrations of DDT process residue and the related compounds dichlorodiphenyl-dichloroethane (DDD) and dichlorodiphenyl dichloroethylene (DDE). Samples collected at a depth of approximately 0.5 foot had DDT concentrations ranging from 1.8 mg/kg to 12,000 mg/kg. The 0.5-foot sample from GA-SB-05 had a 12,000 mg/kg concentration of DDT and low levels of endosulfan I and II and gamma benzene hexachloride (BHC). The next highest detection of DDT in the 0.5-foot samples was 470 mg/kg in GA-SB-04, indicating that the extent of soil with DDT in the 12,000 mg/kg range is limited to the near surface in the General Acid Plant Area.

The 2-foot soil samples had DDT concentrations ranging from below the detection limit to 130 mg/kg in Phase 2. During Phase 1, several samples collected at a depth of 2 feet had concentrations exceeding 130 mg/kg, with concentrations of DDT up to 2,700 mg/kg (Figure 6-1). DDT concentrations detected in the 4-foot samples ranged from below the detection limit to a maximum of 510 mg/kg; however, most of the detected concentrations were below 20 mg/kg.

DDT concentrations declined with depth, such that the samples collected at a depth of 6 feet had DDT concentrations ranging from below the detection limit to a maximum of 26 mg/kg. The one exception to this is the 6-foot sample collected from GA-SB-03, which had a DDT concentration of 1,200 mg/kg.

Before the slug tests were conducted, DEQ and Elf Atochem discussed possible complications that could arise from the presence of saturated conditions in the fill zone above the top of alluvium. This concern was based on the assumption that the fill had a substantially different hydraulic conductivity than the underlying alluvium. The results of the slug tests, which overall were very consistent between wells regardless of whether the well screen was open to saturated fill, suggest that the presence of saturated fill in the screened interval did not adversely affect the slug test results. For example, the slug test results at MWA-1, which is located far enough inland that fill is absent in the well vicinity, yielded a hydraulic conductivity value essentially equivalent to the average for all wells at the site.

TABLE 5-3
Aquifer Test Results

	Hydraulic Conductivity							
	MWA-1[a]		MWA-2[b]		MWA-3[c]		MWA-4[c]	
	(ft/d)	(cm/s)	(ft/d)	(cm/s)	(ft/d)	(cm/s)	(ft/d)	(cm/s)
Rising head	17	6.0×10^{-3}	12	4.2×10^{-3}			21	7.4×10^{-3}
(slug withdrawal)	16	5.6×10^{-3}	14	4.9×10^{-3}			26	9.1×10^{-3}
	18	6.3×10^{-3}	14	4.9×10^{-3}				
Falling head	18	6.3×10^{-3}	7.4	2.6×10^{-3}	44	1.6×10^{-2}	5.9	2.1×10^{-3}
(slug insertion)			8.5	3.0×10^{-3}	29	1.0×10^{-2}		
			9.1	3.2×10^{-3}				
			9.0	3.2×10^{-3}				
Mean	17	6.1×10^{-3}	11	3.7×10^{-3}	37	1.3×10^{-2}	18	6.2×10^{-3}

[a]Fill is absent at this location.
[b]The top 0.5 foot of the well screen was open to saturated fill during testing.
[c]The top 2.5 feet of the well screen was open to saturated fill during testing.

Estimates of groundwater flow velocity were made for the shallow water-bearing lens by using a modified form of Darcy's Law:

$$V = Ki/n_e$$

where V = average flow velocity (length/time), K = saturated hydraulic conductivity (length/time), i = hydraulic gradient (dimensionless), and n_e = effective porosity (dimensionless).

Using a reasonable estimate of effective porosity in the shallow water-bearing lens of 0.2 (EPA, 1983), a calculated average hydraulic conductivity of 21 feet per day (from slug test data), and an observed horizontal hydraulic gradient under nonflood conditions ranging from 0.006 to 0.009 (from groundwater elevation data), the average horizontal groundwater flow velocity for the shallow water-bearing lens is estimated to be approximately 0.6 to 0.9 foot per day.

TABLE 6-1
General Acid Plant Area Soil Sampling Results
Detected Constituents Only (mg/kg)

			Organochlorinated Pesticides						TPH	Volatile Organic Compounds			
Station ID	Date Sampled	Depth (feet bgs)	4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Gamma-BHC	Diesel	2-Butanone (MEK)	Acetone	Chlorobenzene	Methylene Chloride
GA-MWA01	12/11/96	14	0.15 U	0.15 U	0.15 U	0.075 U	0.15 U	0.075 U		0.015 U	0.029	0.059	0.008
		19	0.14 U	0.14 U	0.14 U	0.072 U	0.14 U	0.072 U		0.014 UJ	0.056 J	0.057 J	0.036 J
		26	0.13 U	0.13 U	0.13 U	0.069 U	0.13 U	0.069 U		0.014 U	0.025	0.007 U	0.008
GA-MWA02	12/11/96	24	0.13 U	0.13 U	0.36	0.068 U	0.13 U	0.068 U		0.016	0.075	0.084	0.007 U
		29	0.13 U	0.13 U	0.55	0.068 U	0.13 U	0.068 U		0.013 UJ	0.042 J	0.13 J	0.007 J
GA-MWA03	12/11/96	22	0.13 U	0.13 U	0.13 U	0.065 U	0.13 U	0.065 U		0.013 U	0.1	0.006 U	0.043
		24	0.72	0.26 U	2.5	0.13 U	0.26 U	0.13 U		0.013 U	0.052	0.007 U	0.023
		27.5	0.13 U	0.13 U	0.64	0.066 U	0.13 U	0.066 U		0.013 U	0.061	0.006 U	0.01
GA-MWA04	12/11/96	24	41	5.4	79	1.3 U	2.5 U	1.3 U		0.013 U	0.25	0.01	0.055
		27.8	1.1	0.16	2.6	0.069 U	0.13 U	0.069 U		0.014 UJ	0.12 D	0.13 DJ	0.02 J
		30	0.13 U	0.13 U	0.59	0.067 U	0.13 U	0.067 U		1.6 UR	1.6 UR	4.3 J	0.82 UR
GA-SB01	10/08/96	0.5	4.6	12	400 D	1.9 U	3.7 U	1.9 U					
		2	1.2	5.1	61 D	0.19 U	0.37 U	0.19 U					
		6	0.006	0.0041 U	0.32 D	0.0021 U	0.0041 U	0.0021 U					
GA-SB02	10/08/96	2.5	0.54	0.38	16 DJ	0.19 U	0.36 U	0.19 U					
		4	0.0041 U	0.0041 U	0.073 U	0.0021 U	0.0041 U	0.0021 U					
		6	0.49 U	0.49 U	2.5	0.25 U	0.49 U	0.25 U					
GA-SB03	10/08/96	2.5	0.35 U	0.47	7.9	0.18 U	0.35 U	0.18 U					
		4	0.015	0.018	0.65 D	0.0019 U	0.0036 U	0.0019 U					
		6	15	6.3	1200 D	2.2 U	4.3 U	2.2 U					
		8								93 U	93 UJ	1,000	47 UJ
		10								360 U	1,300 J	4,500	180 UJ
GA-SB04	10/08/96	0.5	37	12	470 DJ	1.9 U	3.8 U	1.9 U					
		2	0.036	0.0039 U	0.14 D	0.002 U	0.0039 U	0.002 U					
		4	0.52	0.38 U	3.4	0.2 U	0.38 U	0.2 U					
		6	0.46 U	0.46 U	11	0.24 U	0.46 U	0.24 U					
GA-SB05	10/08/96	0.5	260 D	33	12000 D	2 U	3.9 U	2 U					
		2	0.0043 U	0.0043 U	0.081 U	0.0035	0.033	0.0057					
		4	0.0037 U	0.0037 U	0.015 U	0.0019 U	0.0037 U	0.007					
		6	0.39 U	0.39 U	1.7 J	0.2 U	0.39 U	0.2 U					
GA-SB06	10/11/96	2	0.2 U	0.2 U	1.5	0.1 U	0.2 U	0.1 U					
GA-SB07	10/14/96	4	79	43 U	510	22 U	43 U	22 U	270				
GA-SB08	12/13/96	0.5	1.2 U	1.2 U	12	0.59 U	1.2 U	0.59 U					
		2	0.12 U	0.12 U	0.66	0.063 U	0.12 U	0.063 U					
		4	0.12 U	0.12 U	0.42	0.064 U	0.12 U	0.064 U					
		6	0.11 U	0.11 U	0.22	0.059 U	0.11 U	0.059 U					
GA-SB09	12/13/96	0.5	11 U	12	310	5.5 U	11 U	5.5 U					
		2	13 U	13 U	130	6.5 U	13 U	6.5 U					
		4	2.4 U	2.4 U	21	1.2 U	2.4 U	1.2 U					
		6	0.11 U	0.11 U	0.2	0.055 U	0.11 U	0.055 U					
GA-SB10	12/13/96	0.5	1.1 U	1.1 U	12	0.56 U	1.1 U	0.56 U					
		2	2.3 U	2.3 U	38	1.2 U	2.3 U	1.2 U					
		4	1.2 U	3.7	12	0.61 U	1.2 U	0.61 U					
		6	2.4 U	7.5	26	1.3 U	2.4 U	1.3 U					
GA-SB11	12/13/96	0.5	11 U	11 U	96	5.5 U	11 U	5.5 U					
		2	0.13 U	0.13 U	0.47	0.065 U	0.13 U	0.065 U					
		4	0.13 U	0.13 U	0.49	0.067 U	0.13 U	0.067 U					
		6	0.13 U	0.13 U	0.13 U	0.068 U	0.13 U	0.068 U					

mg/kg - Milligrams per kilogram.
U = Undetected at the associated quantification limit.
J = Estimated value.
D = Diluted sample.
R = Rejected result (presence or absence of constituent cannot be certain).

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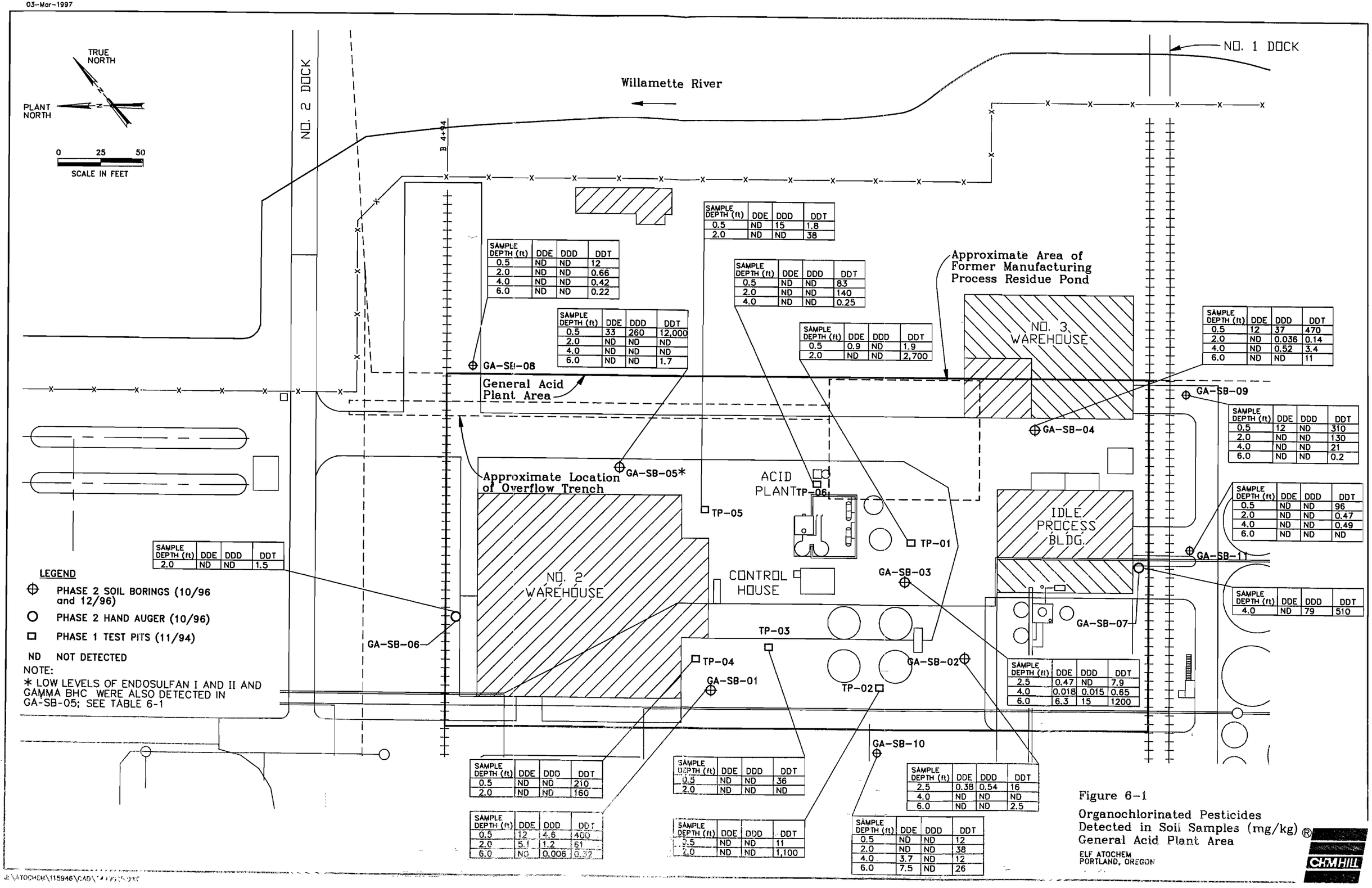

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	ND	ND	12
2.0	ND	ND	0.66
4.0	ND	ND	0.42
6.0	ND	ND	0.22

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	33	260	12,000
2.0	ND	ND	ND
4.0	ND	ND	ND
6.0	ND	ND	1.7

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	ND	15	1.8
2.0	ND	ND	38

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	ND	ND	83
2.0	ND	ND	140
4.0	ND	ND	0.25

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	0.9	ND	1.9
2.0	ND	ND	2,700

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	12	37	470
2.0	ND	0.036	0.14
4.0	ND	0.52	3.4
6.0	ND	ND	11

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	12	ND	310
2.0	ND	ND	130
4.0	ND	ND	21
6.0	ND	ND	0.2

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	ND	ND	96
2.0	ND	ND	0.47
4.0	ND	ND	0.49
6.0	ND	ND	ND

SAMPLE DEPTH (ft)	DDE	DDD	DDT
4.0	ND	79	510

SAMPLE DEPTH (ft)	DDE	DDD	DDT
2.5	0.47	ND	7.9
4.0	0.018	0.015	0.65
6.0	6.3	15	1200

SAMPLE DEPTH (ft)	DDE	DDD	DDT
2.0	ND	ND	1.5

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	ND	ND	210
2.0	ND	ND	160

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	12	4.6	400
2.0	5.1	1.2	61
6.0	NO	0.006	0.32

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	ND	ND	36
2.0	ND	ND	ND

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	ND	ND	11
2.0	ND	ND	1,100

SAMPLE DEPTH (ft)	DDE	DDD	DDT
2.5	0.38	0.54	16
4.0	ND	ND	ND
6.0	ND	ND	2.5

SAMPLE DEPTH (ft)	DDE	DDD	DDT
0.5	ND	ND	12
2.0	ND	ND	38
4.0	3.7	ND	12
6.0	7.5	ND	26

LEGEND

- ⊕ PHASE 2 SOIL BORINGS (10/96 and 12/96)
- ○ PHASE 2 HAND AUGER (10/96)
- □ PHASE 1 TEST PITS (11/94)

ND NOT DETECTED

NOTE:
* LOW LEVELS OF ENDOSULFAN I AND II AND GAMMA BHC WERE ALSO DETECTED IN GA-SB-05; SEE TABLE 6-1

Figure 6-1

Organochlorinated Pesticides Detected in Soil Samples (mg/kg) ®
General Acid Plant Area

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On the basis of field evidence of the presence of VOCs in the lower portion of GA-SB-03, the 8-foot and 10-foot samples were analyzed for VOCs. As shown in Figure 6-2 and Table 6-1, chlorobenzene was detected in the 8-foot sample at a concentration of 1,000 mg/kg and in the 10-foot sample at a concentration of 4,600 mg/kg. This boring appears to be in or near the footprint of the former chlorobenzene recovery unit. Therefore, the chlorobenzene detected in these soil samples is related to past operations of the former chlorobenzene recovery unit.

One boring, GA-SB-07, was advanced along the railroad tracks on the southern edge of the General Acid Plant Area. A sample was collected at a depth of 4 feet and analyzed for TPH-D (using EPA Method 8015 modified) and organochlorinated pesticides to assess the potential for spills of DDT/diesel mixture as it was loaded onto railcars for shipping. Diesel was detected in the sample at a concentration of 270 mg/kg. This concentration is typical for soil located along railroad tracks.

6.1.2 Former Residue Pond

6.1.2.1 Summary

The near-surface areal extent (above approximately 5 to 10 feet bgs) of the DDT-affected soil in the Former Residue Pond area is approximately 60 by 56 feet. The extent of affected soil appears to spread at depth in the unsaturated zone, such that at approximately 20 feet bgs the lateral extent of affected soil may be 20 to 30 feet beyond what was observed at shallower depths. This spreading may have been caused by a combination of capillary suction in the lateral direction, liquid-phase dispersion, and/or smearing and spreading caused by ongoing water table fluctuations. The presence and extent of DDT-affected soil below the water table is not known. Low levels of chlorobenzene appear to be associated with the DDT-affected soil. The higher levels of chlorobenzene detected just beyond the west edge of the Former Residue Pond related to the former chlorobenzene recovery unit.

6.1.2.2 Discussion

Five soil borings were advanced around the expected edges of the Former Residue Pond (RP-SB16 through RP-SB20) to further delineate the subsurface extent of affected soil in the unsaturated zone. The borings were advanced to depths ranging from 21 to 25.5 feet. Thirteen soil samples were analyzed for organochlorinated pesticides to confirm field observations in assessing the extent of affected soil. Table 6-2 and Figure 6-3 summarize the analytical results. In general, soil samples that appeared pink had higher concentrations of DDT than soil samples that did not appear pink. Soil samples collected from within the expected boundaries of the Former Residue Pond that exhibited the distinctive pink color had DDT concentrations generally exceeding 5,000 mg/kg. Samples collected beyond the visibly pink material had DDT concentrations well below this level, ranging from below the detection limit to a maximum of 360 mg/kg.

Stratigraphic cross sections to the north and south (see Figure 6-4) and to the east and west (see Figure 6-5) of the Former Residue Pond illustrate the correlation between the visibly affected soil and DDT concentrations. These cross sections incorporate data collected during both Phase 1 and Phase 2. Borings RP-SB-19 and RP-SB-20 laterally bound the extent of affected soil in the unsaturated zone to the south and east, respectively, of the Former Residue Pond. Boring RP-SB-16 (Figure 6-4) shows a lateral spreading of the affected soil at

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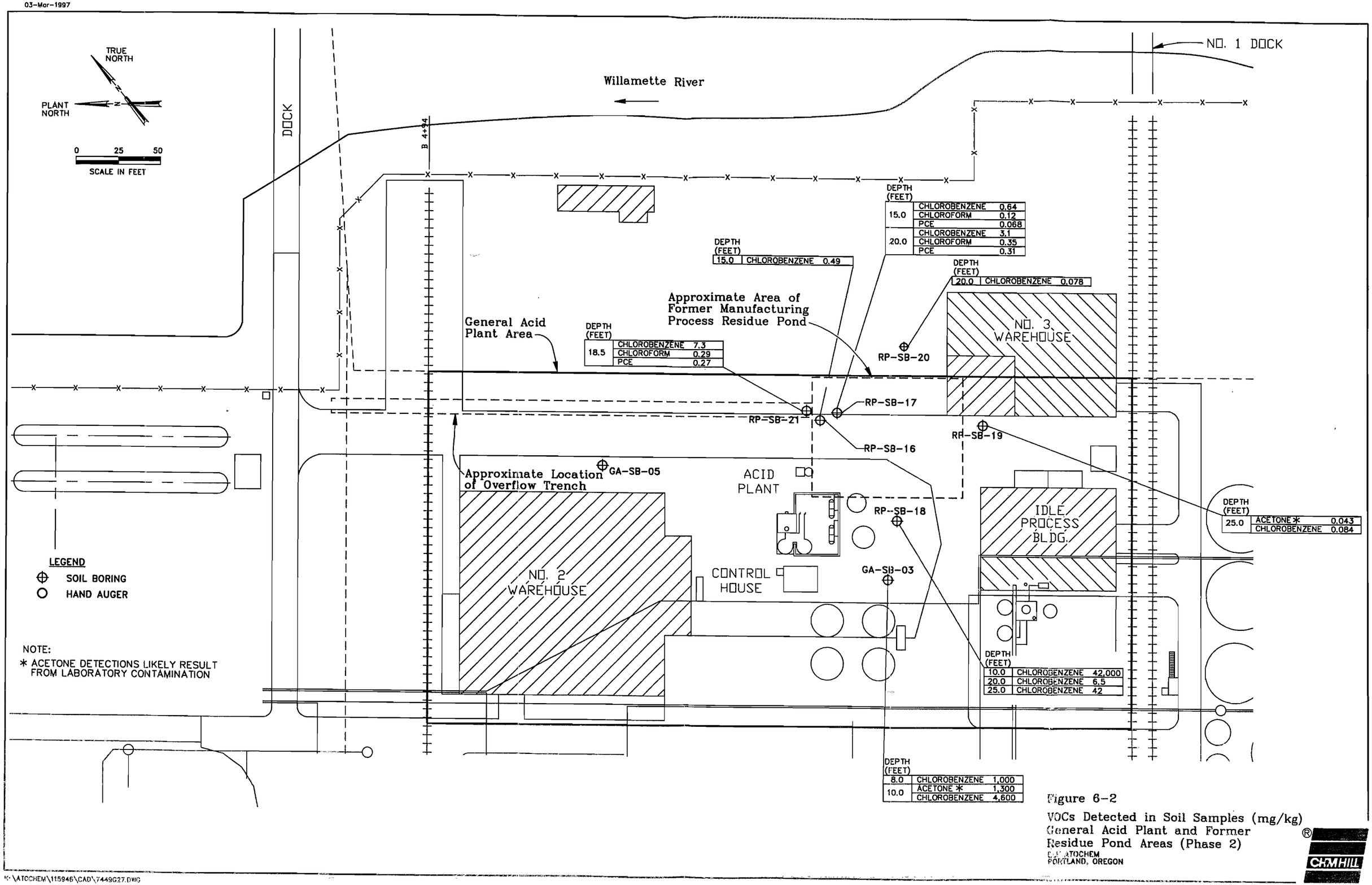

Figure 6-2

VOCs Detected in Soil Samples (mg/kg)
General Acid Plant and Former Residue Pond Areas (Phase 2)

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TABLE 6-2

Former Residue Pond and Overflow Trench Area Soil Sampling Results

Detected Constituents Only (mg/kg)

Station ID	Date Sampled	Depth (feet bgs)	Pesticides			Volatile Organic Compounds			
			4,4'-DDD	4,4'-DDE	4,4'-DDT	Acetone	Chlorobenzene	Chloroform	Tetrachloroethene
RP-SB16	10/10/96	5	21 U	21 U	360				
		15	1.9 U	1.9 U	24	0.03 UJ	0.49	0.014 U	0.014 U
		20	410 U	410 U	13,000				
RP-SB17	10/09/96	10	190 U	190 U	5,100				
		15	200 U	200 U	2,100	0.062 UJ	0.64	0.12	0.067
		20	390 U	390 U	11,000	0.024 UJ	3.1 U	0.35	0.31
RP-SB18	10/09/96	10	690 D	83	21,000 D	5,200 UJ	43,000	2,000 U	2,000 U
		20	0.36 U	0.36 U	5.8	1.4 UJ	6.5	0.69 U	0.69 U
		25	0.63	0.27	140 D	2.9 UJ	42	1.4 U	1.4 U
RP-SB19	10/10/96	15	0.37 U	0.37 U	1.8				
		25	0.044 U	0.044 U	0.37	0.04 J	0.081 J	0.007 UJ	0.007 UJ
RP-SB20	10/10/96	15	0.74 U	0.74 U	3.9				
		20	0.36 U	0.36 U	2.5	0.011 UJ	0.078	0.005 U	0.005 U
RP-SB21	10/10/96	5	390 U	390 U	9,200				
		18.5	800 U	800 U	20,000	0.06 UJ	7.2 DJ	0.29 J	0.27 UJ
RP-SB22	10/11/96	5	0.25 U	0.25 U	1.4				
RP-SB23	10/11/96	5	0.18 U	0.18 U	1.5				
RP-SB25	12/12/96	2	55 U	55 U	1,300 B				
RP-SB26	12/12/96	10	1.1 U	1.1 U	9				
RP-SB27	12/12/96	2	1.1 U	1.1 U	11				
		20	1.4 U	1.4 U	7.9				
RP-SB28	12/12/96	10	0.11 U	0.15	1.3				
		20	0.7 U	0.7 U	9.1				
RP-SB29	12/12/96	5	0.1 U	0.1 U	0.54 U				
RP-SB30	12/12/96	5	0.71 U	0.71 U	8.7 B				
RP-SB31	12/12/96	5	570 U	570 U	19,000 B				
		14	110 U	110 U	750				
RP-SB32	12/12/96	18	0.12 U	0.12 U	1.1 U				
RP-SB33	12/13/96	2	1200 U	1200 U	31,000 B				
		20	0.14 U	0.14 U	3.1 U				
RP-SB34	12/13/96	10	5.3 U	5.3 U	62				
RP-SB37	12/13/96	10	0.11 U	0.11 U	1.7 U				
		20	0.3	0.14	2.8 U				

mg/kg - Milligrams per kilogram
bgs = Below ground surface.
U = Undetected at the associated quantification limit.
J = Estimated value.
D = Diluted sample.
B = Concentration between detection limit and contract-required detection limit.

ALR 7449G28
3-Mar-1997

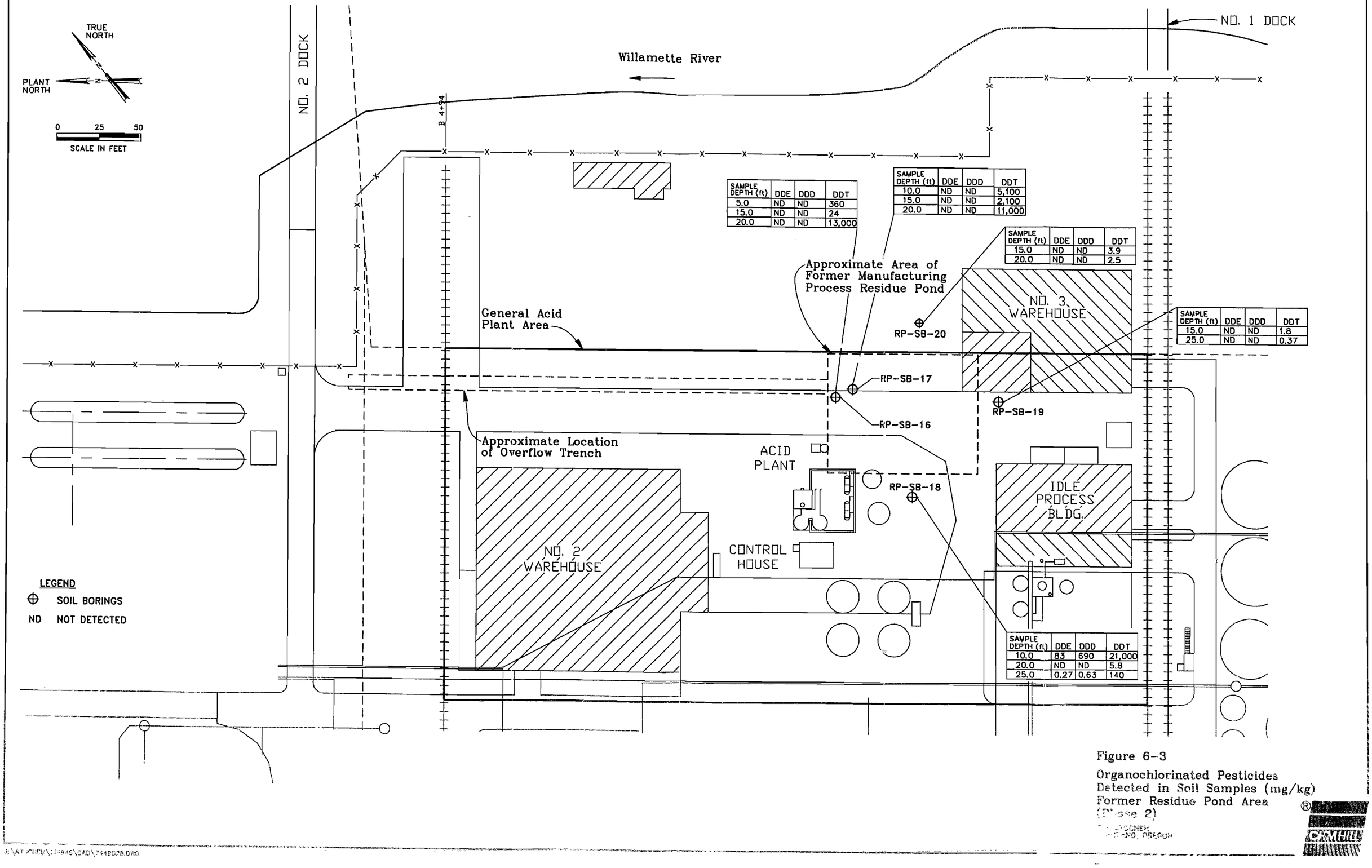
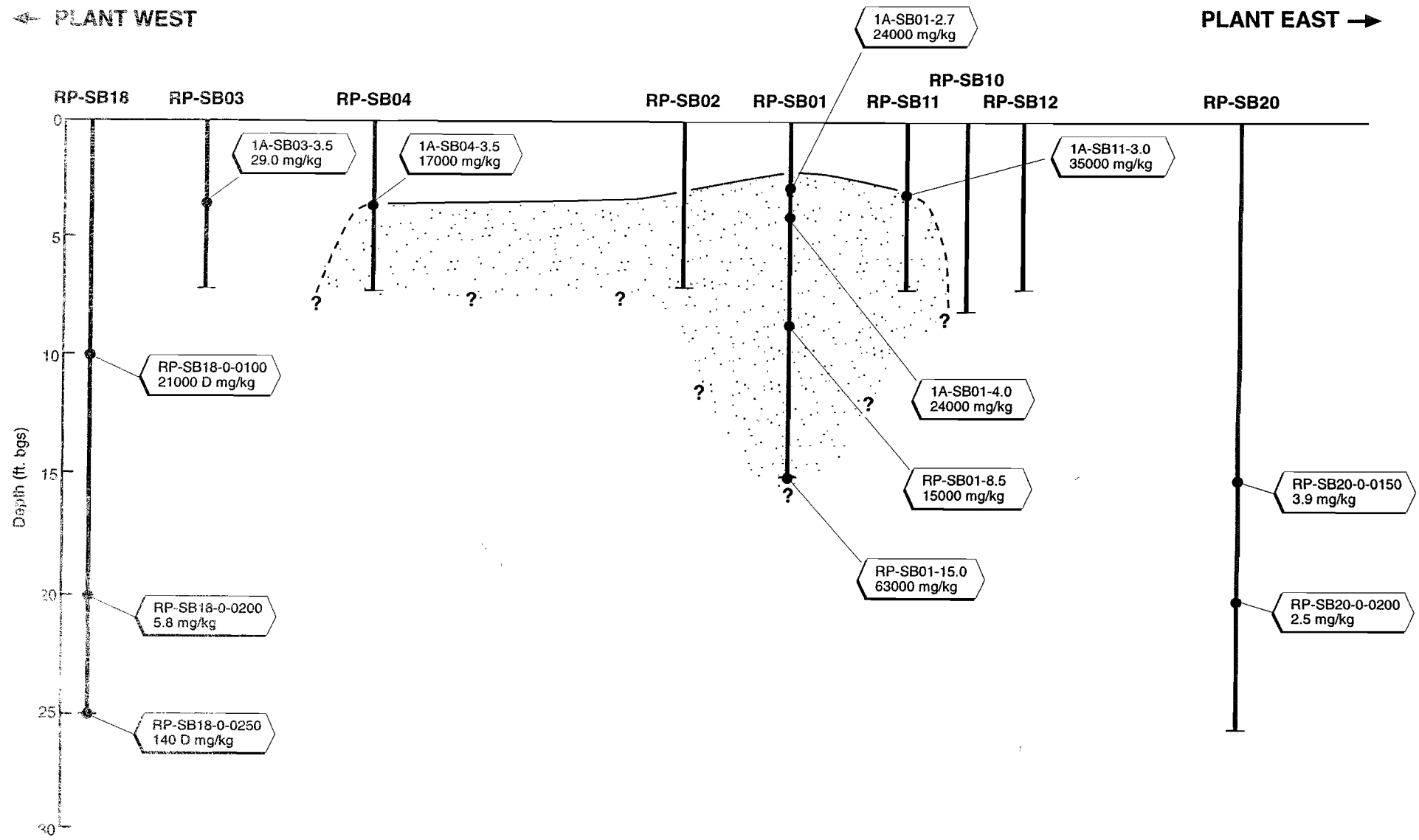


Figure 6-3

Organochlorinated Pesticides Detected in Soil Samples (mg/kg) Former Residue Pond Area (Phase 2)

PORTLAND, OREGON

J:\AT_CHEM\[illegible]\CAD\7449G28.DWG



Vertical Exaggeration: 2

= 12 feet

0 3 6 12 feet

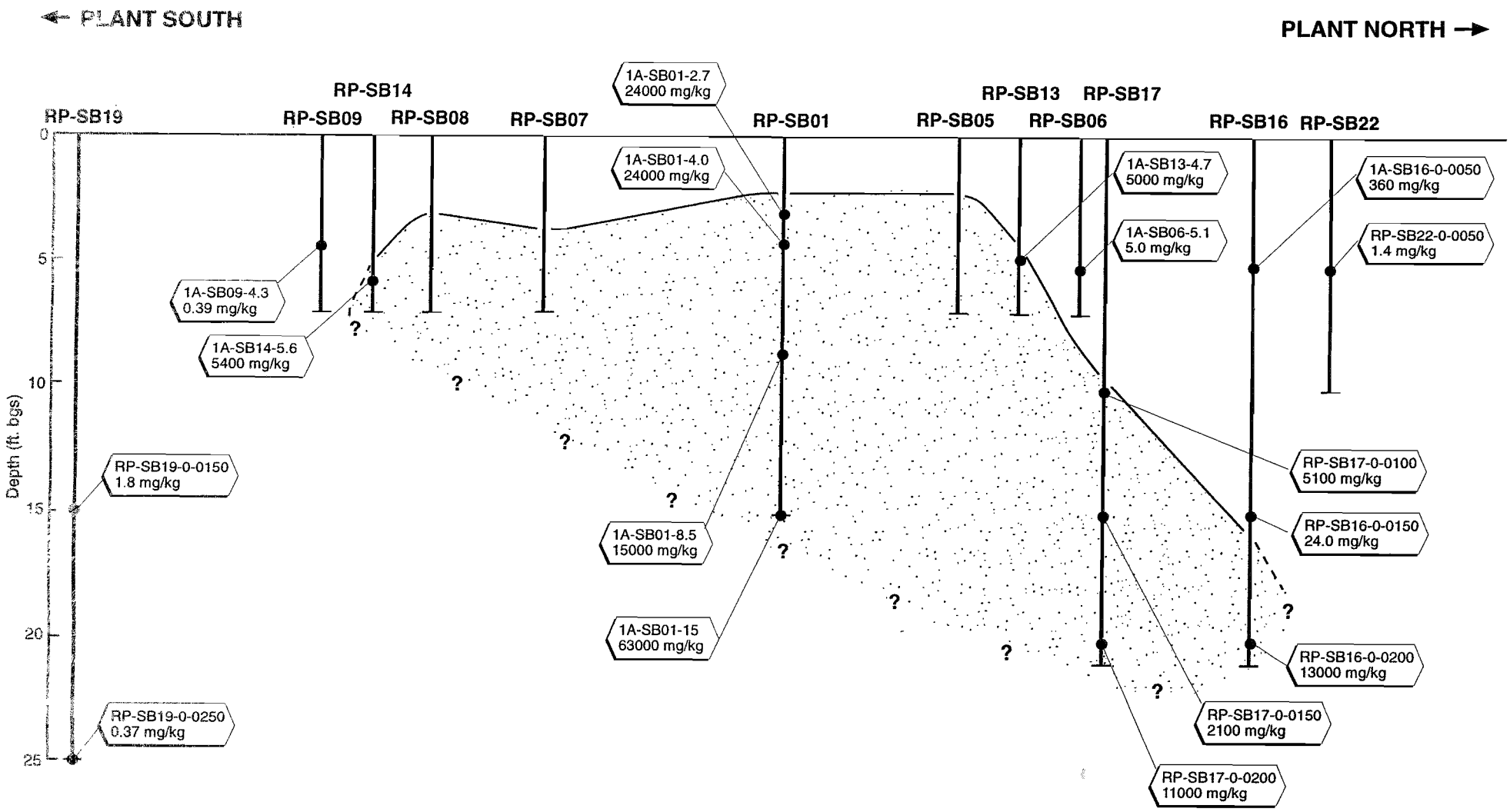
Legend

No Visible Evidence of Residue

Visible Evidence of Residue

Sample I.D.
DDT Concentration

Figure 6-4
Pond: East-West Cross Section
Elf Atochem
Portland, Oregon



Vertical Exaggeration: 2

" = 12 feet

0 3 6 12 feet

Legend

No Visible Evidence of Residue

Visible Evidence of Residue

Sample I.D.
DDT Concentration

Figure 6-5
Pond: North-South Cross Section
Elf Atochem
Portland, Oregon

depth. These two figures demonstrate the expected extent of DDT-affected soil in the unsaturated zone in the Former Residue Pond area.

Eight soil samples were also analyzed for VOCs. With the exception of samples from boring RP-SB-18, low levels of chlorobenzene (0.084 to 3.1 mg/kg), chloroform (0.12 to 0.35 mg/kg) and tetrachloroethene (PCE) (0.068 to 0.31 mg/kg) were detected in the samples (Figure 6-2 and Table 6-2). Acetone was also detected in one of the samples, but likely was present because of laboratory contamination. Soil samples from boring RP-SB-18 had detected chlorobenzene concentrations of 42,000 mg/kg in the 10-foot sample, decreasing to 6.5 mg/kg and 42 mg/kg in the 20- and 25-foot samples, respectively. This boring appears to be within the footprint of the former chlorobenzene recovery unit. Therefore, the chlorobenzene detected in these soil samples is related to past operations of the former chlorobenzene recovery unit.

6.1.3 Overflow Trench of the Former Residue Pond

6.1.3.1 Summary

According to Atochem, the overflow trench reportedly was approximately 5 to 6 feet wide, 5 to 6 feet deep, and extended northward from the northeastern corner (plant north) of the Former Residue Pond. This general configuration was confirmed during sampling.

The results of soil sampling and analysis along the overflow trench were consistent with results from the Former Residue Pond: pink soil generally had the highest concentrations of DDT, and soil outside the trench that was not pink had DDT concentrations one or more orders of magnitude less. The total width of the DDT-affected soil along the overflow trench is approximately 15 feet. The depth of pink DDT-affected soil is greatest near the Former Residue Pond (similar in depth to soil beneath the pond itself) and decreases with distance away from the pond (limited to a depth of about 5 feet near the northern end of the trench). The end of the overflow trench appears to lie between two sampling points: RP-SB33 and RP-SB35.

6.1.3.2 Discussion

As shown in Figure 6-6, 17 soil borings were advanced to depths ranging from approximately 10 feet to 23 feet to evaluate the presence and extent of soil affected by the overflow trench (RP-SB21 through RP-SB37). The inferred southern trench boundary was identified by soil borings RP-SB21, RP-SB22, and RP-SB23. Four transects were then advanced with a Geoprobe across the inferred trench axis between the Former Residue Pond and northern boundary of the General Acid Plant area.

Twenty soil samples were analyzed for organochlorinated pesticides to confirm field observations in assessing the extent of affected soil. Table 6-2 and Figure 6-6 summarize the analytical results.

Similar to the Former Residue Pond, soil samples that appeared pink typically had higher concentrations of DDT than soil samples that did not appear pink. Generally, soil samples collected within the expected boundaries of the overflow trench that had visually apparent pink residue had detected DDT concentrations exceeding 9,000 mg/kg. Samples collected beyond the visibly pink material had substantially lower DDT concentrations, ranging from below the detection limit to 1,300 mg/kg.

ALR 7449G36
03-Mar-1997

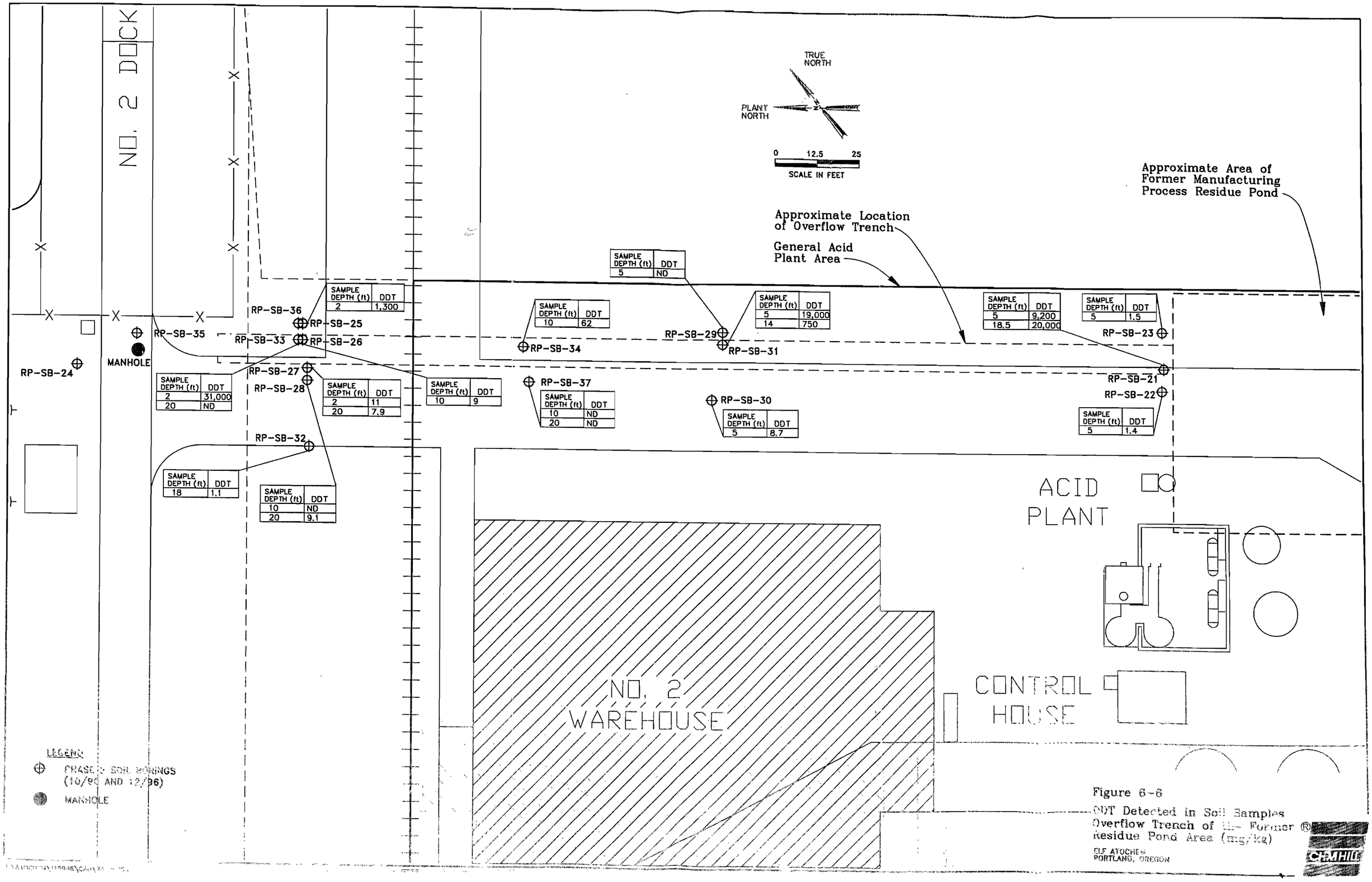


Figure 6-6
DDT Detected in Soil Samples
Overflow Trench of the Former Residue Pond Area (mg/kg)
ELF ATOCHEM
PORTLAND, OREGON

CH2MHILL

A north/south profile of the overflow trench (lengthwise along the trench) shows the location of the affected soil associated with the overflow trench (Figure 6-7). The affected soil lengthwise along the trench appears to be wedge-shaped, pinching out approximately 270 feet north of the Former Residue Pond edge. At the southern end of the overflow trench, just beyond the edge of the Former Residue Pond, affected soil was encountered at a depth of approximately 2.5 feet (boring RP-SB21). Affected soil was observed at shallower depths along the northern portion of the trench (Figure 6-7), such that in boring RP-SB31, affected soil was encountered at a depth of 1 to 2 feet, and farther north, in borings RP-SB34 and RP-SB33, affected soil was observed at ground surface just underneath the asphalt.

The vertical extent of the affected soil beneath the trench is defined except where it overlaps with pond residues. The vertical extent is more defined in the northern portion of the trench, such that visibly affected soil extends to a depth of approximately 8 feet in boring RP-SB31 and in borings RP-SB34 and RP-SB33 approximately 4.2 feet farther north (Figure 6-7).

Figure 6-8 shows two east-west transects through the overflow trench. The width of the affected soil associated with the trench appears to be less than 15 feet in these transects.

6.1.4 Monitoring Well Soil Sampling Results

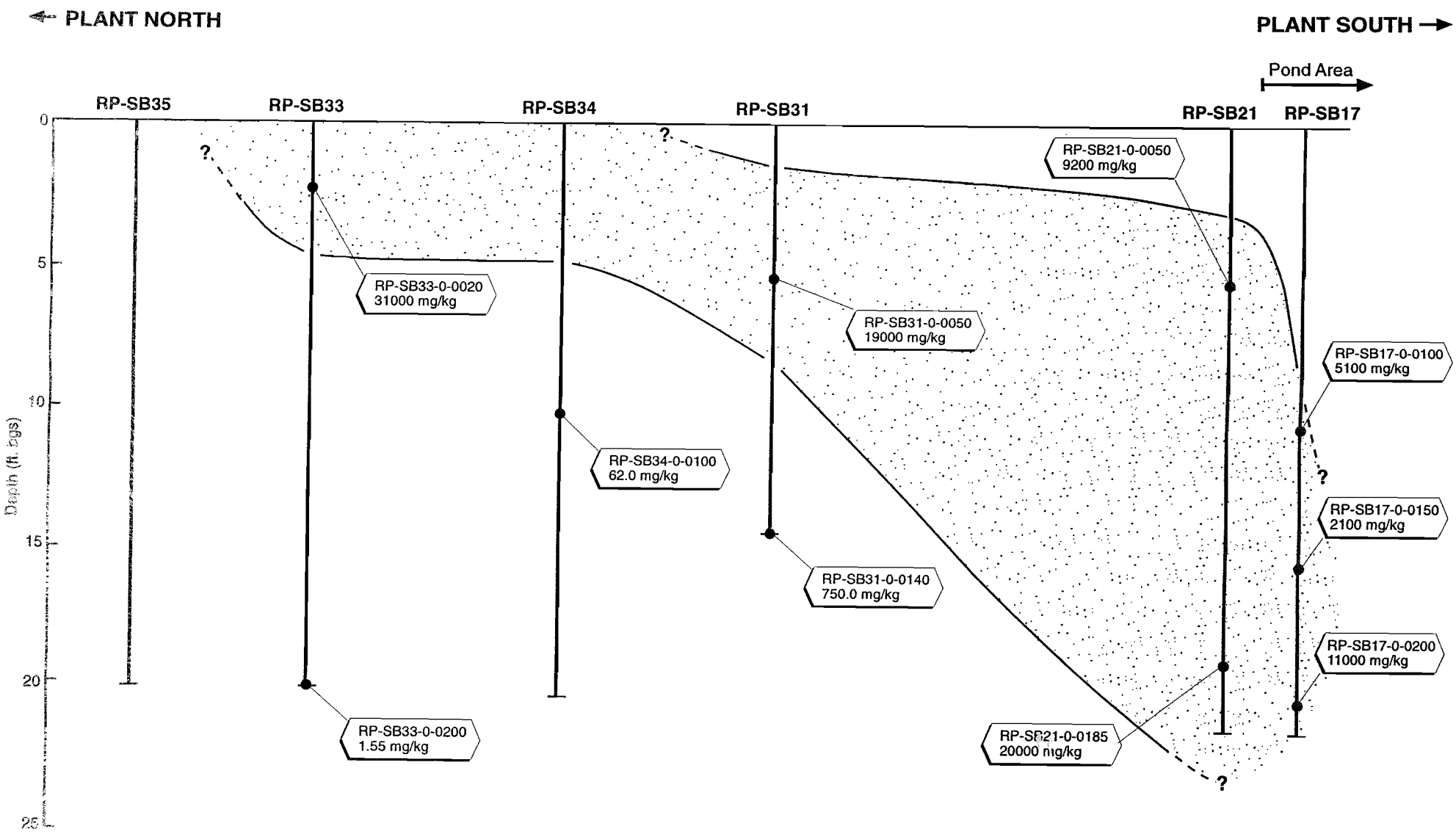
6.1.4.1 Summary

Soil samples collected and analyzed during monitoring well installation had detectable concentrations of DDT, DDD, and DDE generally less than 1 mg/kg. A few VOCs (chlorobenzene, xylenes, acetone, methylene chloride, and 2-butanone) also were detected at low concentrations.

6.1.4.2 Discussion

Four shallow groundwater monitoring wells (MWA-1, MWA-2, MWA-3, and MWA-4) were installed in the uppermost water-bearing zone during December 1996. Twelve soil samples collected from the native alluvium during well drilling were selected for analysis; samples from fill were not analyzed. Soil sample depths ranged from 14 to 30 feet. Eleven of the soil samples were analyzed for organochlorinated pesticides (EPA Method 8080) and VOCs (EPA Method 8240). Four samples were analyzed for total organic carbon (EPA Method 9060), and three samples were analyzed for particle-size distribution (ASTM D-422). Table 6-3 summarizes the analytical results.

Pesticides were not detected at the upgradient well (MWA-1) located to the west, but were detected in the three downgradient wells located to the east. DDT was detected at concentrations ranging from 0.36 to 0.55 mg/kg at the northernmost well (MWA-2). DDT concentrations ranged from 0.64 to 79 mg/kg at the more southern wells (MWA-3 and MWA-4). DDD was detected at concentrations of 0.72 to 41 mg/kg, and DDE was detected at concentrations of 0.16 to 5.4 mg/kg. In general, pesticide concentrations were the highest in the southernmost downgradient well, MWA-4. Pesticide concentrations at wells MWA-3 and MWA-4 appeared to decrease with depth, with the highest concentrations occurring at 24 feet (the approximate top of alluvium beneath the fill zone).



Vertical Exaggeration: 8

1" = 40 feet

0 10 20 40 feet

Legend

No Visible Evidence of Residue

Visible Evidence of Residue

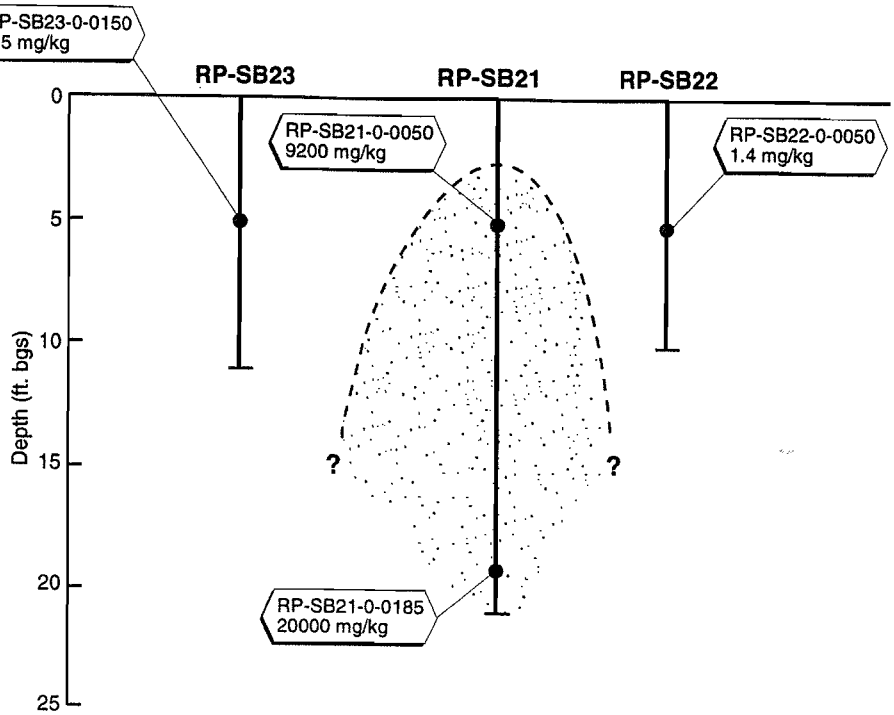
Sample I.D.
DDT Concentration

Figure 6-7
Overflow Trench: Lengthwise Cross Section
Elf Atochem
Portland, Oregon

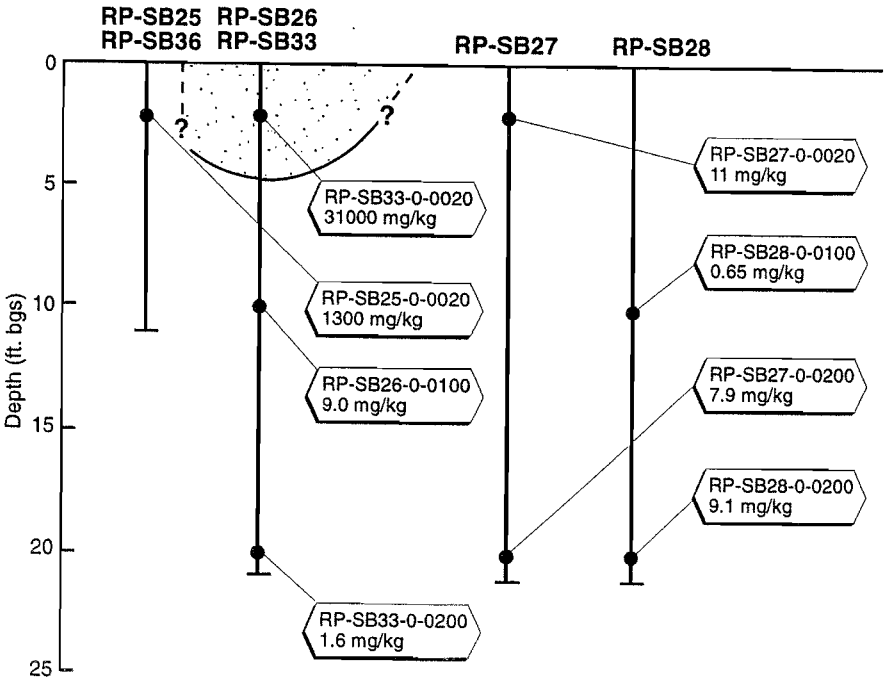
← PLANT EAST

PLANT WEST →

SOUTHERN TRANSECT



NORTHERN TRANSECT



Vertical Exaggeration: 1

1" = 8 feet

0 2 4 8 feet

Legend

No Visible Evidence of Residue

Visible Evidence of Residue

Sample I.D.
DDT Concentration

Figure 6-8
Overflow Trench Transects
Elf Atochem
Portland, Oregon

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TABLE 6-3
Monitoring Well Installation Soil Sampling Results
Detected Constituents Only (mg/kg)

Station ID	Depth From	Date Sampled	4,4'-DDT	4,4'-DDD	4,4'-DDE	Acetone	Chlorobenzene	2-Butanone (MEK)	Methylene Chloride	Total Xylenes	Total Organic Carbon (percent)
GA-MWA1	14	12/11/96	0.15 U	0.15 U	0.15 U	0.029	0.059	0.015 U	0.008	0.01 U	
	19	12/11/96	0.14 U	0.14 U	0.14 U	0.056 J	0.057 J	0.014 UJ	0.036 J	0.01 UJ	0.1970
	26	12/11/96	0.13 U	0.13 U	0.13 U	0.025	0.007 U	0.014 U	0.008	0.01 U	
GA-MWA2	22	12/11/96									0.0633
	24	12/11/96	0.36	0.13 U	0.13 U	0.075	0.084	0.016	0.007 U	0.01 U	
	29	12/11/96	0.55	0.13 U	0.13 U	0.042 J	0.13 J	0.013 UJ	0.007 J	0.01 UJ	
GA-MWA3	22	12/11/96	0.13 U	0.13 U	0.13 U	0.1	0.006 U	0.013 U	0.043	0.01 U	
	24	12/11/96	2.5	0.72	0.26 U	0.052	0.007 U	0.013 U	0.023	0.01 U	0.153
	27.5	12/11/96	0.64	0.13 U	0.13 U	0.061	0.006 U	0.013 U	0.01	0.01 U	
GA-MWA4	24	12/11/96	79	41	5.4	0.25	0.01	0.013 U	0.055	0.01 U	
	27.8	12/11/96	2.6	1.1	0.16	0.12 D	0.13 DJ	0.014 UJ	0.02 J	0.01 UJ	
	30	12/11/96	0.59	0.13 U	0.13 U	1.6 UR	4.3 J	1.6 UR	0.82 UR	0.82 UR	0.133

mg/kg - Milligrams per kilogram.
U = Undetected at the associated quantification limit.
J = Estimated value.
D = Diluted sample.
R = Rejected result (presence or absence of constituent cannot be certain).

Chlorobenzene was detected in concentrations ranging from below the detection limit to 3.3 mg/kg. Chlorobenzene was not detected in soil samples collected from the well MWA-3 boring, but was detected in soil samples from the remaining three wells. The highest chlorobenzene concentration found was in the 30-foot soil sample from the southernmost downgradient well, MWA-4. Other VOCs, including xylenes, acetone, methylene chloride, and 2-butanone (methyl ethyl ketone [MEK]), were detected in concentrations ranging from below the detection limit to 0.141 mg/kg.

6.2 Groundwater Characterization

6.2.1 Geoprobe Groundwater Sampling Results

6.2.1.1 Summary

Groundwater samples collected with a Geoprobe direct-push sampler in fall 1996 were analyzed for VOCs. Chlorobenzene concentrations were higher in samples collected near the river than in samples collected west (upgradient) of the Former Residue Pond and chlorobenzene recovery unit. The extent of chlorobenzene in groundwater north and south of the Former Residue Pond was delineated on the basis of Geoprobe sample results from the area between GW-10 (to the west), GW-7 (to the north), and GW-9 (to the south). Geoprobe sample results for the area downgradient (east) of the Former Residue Pond/ chlorobenzene recovery unit showed concentrations approaching 5 to 10 percent of chlorobenzene's aqueous solubility limit; however, no evidence of phase-separated chlorobenzene in either soil or water samples was detected with hydrophobic dye. A few other VOCs (1,1-dichloroethane, 1,1-dichloroethene, tetrachloroethene , toluene, 1,1,1-trichloroethane, trichloroethene, acetone, 2-butanone, carbon disulfide, chloroethane, and chloroform) in addition to chlorobenzene were detected in some groundwater samples collected with the Geoprobe.

6.2.1.2 Discussion

Fourteen groundwater samples were collected with a Geoprobe in October and November 1996. Twelve of the samples were collected from depths of approximately 31 to 32 feet, and two of the samples were collected from a depth of approximately 45 feet. The groundwater samples were analyzed for VOCs (EPA method 8240) and were screened in the field for the presence of DNAPL using a hydrophobic dye (see Appendix C). DNAPL was not detected in the samples tested. The Geoprobe sampling results for detected VOCs appear in Table 6-4 and Figure 6-9. Figure 6-9 also includes the Geoprobe sampling results from Phase 1 (GW-1 through GW-4).

As shown in Figure 6-9, chlorobenzene, the predominant VOC detected in the Phase 2 Geoprobe water samples, was detected in concentrations ranging from below the detection limit to 34 mg/L. Chlorobenzene was not detected in the samples collected with the Geoprobe in the upgradient area (GW-10) or in the northernmost location (GW-7), bounding the extent of the chlorobenzene to the west and north. The southernmost Geoprobe sample location (GW-9) had a low concentration of chlorobenzene (0.027 mg/L), indicating that the extent of chlorobenzene in the shallow groundwater likely does not extend far beyond the location of GW-9.

TABLE 6-4

Geoprobe Groundwater Sampling Results

Detected Constituents Only (mg/L)

Station ID	Date Sampled	1,1,1-Trichloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethene	Acetone	Chloro-benzene	Chloro-ethane	Chloroform	Methylene Chloride	Tetrachloro-ethene	Toluene	Trichloro-ethene	Total Xylenes
GA-GW05	10/07/96	0.006 J	0.005 UJ	0.002 UJ	0.46 U	7.6 D	0.11 J	0.078 J	0.005 J	0.01 J	0.005 UJ	0.005 UJ	0.005 UJ
GA-GW06	10/08/96	0.005 U	0.005 U	0.005 U	0.057 B	34	0.01 U	0.11	0.005 U	0.1	0.008	0.005 U	0.005 U
GA-GW07	10/08/96	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U	0.01 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
GA-GW08	10/08/96	0.005 U	0.005 U	0.005 U	0.074 U	0.96 D	0.01 U	0.013	0.005 U	0.006	0.005 U	0.005 U	0.005 U
GA-GW09	10/09/96	0.005 U	0.005 U	0.005 U	0.011 U	0.027	0.01 U	0.005 U	0.005 U	0.007	0.005 U	0.006	0.005 U
GA-GW10	10/09/96	0.005 U	0.007	0.005 U	0.034 U	0.005 U	0.01 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
GA-GW11	10/09/96	0.25 U	0.25 U	0.25 U	0.5 U	6	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
GA-GW12	11/21/96	0.0054	0.033	0.016	0.025 U	0.047	0.001 U	0.001 U	0.025 JB	0.0019	0.093	0.0011	0.001 U
GA-GW13	11/21/96	0.02 U	0.02 U	0.02 U	0.5 U	1.8	0.02 U	0.02 U	0.51 JB	0.03	0.02 U	0.035	0.02 U
GA-GW14	11/21/96	0.1 U	0.1 U	0.1 U	2.5 U	32	0.1 U	0.1 U	1 U	0.1 U	0.1 U	0.1 U	0.1 U
GA-GW15	11/22/96	0.01 U	0.01 U	0.01 U	0.25 U	5.3	0.01 U	0.014	0.1 U	0.01	0.01 U	0.01 U	0.01 U
GA-GW16	11/22/96	0.1 U	0.1 U	0.1 U	2.5 U	19	0.1 U	0.84	1 U	0.1 U	0.1 U	0.1 U	0.1 U
GA-GW17	11/22/96	0.01 U	0.01 U	0.01 U	0.25 U	4.5	0.01 U	0.012	0.1 U	0.01 U	0.01 U	0.01 U	0.01 U
GA-GW18	11/22/96	0.04 U	0.04 U	0.04 U	1 U	6.6	0.04 U	0.04 U	0.4 U	0.04 U	0.04 U	0.04 U	0.055

mg/kg - Milligrams per kilogram.

J = Estimated value.

U = Undetected at the associated quantification limit.

D = Diluted sample.

B = Concentration between detection limit and contract-required detection limit.

ALR 7449G29
03-Mar-1997

TRUE NORTH
PLANT NORTH
0 25 50
SCALE IN FEET

NO. 2 DOCK

B 4+94

Willamette River

CHLOROBENZENE	34
2-BUTANONE	0.074
ACETONE	0.057
CARBON DISULFIDE	0.006
CHLOROFORM	0.11
PCE	0.1
TOLUENE	0.008

GW-6

GW-17 (DEEPER SAMPLE)

GW-16

CHLOROBENZENE	4.5
CHLOROFORM	0.012

CHLOROBENZENE	19
CHLOROFORM	0.84

GW-11

CHLOROBENZENE	6

GW-15

CHLOROBENZENE	5.3
CHLOROFORM	0.014
PCE	0.01

GW-18 (DEEPER SAMPLE)

GW-14

CHLOROBENZENE	32

CHLOROBENZENE	6.6

GW-5

CPT-1

CHLOROBENZENE	7.6
CHLOROETHANE	0.089
CHLOROFORM	0.063
1,1,1-TCA	0.006
PCE	0.01

GW-9

CHLOROBENZENE	0.027
TCE	0.007
PCE	0.006

GW-8

CPT-2

CHLOROBENZENE	0.96
ACETONE	0.048
CHLOROFORM	0.013
PCE	0.006

GW-13

CHLOROBENZENE	1.8
PCE	0.030
TCE	0.035

CHLOROBENZENE	0.047
1,1-DCA	0.033
1,1-DCE	0.016
PCE	0.0019
TOLUENE	0.083
1,1,1-TCA	0.0054
TCE	0.0011

GW-12

General Acid Plant Area

Approximate Area of Former Manufacturing Process Residue Pond

Approximate Location of Overflow Trench

ACID PLANT

CONTROL HOUSE

GW-10

1,1-DCA	0.007

CPT-3 GW-7

NOT DETECTED

LEGEND

- PHASE 2 GEOPROBES (10/96 & 11/96)
- CONE PENETROMETER (10/96)

Figure 6-9
VOCs Detected in Geoprobe Groundwater Samples (mg/L)
ELF ATOCHEM
PORTLAND, OREGON

CH2MHILL

J:\ATOCHEM\115946\CAD\7449G29.DWG

The highest concentrations of chlorobenzene were detected in GW-6 (34 mg/L), GW-14 (32 mg/L), and GW-16 (19 mg/L) . To evaluate the preferred placement of the screened interval for the monitoring wells, deeper samples (approximately 45 feet bgs) were collected next to GW-14 and GW-16 from Geoprobes GW-17 and GW-18 (Figure 6-9). The results of these two samples (GW-17 had a chlorobenzene concentration of 4.5 mg/L, and GW-18 had 6.6 mg/L) indicate that chlorobenzene concentrations decline with depth. On the basis of these results, and considering the presence of thin silt layers at about 35 feet based on nearby CPT probes, DEQ and Elf Atochem agreed to screen the monitoring wells near the water table.

The highest concentration of chlorobenzene detected in the Geoprobe water samples (34 mg/L) is approximately 7 percent of chlorobenzene's aqueous solubility (about 500 mg/L; see Section 7.1.2). In some cases, concentrations of this magnitude suggest the presence of a separate phase of nonaqueous phase liquid (NAPL) in the subsurface; however, no evidence of NAPL was observed in either soil or groundwater samples by using the Sudan IV hydrophobic dye shake test.

In addition to chlorobenzene, low concentrations of other VOCs were detected, including 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), PCE, toluene, 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), acetone, MEK, carbon disulfide, chloroethane, and chloroform (Table 6-4 and Figure 6-9).

6.2.2 Monitoring Well Sampling Results

6.2.2.1 Summary

Groundwater samples collected in January and March 1997 were analyzed for VOCs and organochlorinated pesticides. The January samples also were analyzed for TPH.

Both sample sets appear to have been affected by high water levels related to flood conditions in the Willamette River. For example, chlorobenzene was either present at low concentrations or below the detection limit in wells located near the Willamette River while the westernmost well, interpreted to be upgradient of the Former Residue Pond under normal groundwater flow conditions, had the highest chlorobenzene concentrations.

DDT was not detected in the westernmost (typically upgradient) well in either January or March 1997. In the wells located along the Willamette River (typically downgradient), DDT was detected in each well in the January sampling event, but in only one well (MWA-3) during the March sampling event.

6.2.2.2 Discussion

Groundwater samples were collected from the four shallow monitoring wells on January 2 and March 12, 1997. January samples were analyzed for organochlorinated pesticides, VOCs and TPH-D; the TPH analysis was deleted in March because TPH was not detected in the January samples. Table 6-5 and Figure 6-10 summarize the analytical results. Samples were analyzed in the field for pH, specific conductance, turbidity, and temperature (these data are summarized in Appendix C).

The pH of groundwater at the site is near neutral, which is typical for shallow groundwater in western Oregon. The exception to this observation is well MWA-1, which had a pH slightly greater than 11.

TABLE 6-5
Monitoring Well Groundwater Sampling Results
Detected Constituents Only (mg/L)

Station ID	Date Sampled	Acetone	Chloro-benzene	Chloroform	Tetrachloro-ethene	Trichloro-ethene	4,4'-DDT	4,4'-DDE	4-4'DDD	Gamma BHC	Endosulfan II	Beta BHC
GA-MWA1	01/02/97	0.69	4.3	0.2 U	0.2 U	0.2 U	0.0005 U	0.0005 U	0.0005 U	0.00005 U	0.0005 U	0.00025 U
	03/12/97	1 U	16	0.5 U	0.5 U	0.5 U	0.0001 UJ	0.0001 UJ	0.0001 UJ	0.00005 UJ	0.0001 UJ	0.00005 UJ
GA-MWA2	01/02/97	0.01 U	0.005 U	0.6 D	0.059 D	0.006	0.00012	0.0001 U	0.0001 U	0.00005 U	0.0001 U	0.00005 U
	03/12/97	0.01 U	0.007	0.28 E	0.058	0.005	0.0001 UJ	0.0001 UJ	0.0001 UJ	0.00005 UJ	0.0001 UJ	0.00005 U
GA-MWA3	01/02/97	0.01 U	0.005 U	0.01	0.013	0.005 U	0.00033	0.0001 UJ	0.0001 UJ	0.000089	0.0001 U	0.00005 U
(field duplicate)	01/02/97	0.01 U	0.005 U	0.01	0.014	0.005 U	0.00033	0.0001 UJ	0.0001 UJ	0.000092	0.0001 U	0.00005 U
	03/12/97	0.01 U	0.005 U	0.022	0.014	0.005 U	0.00026 J	0.0001 UJ	0.0001 UJ	0.000026 J	0.0001 U	0.00005 U
GA-MWA4	01/02/97	0.01 U	0.075	0.009	0.005 U	0.005 U	0.0012	0.0005 U	0.0068	0.0006	0.00075	0.00025 U
(rinse blank)	01/02/97	0.01 U	0.005 U	0.005 U	0.005 U	0.005 U						
	03/12/97	0.05 U	0.96	0.025 U	0.025 U	0.025 U	0.0001 UJ	0.00013 J	0.006 DJ	0.00014 J	0.0001 UJ	0.00014 J
(field duplicate)	03/12/97	0.05 U	0.98	0.025 U	0.025 U	0.025 U	0.0001 UJ	0.00015 J	0.0061 DJ	0.00005 UJ	0.0001 UJ	0.00005 UJ
(rinse blank)	03/12/97	0.01 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0001 UJ	0.0001 UJ	0.0001 UJ	0.00005 UJ	0.0001 UJ	0.00005 U
(trip blank)	03/12/97	0.01 U	0.005 U	0.005 U	0.005 U	0.005 U						

mg/kg - Milligrams per kilogram.
U = Undetected at the associated quantification limit.
D = Diluted sample.
E = Estimated value.
J = Estimated value.

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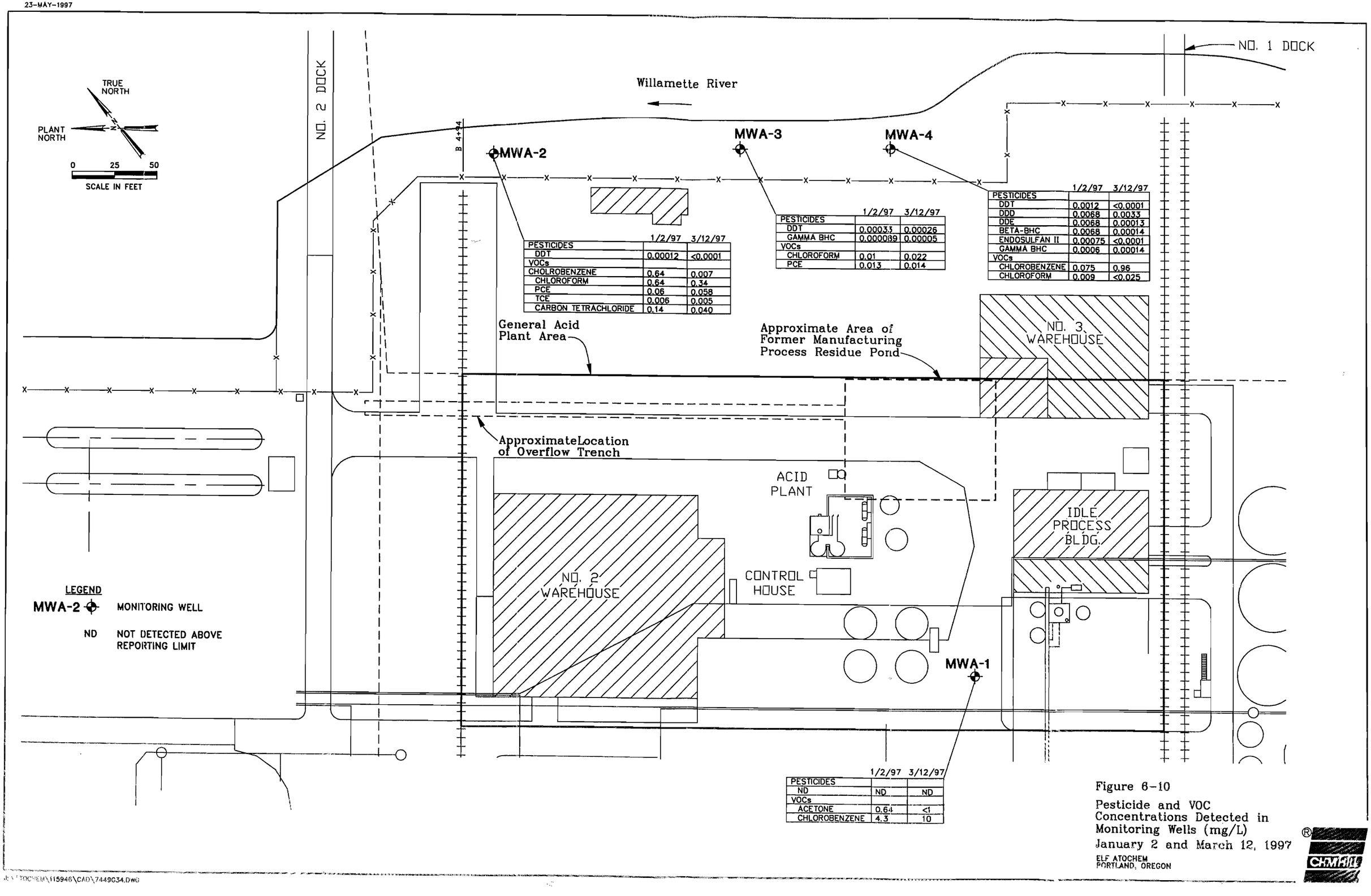

Figure 6-10

Pesticide and VOC Concentrations Detected in Monitoring Wells (mg/L)

January 2 and March 12, 1997

ELF ATOCHEM
PORTLAND, OREGON

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Turbidity in the wells was low and generally lower in the March sample than in the January sample, suggesting that lower purge rates and the effects of repetitive sampling are reducing remnant turbidity associated with the installation of the monitoring wells. As with pH and specific conductance, MWA-1 is unusual in that the water produced from the well during sampling had a dark-brown color (nearly opaque) with no visible turbidity. The turbidimeter (nephelometer) read very low turbidity levels in this sample (less than 5 nephelometric turbidity units), but this result may be influenced by the color of the sample.

As described in Section 5.2, on January 2, 1997, the Willamette River was at an unusually high river stage, reversing the groundwater gradient. Consequently, results for this sampling event are unlikely to represent typical conditions when groundwater discharges to the river, but rather represent groundwater conditions when the hydraulic gradient is reversed and groundwater levels rise beneath the site in response to the high river stage. The highest concentration of chlorobenzene (4.3 mg/L) was detected in MWA-1 (Figure 6-10), which under normal conditions lies upgradient of the Former Residue Pond. A low level of chlorobenzene was detected in one downgradient well, MWA-4 (0.075 mg/L). Other VOCs detected included chloroform, PCE, TCE, carbon tetrachloride, and acetone. Based on the Geoprobe results, however, these compounds are present at relatively low concentrations (compared to chlorobenzene) under typical, non-flood conditions. Pesticides were not detected in the upgradient well (MWA-1), but were detected in the three downgradient wells. Concentrations of DDT ranged from 0.00012 to 0.0012 mg/L. DDD, gamma BHC, and endosulfan II were also detected in MWA-4. Gamma BHC was detected in MWA-3.

The four monitoring wells were resampled on March 12, 1997, when the Willamette River stage had dropped and the groundwater gradient had returned to its normal direction toward the river (north-northeast). As presented in Figure 6-10, despite lower Willamette River levels, the March groundwater sampling results were similar to the January sampling event when the groundwater gradient was reversed. The highest concentration of chlorobenzene (16 mg/L) again was detected in the upgradient well (MWA-1). Pesticides were not detected in the upgradient well (MWA-1) during the March sampling. DDT was detected in only one of the downgradient wells (MWA-3) at a concentration of 0.00033 mg/L.

The results of the first two groundwater sampling events were unexpected because the western, typically upgradient well had higher chlorobenzene concentrations than the eastern, typically downgradient wells. This outcome is nearly opposite the results of the Geoprobe sampling that occurred in October 1996. These results are believed to be attributable to high river stage conditions that existed in late 1996 and early 1997.

Future groundwater quality data collected during more typical river stage conditions, particularly in late summer or early fall, should provide additional information on the distribution of constituents in groundwater near the Former Residue Pond and near the river.

SECTION 7

Mobility Properties of Potential Constituents of Concern

SECTION 7

Fate and Mobility of Key Constituents of Concern

SECTION 7

Mobility Properties of Potential Constituents of Concern

This section describes general transport properties of constituents of potential concern in Elf Atochem's Acid Plant Area. Table 7-1 lists constituents that have been detected in soil or groundwater samples from the site.

TABLE 7-1
Detected VOCs and Pesticides

Volatile Organic Compounds		Pesticides
Acetone	Tetrachloroethene	DDT
Carbon disulfide	Toluene	DDD
Carbon tetrachloride	Trichloroethene	DDE
Chlorobenzene	Xylenes, total	Endosulfan I
Chloroethane	1,1-dichloroethane	Endosulfan II
Chloroform	1,1-dichloroethene	Gamma-BHC
cis-1,2-dichloroethene	1,1,1-trichloroethane	Beta-BHC
Ethylbenzene	2-butanone (MEK)	
Methylene chloride		

The following constituents generally have the highest concentrations relative to possible action levels:

- DDT
- DDD
- DDE
- Chlorobenzene
- Chloroform

This section focuses on these key constituents.

The mobility of organic compounds is affected by several processes, including sorption, dissolution, and volatilization. Physical properties that determine a compound's natural tendency to undergo these processes include hydrophobicity, solubility, and vapor pressure.

The primary process affecting the mobility of pesticides is sorption. The primary processes affecting the mobility of VOCs are sorption, dissolution, and volatilization.

7.1 Sorption

Sorption is the process by which compounds partition and redistribute between solid and liquid phases. It is a measure of an organic compound's attraction to solid matter such as a soil or aquifer matrix.

Factors that affect sorption include the compound's hydrophobicity, the organic carbon content of surrounding soil, and the size and mineral composition of the solid particles (Karickhoff et al., 1979). Other factors that affect sorption include the chemical structure, molecular weight, and solubility of the organic compound; the pH, temperature, moisture content, porosity, and bulk density of the surrounding soil; and the presence of other organic compounds.

The tendency for an organic compound to adsorb to solid matter can be evaluated in terms of two partition coefficients: the octanol-water partition coefficient (K_{ow}) and the organic carbon partition coefficient (K_{oc}). K_{oc} is the ratio of the specified organic compound's concentration in octanol to its concentration in water. In general, compounds with high K_{ow} (>10,000) are hydrophobic, and compounds with low K_{ow} (<10) are considered relatively hydrophilic. K_{oc} is defined as the ratio of the quantity of compound adsorbed per unit weight of organic carbon in the solid media to the concentration of that organic compound in solution. In general, higher K_{oc} values indicate stronger sorption characteristics. Table 7-2 shows K_{ow} and K_{oc} values (expressed as logarithms) for the constituents of concern at the site.

TABLE 7-2
Sorption Partition Coefficients for Constituents of Concern

Constituent	log K_{ow} (ml/g)	log K_{oc} (ml/g)	K_d	Retardation Factor
DDT	4.89 to 6.91	5.14 to 5.77	340	2,600
DDD	5.80 to 6.22	5.38	290	2,200
DDE	5.69 to 6.20	5.39	290	2,200
Chlorobenzene	2.65 to 2.98	1.92 to 2.50	0.19	2.4
Chloroform	1.90 to 1.97	1.46 to 1.94	0.060	1.5

Notes:
1. Values taken from Montgomery, 1996.
2. $K_d = K_{oc} * f_{oc}$ where K_{oc} = mean of range cited and $f_{oc} = 0.0012$.
3. $R = 1+7.5K_d$, assuming bulk density = 1.5 grams per cubic centimeter and porosity = 20 percent (Freeze and Cherry, 1979).

On the basis of their tendency to adsorb to the solid phase, pesticides such as DDT, DDD, and DDE are far less mobile than chlorobenzene or chloroform. The high values of K_{ow} and K_{oc} associated with these pesticides suggest that sorption is a key fate process for DDT, DDD, and DDE. By comparison, chlorobenzene and chloroform have substantially lower sorption coefficients and, therefore, are anticipated to be more mobile than the pesticides.

7.2 Solubility

A compound's solubility indicates its tendency to dissolve into and migrate with infiltrating water in the unsaturated soil and to dissolve into and be mobilized with groundwater. Pesticides typically have low solubility in water and are less likely to leach from the soil matrix than VOCs, which typically have higher solubility. The solubility of hydrophobic compounds such as DDT can be significantly higher in certain organic solvents, a characteristic referred to as cosolvency. The solubility of DDT, for example, is about 0.003 mg/L in water and 740,000 mg/L in chlorobenzene (Montgomery, 1996). Table 7-3 lists the aqueous solubilities for the constituents of concern at the site.

TABLE 7-3
Aqueous Solubility for Constituents of Concern

Constituent of Concern	Aqueous Solubility at 25°C (mg/L)
DDT	0.0012 to 0.0055[a]
DDD	0.09 to 0.16[a]
DDE	0.04[a]
Chlorobenzene	471.7 to 534[a]
Chloroform	7,222 to 7,950

[a]The range cited includes the majority of values listed in Montgomery, 1996.

7.3 Volatility

Volatility is the process by which compounds convert from the liquid or solid phase to the vapor phase. Desorption, solubility, and vapor pressure are the dominant processes and physical properties that affect volatilization of compounds. Other factors affecting volatilization include the concentration of organic compounds in the soil, the composition of the soil, and atmospheric conditions such as wind speed, temperature, turbulence, and humidity.

Vapor pressure (V_p) is the pressure exerted by the vapor phase of a compound in equilibrium with the solid or liquid phase at a given temperature. A compound's V_p is proportional to its tendency to partition into the vapor phase from the aqueous phase.

Henry's Law constant (H_c) is a measurement of a compound's tendency to partition into the vapor phase from the aqueous phase. It is a function of a compound's vapor pressure, molecular weight, and solubility in water. The larger the H_c, the greater is a compound's tendency to volatilize. Compounds with an H_c value greater than 4.6×10^{-3} atmosphere-meters cubed per mole (atm-m^3/mol) are considered to be highly volatile (Smith et al, 1980). Table 7-4 presents vapor pressure and H_c values for the constituents of concern at the site.

TABLE 7-4
Vapor Pressure and H_c Values for Constituents of Concern

Constituent of Concern	V_p at 25°C (mm Hg)	H_c at 25°C (atm m^3/mol)
DDT	1×10^{-7} to 4.3×10^{-7}	1.58×10^{-5} to 3.89×10^{-5}
DDD	4.68×10^{-6}	2.16×10^{-8}
DDE	6.5×10^{-6} to 15.7×10^{-6}	6.8×10^{-5} [a]
Chlorobenzene	11.86	3.6×10^{-8} to 4.45×10^{-8}
Chloroform	198 to 246	3.18×10^{-8} to 4.35×10^{-8} [a]

Values taken from Montgomery, 1996.

As shown in Table 7-4, chlorobenzene and chloroform have H_c values that are two orders of magnitude lower than those for DDT, DDE, and DDD. Therefore, VOCs onsite are expected to volatilize much more readily than DDD, DDE, or DDT.

7.4 Summary

DDT, DDE, and DDD are relatively immobile in the environment because of their tendency to absorb, low aqueous solubilities, and low vapor pressures. They are not likely to be transported into the atmosphere as vapors or dissolved in surface water runoff because of their low volatilities and generally low solubilities.

Chlorobenzene and chloroform are generally more mobile in the environment than DDT, DDE, and DDD because of their relatively greater solubilities and higher vapor pressures. Chlorobenzene exhibits moderate sorption to organic matter in soil and sediment and is not expected to readily adsorb to soil relative to DDT, DDE, and DDD. Chlorobenzene and chloroform are expected to evaporate rapidly from surficial soil and surface water based on their Henry's Law constants.

SECTION 8

Conclusions

SECTION 8

Conclusions and Recommendations

Conclusions

The goal of the Phase 2 investigation was to gather information on the nature and extent of DDT process residues and related compounds in the General Acid Plant Area to support a future assessment of potential risk posed by these materials and an evaluation of potential remedial actions.

The Phase 2 investigation confirmed the Phase 1 findings that past DDT production activities affected soil and groundwater at the site. The following specific findings relate to the presence and distribution of constituents of concern associated with former DDT production:

- Concentrations of DDT process residue decrease with depth beneath ground surface in the General Acid Plant Area (that is, the area surrounding the Former Residue Pond).
- The near-surface extent of the Former Residue Pond is approximately 56 by 60 feet. The extent of affected soil appears to expand approximately 20 to 30 feet beyond these boundaries at depths in the unsaturated zone. The presence of DDT-affected soil below the water table is not known, but is suspected, given the proximity of DDT-affected soil to the water table and known water table fluctuations. Low levels of chlorobenzene are associated with the DDT-affected soil beneath the Former Residue Pond. Higher levels of chlorobenzene detected in soil at the west edge of the Former Residue Pond are attributable to past operations of the former chlorobenzene recovery unit.
- The location and size of the former Overflow Trench were confirmed. Affected soil associated with the Overflow Trench was found to be a maximum of 15 feet wide and to extend approximately 270 feet northward from the edge of the Former Residue Pond. The affected soil within and beneath the Overflow Trench, which was similar in appearance to that beneath the Former Residue Pond, reached its greatest depth (the water table) immediately adjacent to the Former Residue Pond, where the zones of affected subsurface soil associated with the pond and the end of the trench appear to merge. The depth of affected soil beneath the trench gradually decreases with increased distance from the pond, reaching a minimum depth of about 5 feet near the north end of the Overflow Trench.
- Chlorobenzene was detected in groundwater samples from the shallow water-bearing lens at the site. Low concentrations of DDT were detected in groundwater in a few monitoring wells in the initial sampling event, but in only one well in the second event. Because the prevalence and concentration of DDT in the groundwater samples decreased between the first and second sets of samples, it is possible that the detection of DDT in groundwater could be associated with remnant aquifer disturbance from well installation.

- The distribution of chlorobenzene in groundwater samples collected in October 1996 (with Geoprobes) was consistent with expected conditions: concentrations were highest east (downgradient) of the Former Residue Pond near the river, and chlorobenzene was not detected in the western (upgradient) well. The two sets of groundwater samples collected from the monitoring wells in January and March 1997, however, indicated an almost opposite distribution of chlorobenzene, suggesting that unusual water levels and groundwater gradients associated with flood conditions along the Willamette River in early 1997 influenced the distribution of chlorobenzene in groundwater at the site.
- Future groundwater sampling planned for June and September 1997 will provide additional information regarding the presence and distribution of constituents of concern associated with the former DDT manufacturing process at the site.

The following conclusions relate to groundwater occurrence at the site:

- The shallow water-bearing lens beneath the facility lies in an interbedded alluvial silt/sand zone. The shallow water-bearing lens is overlain by fill near the Willamette River, where a zone of imported fill containing silt, sand, scattered gravel, and demolition rubble was placed in the past to extend the river bank eastward. Where saturated, the fill constitutes part of the shallow water-bearing lens.
- On the basis of information from subsurface explorations at other sites in the vicinity of the Elf Atochem facility, the shallow water-bearing lens is underlain by a local lower-permeability silt zone. The depth of this zone beneath the facility is unknown; however, a silt zone encountered at a depth of about 47 feet below ground surface (bgs) in the deepest cone penetrometer exploration may represent the top of this local silt zone.
- Groundwater occurs in a shallow water-bearing lens with depths to water ranging from 13 to 24 feet bgs. The lens typically discharges eastward towards the Willamette River, a regional groundwater discharge feature. Under high river stage conditions such as those observed in the January 1997 flood, the river stage can rise above groundwater levels and cause a temporary reversed gradient in the shallow water-bearing lens. The magnitude and duration of such reversals are limited and likely have little influence on long-term average groundwater flow directions at the site.

Recommendations

Elf Atochem is committed to working cooperatively with Oregon Department of Environmental Quality (DEQ) to investigate soil and groundwater conditions in the General Acid Plant Area. A third phase of work is recommended to fill in gaps in the understanding of the nature and extent of DDT process residues and related compounds, and to assess potential remedial action objectives. The following tasks are recommended, along with proposed completion dates:

1. Complete a year of quarterly groundwater monitoring by collecting summer and fall samples from the monitoring wells at the site. Sampling procedures and analysis will be consistent with the second quarter 1997 event described in this report. The need, scope, and frequency of any additional groundwater monitoring beyond 1997 will be determined by Elf Atochem and DEQ after the four quarters of sampling data are available. *Samples to be collected in June and September 1997*

2. Collect soil samples from two locations where the extent of exposed surface soil (defined as surface to 0.5 ft) containing DDT process residues above potential industrial soil cleanup levels is not yet defined. Although site-specific surface soil cleanup levels are not yet available, an action level of 20 mg/kg (equivalent to DEQ's industrial maximum allowable soil concentration for simple sites) is used for comparison purposes.

   The two locations to be sampled are:

   - A point due west (plant west) of GA-SB-01 along the edge of the General Acid Plant Area. This point is anticipated to define the extent of DDT-affected surface soil up to the eastern edge of an active process area where pavement, foundation footings, and process units associated with chlor-alkali production are present.
   - A point along the railroad tracks near the southwestern corner (plant southwest) of the General Acid Plant Area. This sample will allow the unpaved area west of GA-SB-11 and south of GA-SB-02 to be investigated. Although both GA-SB-09 and GA-SB-11 along the south edge of the General Acid Plant Area contain surficial DDT concentrations above the preliminary soil cleanup level of 20 mg/kg, no additional samples are recommended south of these points because the area is paved.

   Soil samples to be collected in September 1997.

3. Complete a beneficial use survey for the facility to meet the requirements of OAR 340-122-080(6). *Beneficial use survey to be completed in October 1997.*

4. Characterize deeper groundwater quality beneath the General Acid Plant Area. The objective of this work will be to collect groundwater samples beneath the shallow water bearing lens to investigate the total depth of dissolved chlorobenzene at concentrations above either the 0.1 mg/L maximum contaminant level or an alternative concentration mutually agreed to by Elf Atochem and DEQ as appropriate for the site. Grab samples of deep groundwater at various depths will be collected using direct-push sampling techniques at two locations in the area between the former process residue pond and the site fence along the Willamette River. *Samples to be collected in September 1997.*

5. Complete a baseline risk assessment for the General Acid Plant Area. *Baseline risk assessment to be completed in November 1997.*

6. Develop preliminary remedial action objectives for soil and groundwater at the facility based on site-specific conditions. *To be completed in November 1997.*

The results of the work described above will be delivered to DEQ in a draft report in December of 1997.

SECTION 9

Works Cited

SECTION 9

Works Cited

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APPENDIX A

Willamette River Stage Data

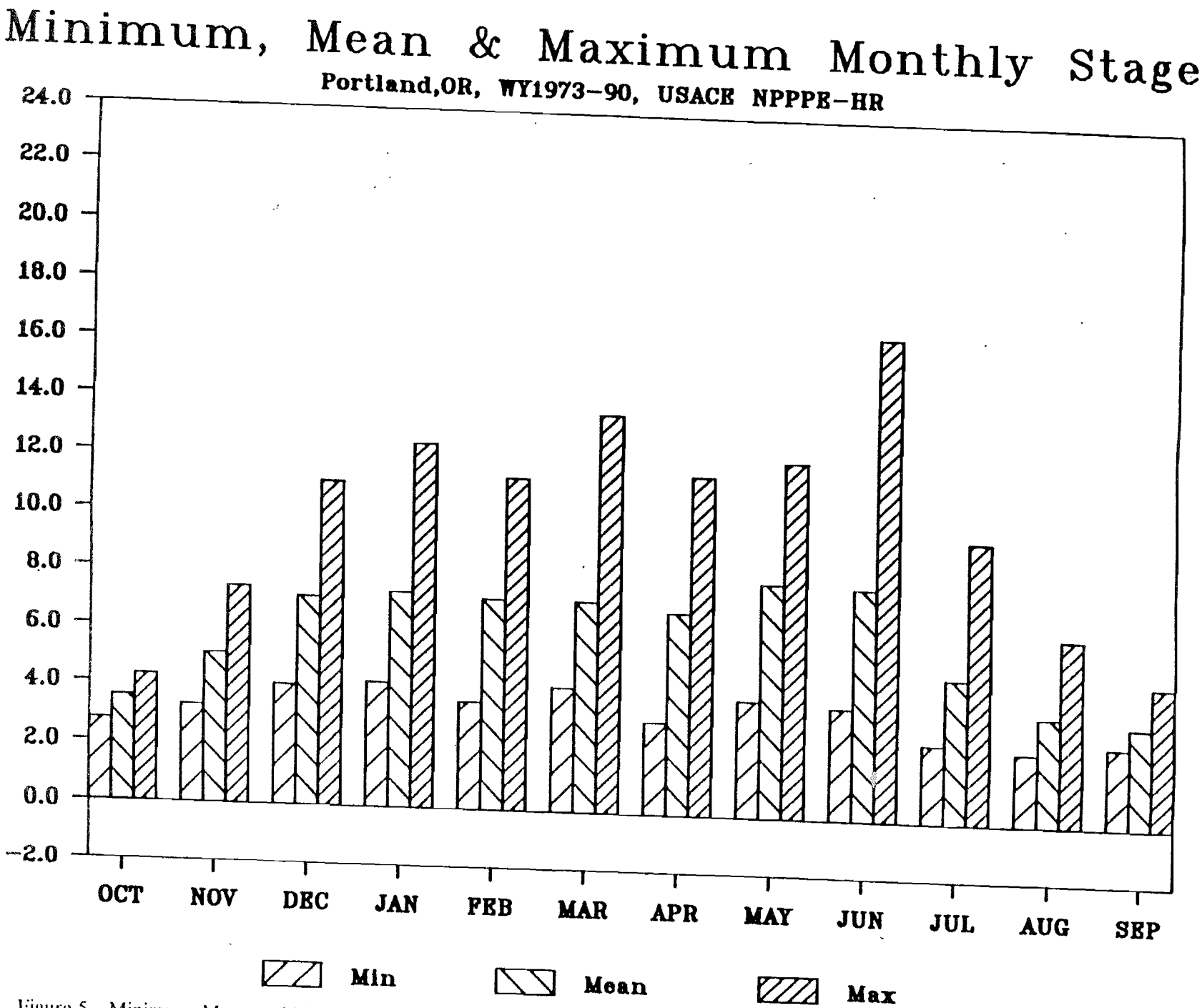
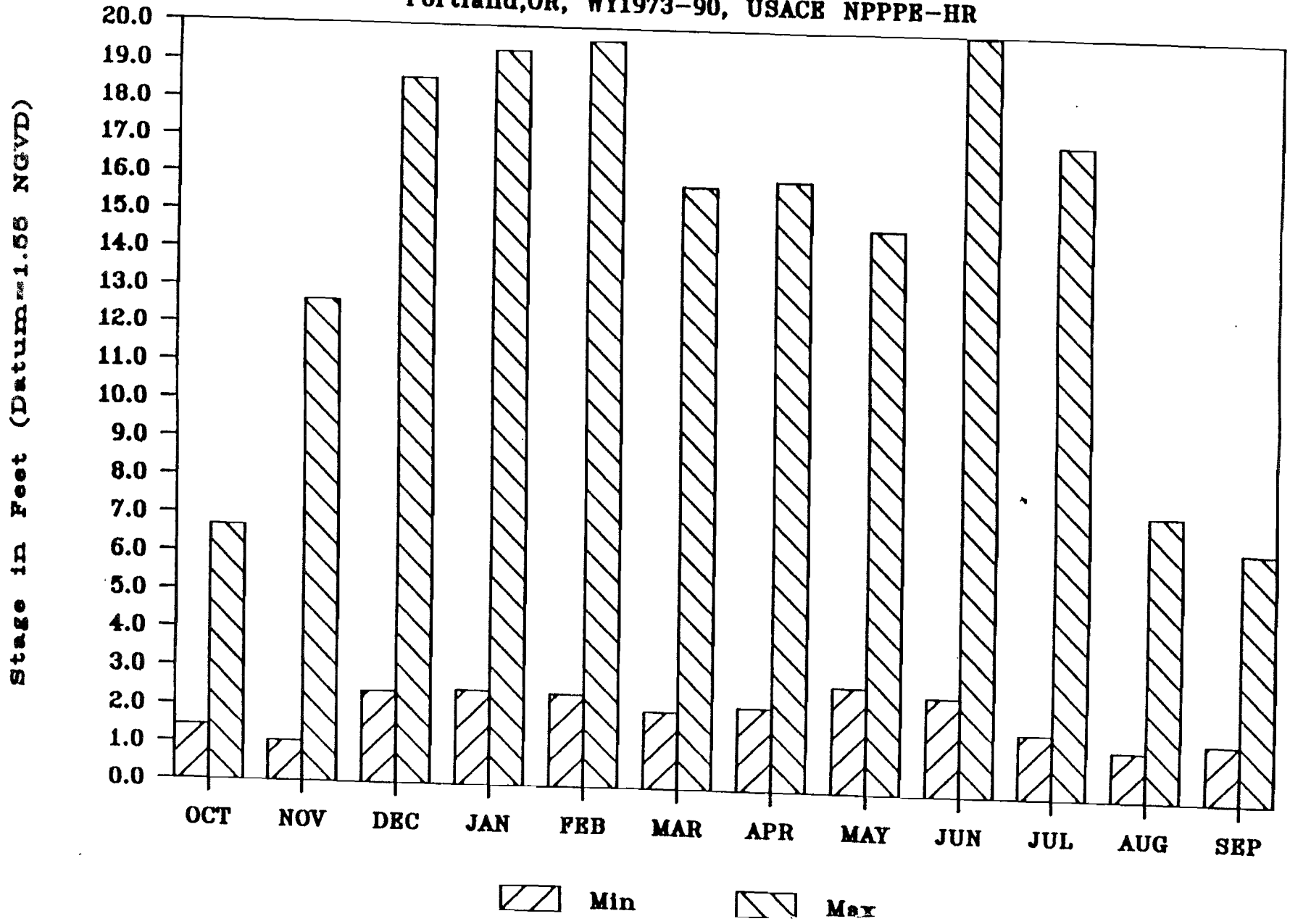


Figure 5. Minimum, Mean and Maximum Monthly Stage at Portland, Oregon, Water Years 1973–1990.

Source: U.S. Army Corps of Engineers, Portland–Vancouver Harbor Information Package, March 1991

Minimum and Maximum Daily Stage

Portland,OR, WY1973-90, USACE NPPPE-HR



Minimum and Maximum Extreme Stage

Portland,OR, WY1973-90, USACE NPPPE-HR

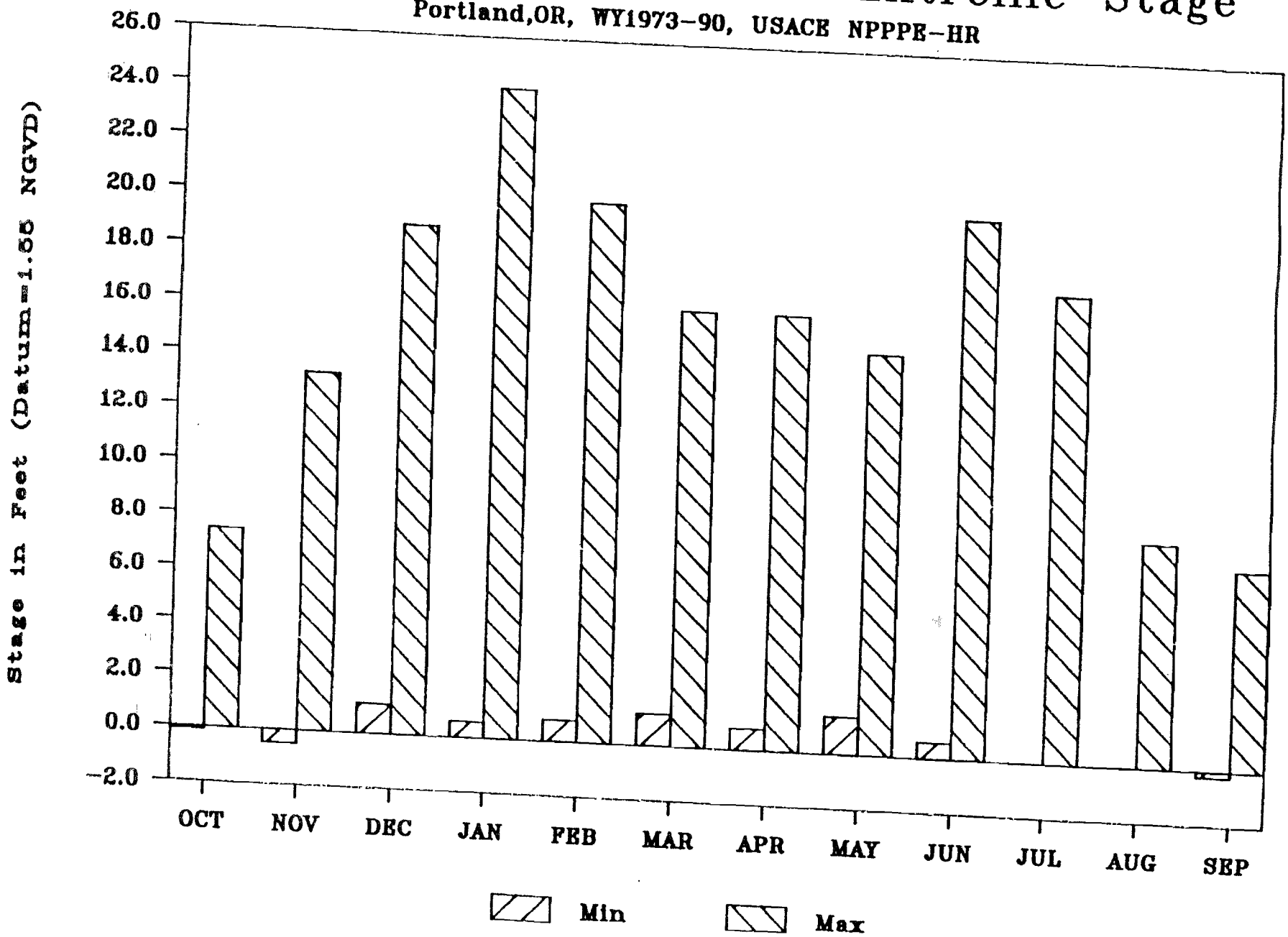


Table 4. Minimum, Mean, and Maximum Monthly Stage at Portland, Oregon, Water Years 1973-1990 (Gage Zero Equals 1.82 Feet, NGVD)

MONTH	MINIMUM MONTHLY STAGE (FEET)	MEAN MONTHLY STAGE (FEET)	MAXIMUM MONTHLY STAGE (FEET)
October	2.7	3.5	4.3
November	3.3	5.1	7.4
December	4.0	7.1	11.1
January	4.2	7.3	12.5
February	3.6	7.2	11.4
March	4.2	7.2	13.7
April	3.1	6.9	11.6
May	3.9	8.0	12.2
June	3.8	7.9	16.6
July	2.7	4.9	9.6
August	2.5	3.7	6.3
September	2.7	3.4	4.8

Table 5. Minimum and Maximum Daily Stage at Portland, Oregon, Water Years 1973-1990 (Gage Zero Equals 1.55 feet, NGVD).

MONTH	MINIMUM DAILY STAGE (FEET)	MAXIMUM DAILY STAGE (FEET)
October	1.5	6.7
November	1.1	12.7
December	2.4	18.6
January	2.5	23.8
February	2.5	19.7
March	2.1	15.9
April	2.2	16.1
May	2.8	14.8
June	2.6	20.0
July	1.7	17.2
August	1.3	7.5
September	1.6	6.6

Table 6. Minimum and Maximum Extreme Stage at Portland, Oregon, Water Years 1973-1990 (Gage Zero Equals 1.55 Feet, NGVD).

MONTH	MINIMUM EXTREME STAGE (FEET)	MAXIMUM EXTREME STAGE (FEET)
October	-0.1	7.4
November	-0.5	13.3
December	1.1	18.9
January	0.6	24.1
February	0.8	20.0
March	0.1	16.2
April	0.8	16.2
May	1.4	14.9
June	0.6	20.0
July	0.0	17.4
August	0.0	8.3
September	-0.2	7.4

APPENDIX B

Well Logs for Wells Located within a 1-Mile Radius

Multnomah County

Township 1N

Range 1W

Section 12

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

RECEIVED
NOV 12 1985
WATER RESOURCES DEPT
SALEM, OREGON

MULT 801

1W/1W-12

PLEASE TYPE or PRINT IN INK

(for official use only)

(1) OWNER:
Name Northwest Natural Gas Co. Rect. #226
Address 220 NW. Second Ave.
City Portland State Oregon

(2) TYPE OF WORK (check): Cathodic Protection Ground bed
New Well XX Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12

(3) TYPE OF WELL:
Rotary Air ☐ Driven ☐
Rotary Mud XX Dug ☐
Cable ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Thermal: Irrigation ☐ Withdrawal ☐ Reinjection ☐
Other: Piezometric ☐ Grounding ☐ XX Test ☐

NOT A WATER WELL

(5) CASING INSTALLED: Steel XX Threaded ☐ Plastic XX Welded ☐
10" Diam. from 0 ft. to 20 ft. Gauge .250
2" Diam. from 0 ft. to 100 ft. Gauge sche. 40

LINER INSTALLED: Steel ☐ Threaded ☐ Plastic ☐ Welded ☐
" Diam. from ft. to ft. Gauge

(6) PERFORATIONS: Perforated? ☐ Yes ☐ No
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Diam. Slot Size Set from ft. to ft.
Diam. Slot Size Set from ft. to ft.

NOT A WATER WELL

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Air test gal./min. with drill stem at ft. hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION: Special standards: Yes ☐ No ☐
Well seal—Material used Cement
Well sealed from land surface to 20 / 50'-80' ft.
Diameter of well bore to bottom of seal 14 / 83/4 in.
Diameter of well bore below seal 8 3/4 in.
Amount of sealing material 19 sacks XX pounds ☐
How was cement grout placed? Pumped

Was pump installed? Type HP Depth ft.
Was a drive shoe used? ☐ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of Water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.

NOT A WATER WELL

(10) LOCATION OF WELL by legal description:
County Multnomah ¼ ¼ of Section 12 of
Township 1 N (Township is North or South), Range 1 W (Range is East or West), WM.
Tax Lot Lot Block Subdivision
MAILING ADDRESS OF WELL (or nearest address)
Site: Gasco Reg. Station St Helen Rd.

(11) WATER LEVEL of COMPLETED WELL:
Depth at which water was first found ft.
Static level ft. below land surface. Date
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 8 3/4
Depth drilled 400 ft. Depth of completed well Ø ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Gravel	0	1	
Clay	1	2	
Sand	2	10	
Brown clay	10	40	
Sand	40	50	
Broken rock	50	78	
Black basalt hard some broken lava rock layers	78	290	
Broken multi colored rock & sandstone little clay	290	310	
Black basalt hard	310	370	
Broken rock sandy clay	370	390	
Black basalt hard	390	400	

Date work started Oct. 16, 1985 completed Oct. 22, 1985
Date well drilling machine moved off of well Oct. 22, 1985 19

(unbonded) Water Well Constructor Certification (if applicable):
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Date , 19

(bonded) Water Well Constructor Certification:
Bond CB-0130-11384-82 (number) Issued by: UFS&G (Surety Company Name)
On behalf of Jim Hansen / Hansen Drilling Co. Inc. (type or print name of Water Well Constructor)

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief:
(Signed) Jim J Hansen (Water Well Constructor)
(Dated) Oct. 23, 1985

NOTICE TO WATER WELL CONSTRUCTOR
The original and first copy of this report are to be filed with the

WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310
within 30 days from the date of well completion.

SP*46866-690

MULT
802

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

State Well No. 1N/1W-12N

State Permit No. .....

(1) OWNER:
Name Portland Gas & Coke Company
Address

(2) LOCATION OF WELL:
County Multnomah Driller's well number
SW ¼ SW ¼ Section 12 T. 1N R. 1W W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☐
12 " Diam. from 0 ft. to 63 ft. Gage .....
8 " Diam. from ..... ft. to ..... ft. Gage .....
..... " Diam. from ..... ft. to ..... ft. Gage .....

(7) PERFORATIONS:
Perforated? ☐ Yes ☐ No
Type of perforator used
Size of perforations in. by in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

(8) SCREENS:
Well screen installed? ☐ Yes ☐ No
Manufacturer's Name .....
Type ..... Model No. .....
Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.
Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

(9) CONSTRUCTION:
Well seal—Material used in seal .....
Depth of seal ..... ft. Was a packer used? .....
Diameter of well bore to bottom of seal ..... in.
Were any loose strata cemented off? ☐ Yes ☐ No Depth .....
Was a drive shoe used? ☐ Yes ☐ No
Was well gravel packed? ☐ Yes ☐ No Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 48 ft. below land surface Date 1954
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: 140 gal./min. with ft. drawdown after hrs.
" 150 " with drawdown to 200 feet
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:
Diameter of well below casing .....
Depth drilled ft. Depth of completed well 382 ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sand	0	61
Rock (basalt)	61	241
Sand and broken rock	241	246
Sand	246	258
Basalt, broken, soft	258	370
Data from USGS		

Work started 19 Completed 1948
Date well drilling machine moved off of well 19

(13) PUMP:
Manufacturer's Name .....
Type: ..... H.P. .....

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME A. M. Jannsen
(Person, firm or corporation) (Type or print)
Address .....
Drilling Machine Operator's License No. .....
[Signed] .....
(Water Well Contractor)
Contractor's License No. ..... Date ..... 19.....

(USE ADDITIONAL SHEETS IF NECESSARY)

Multnomah County

Township 1N

Range 1W

Section 13

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

MULT 803 NC

WATER WELL REPORT

STATE OF OREGON
(Please type or print)
(Do not write above this line)

RECEIVED
AUG 22 1973
STATE ENGINEER
SALEM, OREGON

State Well No. 1N/1W-13
State Permit No.

(1) OWNER:

Name Liquid Air, Inc.
Address 3200 N. W. Yeon
Portland, Oregon

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☒
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☒ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:

Threaded ☐ Welded ☐
X" Diam. from X ft. to ft. Gage
X" Diam. from X ft. to ft. Gage
X" Diam. from X ft. to ft. Gage

(6) PERFORATIONS:

Perforated? ☐ Yes ☐ No.
Type of perforator used X
Size of perforations X in. by in.
X perforations from X ft. to ft.
X perforations from X ft. to ft.
X perforations from X ft. to ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:

Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used Bentonite
Well sealed from land surface to 50 ft.
Diameter of well bore to bottom of seal 12-1/4 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal sacks
Number of sacks of bentonite used in well seal 5 sacks
Brand name of bentonite International Gel
Number of pounds of bentonite per 100 gallons of water 50 lbs./100 gals.
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County Multnomah Driller's well number
¼ ¼ Section 13 T. 1 N R. 1 W. W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.

Depth at which water was first found ft.
Static level ft. below land surface. Date
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:

Diameter of well below casing 6"
Depth drilled X 102 ft. Depth of completed well 0 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Fill dirt & rock		0	2
Black sand	2	75	
Sand & gravel	75	85	
Hard rock	85	90	
White sand & gravel	90	102	
Hard rock	102		

Well abandoned - Bentonite plug placed at 50 feet with 5 sacks Bentonite, balance of hole backfilled with formation sand

Work started 7/9/73 19 Completed 8/9/73 19
Date well drilling machine moved off of well 8/9/73 19

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Allan Trummerkamp Date 8/15/73 19
(Drilling Machine Operator)
Drilling Machine Operator's License No. 235

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name A. M. Jannsen Drilling Co.
(Person, firm or corporation) (Type or print)
Address 21075 S.W. Tualatin Valley Hwy, Aloha, Ore.

[Signed] Edward M. Jannsen
(Water Well Contractor)
Contractor's License No. 79 Date 8/15/73, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*43656-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

MULT 864

NC RECEIVED

WATER WELL REPORT
STATE OF OREGON AUG 22 1973 State Well No. 1N/1W-13
(Please type or print) STATE ENGINEER State Permit No.
(Do not write above this line) SALEM, OREGON

(1) OWNER:
Name Liquid Air, Inc.
Address 3200 N. W. Yeon
Portland, Oregon 97210

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☒ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:
Threaded ☐ Welded ☒
8 ⅝ " Diam. from 0 ft. to 83 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:
Perforated? ☐ Yes ☒ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom? AIRLIFT
Yield: 222 gal./min. with 232 ft. drawdown after 1 hrs.
222 " 182 " 1 "
200 " 132 " 1 "
175 " 82 " 1 "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Cement
Well sealed from land surface to 82 ft.
Diameter of well bore to bottom of seal 12-1/4 in.
Diameter of well bore below seal 8 in.
Number of sacks of cement used in well seal 10 sacks
Number of sacks of bentonite used in well seal 0 sacks
Brand name of bentonite
Number of pounds of bentonite per 100 gallons of water lbs./100 gals.
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Multnomah Driller's well number
¼ ¼ Section 13 T. 1 N R. 1 W. W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 200 ft.
Static level 18 ft. below land surface. Date 8/15/73
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing 8"
Depth drilled 302 ft. Depth of completed well 302 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Fill, junk, rock & dirt	0	22	
Black sand	22	50	
Brown sand	50	72	
Cobbles & gravel	72	75	
Hard rock	75	113	
Decomposed rock	113	117	
Brown & gray rock	117	124	
Hard gray rock	124	190	
Black/strks grn,red,brown	190	195	
Brown, hard & broken	195	200	50 gpm
Hard gray, occ fractured zone	200	293	52 gpm
Hard broken rock	293	302	120 gpm

Work started 8/9/73 19 Completed 8/15/73 19
Date well drilling machine moved off of well 8/15/73 19

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Hillis Summerkamp Date 8/15/73 19
(Drilling Machine Operator)
Drilling Machine Operator's License No. 235

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name A. M. Jannsen Drilling Co.
(Person, firm or corporation) (Type or print)
Address 21075 S.W. Tualatin Valley Hwy., Aloha, Ore.
[Signed] Edward M. Jannsen
(Water Well Contractor)
Contractor's License No. 79 Date 8/15/73, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45456-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

MULT 805

WATER WELL REPORT

STATE OF OREGON (Please type or print) (Do not write above this line)

RECEIVED JAN 24 1969 STATE ENGINEER SALEM, OREGON

Well Log No. 1N/1W-13 dd

State Permit No.

(1) OWNER:

Name Pennsalt Chemical Corp.

Address 6400 NW Front Ave. Portland

(2) TYPE OF WORK (check): Dewatering hole

New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☒

(5) CASING INSTALLED:

Threaded ☐ Welded ☒

12 " Diam. from 0 ft. to 12 ft. Gage .250

" Diam. from ft. to ft. Gage

" Diam. from ft. to ft. Gage

(6) PERFORATIONS:

Perforated? ☒ Yes ☐ No.

Type of perforator used torch

Size of perforations 1/8 in. by 8" in.

64 perforations from 4 ft. to 12 ft.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☒ No

Manufacturer's Name

Type Model No.

Diam. Slot size Set from ft. to ft.

Diam. Slot size Set from ft. to ft.

(8) WATER LEVEL: Completed well.

Static level 6.5 ft. below land surface Date 1-22-69

Artesian pressure lbs. per square inch Date

(9) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom?

gal./min. with ft. drawdown after hrs.

" " " "

" " " "

Bailer test none gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(10) CONSTRUCTION:

Well seal—Material used none..temporary dewatering

Depth of seal ft.

Diameter of well bore to bottom of seal in.

Were any loose strata cemented off? ☐ Yes ☐ No Depth

Was a drive shoe used? ☐ Yes ☒ No

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? depth of strata

Method of sealing strata off

Was well gravel packed? ☒ Yes ☐ No Size of gravel: ¼ round

Gravel placed from 0 ft. to 15 ft.

(11) LOCATION OF WELL:

County Multnomah Driller's well number

SE ¼ SE ¼ Section 13 T. 1N R. 1W W.M.

Bearing and distance from section or subdivision corner

Approx. 150' North and 150' West of SE corner of sec. 13

(12) WELL LOG:

Diameter of well below casing 20"

Depth drilled 15 ft. Depth of completed well ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
fill sand	0	12	
blue mucky sand	12	15	6.5
Sub-contracted from			
Earley Construction Co.			
321 Middle Waterway			
Tacoma, Wash. 98421			
Purchase Order # 08520			

Work started 1-13 19 69 Completed 1-14 19 69

Date well drilling machine moved off of well 1-14 19 69

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] (Drilling Machine Operator) Date 1-20, 19 69

Drilling Machine Operator's License No. 289

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Hansen Drilling Co., Inc. (Person, firm or corporation) (Type or print)

Address 6711 N. E. 58th Ave. Vancouver, Wn.

[Signed] Jack C. Hansen (Water Well Contractor)

Contractor's License No. 400 Date 1-20, 19 69

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM 10, OREGON within 30 days from the date of well completion.

MULT 506

WATER WELL REPORT

STATE OF OREGON (Please type or print)

RECEIVED JAN 24 1969 STATE ENGINEER SALEM, OREGON

State Well No. 1N/1W-13 dd

State Permit No. _____

(1) OWNER:
Name Pennsalt Chemical Corp.
Address 6400 NW Front Ave. Portland Oregon

(2) LOCATION OF WELL:
County Multnomah Driller's well number
SE ¼ SE ¼ Section 13 T. 1N R. 1W W.M.
Bearing and distance from section or subdivision corner
Approx. 150 ft. North and 180 ft. West of SE corner of Sec. 13

(3) TYPE OF WORK (check): dewatering hole
Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☒

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☒
12 " Diam. from 0 ft. to 12 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS:
Perforated? ☒ Yes ☐ No
Type of perforator used torch
Size of perforations 1/8 in. by 8" in.
72 perforations from 4 ft. to 12 ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Well seal—Material used in seal none..temporary dewatering
Depth of seal ft. Was a packer used?
Diameter of well bore to bottom of seal in.
Were any loose strata cemented off? ☐ Yes ☐ No Depth
Was a drive shoe used? ☐ Yes ☒ No
Was well gravel packed? ☒ Yes ☐ No Size of gravel: ¼ round
Gravel placed from 0 ft. to 15 ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 6.5 ft. below land surface Date 1-16-69
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test none gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:
Diameter of well below casing 20"
Depth drilled 15 ft. Depth of completed well ft.
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
fill sand	0	12
blue ~~sandy~~ mucky sand	12	15
Sub-contracted from		
Earley Construction Co.		
321 Middle Waterway		
Tacoma, Wash. 98421		
Purchase Order # 08520		

Work started 1-15 1969. Completed 1-16 1969
Date well drilling machine moved off of well 1-16- 1969

(13) PUMP:
Manufacturer's Name
Type: H.P.

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Hansen Drilling Co., Inc.
(Person, firm or corporation) (Type or print)
Address 6711 NE 58th Ave. #400 Vancouver, Wn. Contractors Lic.
Drilling Machine Operator's License No. 289
[Signed] Jos E. Hansen (Water Well Contractor)
Contractor's License No. 400 Date 1-22, 1969

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

MULT 807

WATER WELL REPORT

STATE OF OREGON
(Please type or print)

State Well No. 1N/1W-13J1

State Permit No. .....

(1) OWNER:

Name Penn Salt Company

Address .....

(2) LOCATION OF WELL:

County Multnomah Driller's well number .....

NE ¼ SE ¼ Section 13 T. 1N R. 1W W.M.

Bearing and distance from section or subdivision corner .....

(3) TYPE OF WORK (check):

New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:

Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:

Threaded ☐ Welded ☐

6 " Diam. from 0 ft. to 94 ft. Gage .....
..... " Diam. from ..... ft. to ..... ft. Gage .....
..... " Diam. from ..... ft. to ..... ft. Gage .....

(7) PERFORATIONS:

Perforated? ☐ Yes ☐ No

Type of perforator used .....
Size of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

(8) SCREENS:

Well screen installed? ☐ Yes ☐ No

Manufacturer's Name .....
Type ..... Model No. .....
Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.
Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

(9) CONSTRUCTION:

Well seal—Material used in seal .....
Depth of seal ..... ft. Was a packer used? .....
Diameter of well bore to bottom of seal ..... in.
Were any loose strata cemented off? ☐ Yes ☐ No Depth .....
Was a drive shoe used? ☐ Yes ☐ No
Was well gravel packed? ☐ Yes ☐ No Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? ..... depth of strata .....
Method of sealing strata off .....

(10) WATER LEVELS:

Static level 35 ft. below land surface Date .....
Artesian pressure ..... lbs. per square inch Date .....

(11) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom? .....
Yield: 30 gal./min. with 65 ft. drawdown after ..... hrs.
" " " " "
" " " " "
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:

Diameter of well below casing .....

Depth drilled ..... ft. Depth of completed well 420 ft.

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sand with small amount of clay	0	30
Clay, yellow, sandy	30	40
Blue clay	40	60
Sand	60	90
Rock	90	172
Broken rock, water bearing	172	192
Rock, getting very hard	192	240
Deepened in 1949 to 420 feet		
Rock	240	420
Data from USGS		

Work started ..... 19 Completed April 1949

Date well drilling machine moved off of well 19

(13) PUMP:

Manufacturer's Name .....
Type: ..... H.P. .....

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME A. M. Jannsen
(Person, firm or corporation) (Type or print)

Address .....

Drilling Machine Operator's License No. .....

[Signed] .....
(Water Well Contractor)

Contractor's License No. ..... Date ..... 19...

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

MULT 808

WATER WELL REPORT

STATE OF OREGON
(Please type or print)

State Well No. 1N/1W-13J2

State Permit No. .....

(1) OWNER:

Name Penn Salt Company

Address .....

(2) LOCATION OF WELL:

County Multnomah Driller's well number .....

NE ¼ SE ¼ Section 13 T. 1N R. 1W W.M.

Bearing and distance from section or subdivision corner .....

(3) TYPE OF WORK (check):

New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:

Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:

Threaded ☐ Welded ☐

10 " Diam. from 0 ft. to 100 ft. Gage .....
..... " Diam. from ..... ft. to ..... ft. Gage .....
..... " Diam. from ..... ft. to ..... ft. Gage .....

(7) PERFORATIONS:

Perforated? ☐ Yes ☐ No

Type of perforator used .....

Size of perforations ..... in. by ..... in.

..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

(8) SCREENS:

Well screen installed? ☐ Yes ☐ No

Manufacturer's Name .....

Type ..... Model No. .....

Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

(9) CONSTRUCTION:

Well seal—Material used in seal .....

Depth of seal ..... ft. Was a packer used? .....

Diameter of well bore to bottom of seal ..... in.

Were any loose strata cemented off? ☐ Yes ☐ No Depth .....

Was a drive shoe used? ☐ Yes ☐ No

Was well gravel packed? ☐ Yes ☐ No Size of gravel: .....

Gravel placed from ..... ft. to ..... ft.

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? ..... depth of strata .....

Method of sealing strata off .....

(10) WATER LEVELS:

Static level 58 ft. below land surface Date Sept. 1953

Artesian pressure ..... lbs. per square inch Date .....

(11) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom?

Yield: 120 gal./min. with 110 ft. drawdown after ..... hrs.
" " " "
" " " "

Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.

Artesian flow ..... g.p.m. Date .....

Temperature of water ..... Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:

Diameter of well below casing 8

Depth drilled ..... ft. Depth of completed well 760 ft.

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sand and silt	0	89
Rock, reduced to 8" at 123	89	123
Rock	123	156
Clay	156	157
Rock	157	330
Rock, creviced	330	345
Rock	345	515
Rock, porous (120 gpm, dd 110')	515	538
Rock, hard, gray	538	760
Data from USGS		

Work started ..... 19 Completed September 1953

Date well drilling machine moved off of well 19

(13) PUMP:

Manufacturer's Name .....

Type: ..... H.P. .....

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME A. M. Jannsen
(Person, firm or corporation) (Type or print)

Address .....

Drilling Machine Operator's License No. .....

[Signed] .....
(Water Well Contractor)

Contractor's License No. ..... Date ..... 19.....

(USE ADDITIONAL SHEETS IF NECESSARY)

Multnomah County

Township 1N

Range 1W

Section 24

ORIGINAL
Original and duplicate with the STATE ENGINEER, SALEM, OREGON

MULT 868

WATER WELL REPORT
STATE OF OREGON

State Well No. 1N/1W-4T

State Permit No.

(1) OWNER:
Name THOMAS R. WINN SR.
Address RT 7 BOX 435
PORTLAND 10, ORE.

(2) LOCATION OF WELL:
County MULT. Owner's number, if any—
¼ ¼ Section 8 T. 1N R. 1W W.M.
Bearing and distance from section or subdivision corner
1.81 ACRES

TYPE OF WORK (check):
Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☐
6" Diam. from 0 ft. to 221 ft. Gage
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☐ Yes ☒ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

SCREENS: Well screen installed ☐ Yes ☒ No
Manufacturer's Name
Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

CONSTRUCTION:
Gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☐ Yes ☐ No To what depth? ft.
Material used in seal
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 105 ft. below land surface Date
Artesian pressure lbs. per square inch Date

Log Accepted by:
[Signed] Thomas R. Winn Jr. (Owner) Date 7-21, 1958

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test 12 gal./min. with 70 ft. drawdown after hrs.
Artesian flow g.p.m. Date 7/21/58
Temperature of water Was a chemical analysis made? ☑ Yes ☐ No

(12) WELL LOG: Diameter of well inches.
Depth drilled ft. Depth of completed well ft.
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
SOIL	0	2
CLAY	2	10
ROCK	10	175
WATER	160	175
FORMATION SOFT ROCK		

RECEIVED
JUL 30 1958
STATE ENGINEER
SALEM, OREGON

Work started 7/6/1 19 58 Completed 7/20 19 58

(13) PUMP:
Manufacturer's Name
Type: H.P.

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME PHOLE ROSS (Person, firm, or corporation) (Type or print)
Address 2040 SW 192 ALOHA ORE
Driller's well number
[Signed] Paul E Ross (Well Driller)
License No. 94 Date , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Multnomah County

Township 1N

Range 1E

Section 7

STATE OF OREGON

WATER WELL REPORT

(as required by ORS 537.765)

Mult 577

RECEIVED JAN - 7 1992 WATER RESOURCES DEPT SALEM, OREGON

1N/1E/7C6

START CARD # 26099

(1) OWNER:

Name N.W. Natural Gas Co. Well Number Rect. 168 ~~WATER RE~~ SALEM

Address 220 NW. 2nd Ave.

City Portland State Oregon Zip 97209

(2) TYPE OF WORK: Cathodic Protection

☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD

☐ Rotary Air ☒ Rotary Mud ☐ Cable

☐ Other

(4) PROPOSED USE:

☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation

☐ Thermal ☐ Injection ☒ Other Ground Bed

(5) BORE HOLE CONSTRUCTION:

Special Construction approval Yes ☐ No ☒ Depth of Completed Well Ø ft.

Explosives used Yes ☐ No ☒ Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
14	0	20	cement	0	20	8 sks.
8 3/4	20	400	Bentonite	8	135	3400 lbs

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E

☐ Other

Backfill placed from ft. to ft. Material

Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	10	0	19'8	.375	☒	☐	☐	☐
	1	0	400	~~40~~ 80	☒	☐	☐	☒
	1	0	400	sch 40	☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

NOT A WATER WELL

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:

☐ Perforations Method

☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time

NOT A WATER WELL

Temperature of water Depth Artesian Flow Found

Was a water analysis done? ☐ Yes By whom

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata:

(9) LOCATION OF WELL by legal description:

County Multnomah Latitude Longitude

Township 1 N N or S, Range 1 E E or W, WM.

Section 7 NW ¼ SW ¼

Tax Lot Lot Block Subdivision

Street Address of Well (or nearest address)

N. Carey Blvd & N. Amherst

(10) STATIC WATER LEVEL:

ft. below land surface. Date

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found

From	To	Estimated Flow Rate	SWL

NOT A WATER WELL

(12) WELL LOG:

Ground elevation

Material	From	To	SWL
Top soil	0	1	
Sandy clay	1	4	
Coarse grey sand	4	22	
Sand, small gravel, cemented	22	130	
Gravel, sand	130	162	
Cemented gravel	162	361	
Blue, grey clay	361	400	

NOT A WATER WELL

Date started 12-2-91 Completed 12-6-91

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

Signed Timothy Agnes WWC Number 1446 Date 12-10-91

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief. Bonded 1293

Signed Jeri Hansen WWC Number 841 Date 12-10-91

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9809C 3/88

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM 10, OREGON within 30 days from the date of well completion.

RECEIVED
SEP - 5 1962
STATE ENGINEER
SALEM, OREGON

MULT
939

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

State Well No. 1N/1-7F

State Permit No. .....

(1) OWNER:
Name FRED MEYER INC
Address 721 SW 4TH AVE.
PORTLAND ORE

(2) LOCATION OF WELL:
County MULT. Driller's well number 4130
SE ¼ NW ¼ Section 7 T. 1N R. 1E W.M.
Bearing and distance from section or subdivision corner
2250 FT SOUTH AND 1625 FT.
EAST FROM THE N.W. CORNER
LOCATED IN LOT 25 BLOCK 1
OF HEPPNER SUBDIVISION

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☒

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☒
12" Diam. from 0 ft. to 248 ft. Gage .312
..." Diam. from ... ft. to ... ft. Gage ...
..." Diam. from ... ft. to ... ft. Gage ...

(7) PERFORATIONS:
Perforated? ☒ Yes ☐ No
Type of perforator used STAR
Size of perforations 1/4 in. by 1 1/4 in.
420 perforations from 184 ft. to 194 ft.
480 perforations from 228 ft. to 240 ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

(8) SCREENS:
Well screen installed ☐ Yes ☒ No
Manufacturer's Name ...
Type ... Model No. ...
Diam. ... Slot size ... Set from ... ft. to ... ft.
Diam. ... Slot size ... Set from ... ft. to ... ft.

(9) CONSTRUCTION:
Well seal—Material used in seal CEMENT GROUT
Depth of seal 80 ft. Was a packer used? SAND
Diameter of well bore to bottom of seal 16 in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth ...
Was a drive shoe used? ☒ Yes ☐ No
Was well gravel packed? ☐ Yes ☒ No Size of gravel: ...
Gravel placed from ... ft. to ... ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 143 ft. below land surface Date 8/25/62
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? R.J. STRASSER
Yield: 350 gal./min. with 4 ft. drawdown after 8 hrs.
" " " " "
" " " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 53° Was a chemical analysis made? ☐ Yes ☒ No

(12) WELL LOG:
Diameter of well below casing ...
Depth drilled 248 ft. Depth of completed well 248 ft.
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
SAND SOME BINDER	0	30
SAND AND BROKEN ROCK	30	45
DRY SAND	45	74
MED TO FINE SAND	74	103
SAND, GRAVEL AND COBBLES	103	111
GRAVEL AND COBBLES	111	132
MED TO LARGE GRAVEL	132	146
FINE SAND	146	179
GRAVEL AND SAND	179	194
LARGE GRAVEL	194	198
FINE SAND	198	217
GRAVEL	217	243
SAND AND GRAVEL CLAY BINDER	243	248

Work started JULY 2 19 62 Completed AUG 27 19 62
Date well drilling machine moved off of well AUG 28 19 62

(13) PUMP:
Manufacturer's Name ...
Type: ... H.P. ...

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME R.J. STRASSER DRILLING CO
(Person, firm or corporation) (Type or print)
Address 8110 SE SUNSET LANE PORT. 6, ORE

Drilling Machine Operator's License No. 56

[Signed] Robert L. Strasser
(Water Well Contractor)

Contractor's License No. 10 Date Aug 29, 1962

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED
JUL 26 1968
STATE ENGINEER
SALEM OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

MULT 940

State Well No. 1N/1-7N

State Permit No.

(1) OWNER:
Name McCORMICK AND BAXTER CO
Address 6900 N. EDGEWATER ROAD PORTLAND, OREGON

(2) TYPE OF WORK (check):
New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☒
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☒ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:
Threaded ☐ Welded ☐
..." Diam. from ... ft. to ... ft. Gage ...
..." Diam. from ... ft. to ... ft. Gage ...
..." Diam. from ... ft. to ... ft. Gage ...

PERFORATIONS:
Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name ...
Type ... Model No. ...
Diam. ... Slot size ... Set from ... ft. to ... ft.
Diam. ... Slot size ... Set from ... ft. to ... ft.

(8) WATER LEVEL: Completed well.
Static level ft. below land surface Date
Artesian pressure lbs. per square inch Date

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(10) CONSTRUCTION:
Well seal—Material used ...
Depth of seal ... ft.
Diameter of well bore to bottom of seal ... in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth ...
Was a drive shoe used? ☒ Yes ☐ No
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel: ...
Gravel placed from ... ft. to ... ft.

(11) LOCATION OF WELL:
County MULT. Driller's well number 4268
SW¼ SW¼ Section 7 T. 1N R. 1E W.M.
Bearing and distance from section or subdivision corner

(12) WELL LOG:
Diameter of well below casing ...
Depth drilled 219 ft. Depth of completed well ... ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
FILL SAND	0	17	
BROWN SAND AND SILT	17	51	
BROWN SAND	51	60	
GREY SAND AND SILT	60	145	
PACKED SAND	145	161	
SAND AND SILT	161	219	

ABANDONED AND BACKFILLED WITH BENTONITE SEAL TO PREVENT MOVEMENT OF WATER

Work started DEC 30 1967 Completed JAN 17 1968
Date well drilling machine moved off of well JAN 18 1968

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Don Johnson (Drilling Machine Operator) Date 2/16, 1968
Drilling Machine Operator's License No. 57

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME R.T. STRASSER DRILLING CO. (Person, firm or corporation) (Type or print)
Address 8110 SE SUNSET LANE PORTLAND 97206
[Signed] Robert L. Strasser (Water Well Contractor)
Contractor's License No. 10 Date Feb 15, 1968

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED FEB 26 1968 STATE ENGINEER SALEM, OREGON

MULT 941 G-4242

WATER WELL REPORT

STATE OF OREGON (Please type or print) (Do not write above this line)

State Well No. 1N/1-7 AAN

State Permit No. .....

(1) OWNER:

Name McCORMICK AND BAXTER Co

Address 6900 N. EDGEWATER ROAD PORTLAND OREGON

(2) TYPE OF WORK (check):

New Well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary [ ] Driven [ ]
Cable [X] Jetted [ ]
Dug [ ] Bored [ ]

(4) PROPOSED USE (check):

Domestic [ ] Industrial [X] Municipal [ ]
Irrigation [ ] Test Well [ ] Other [ ]

(5) CASING INSTALLED:

Threaded [ ] Welded [X]

12" Diam. from 0 ft. to 71 ft. Gage .330

12" Diam. from 91 ft. to 95 ft. Gage .330

" Diam. from ..... ft. to ..... ft. Gage .....

PERFORATIONS:

Perforated? [ ] Yes [X] No.

Type of perforator used

Size of perforations in. by in.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

(7) SCREENS:

Well screen installed? [X] Yes [ ] No

Manufacturer's Name EDWARD E. JOHNSON

Type ARMCO IRON Model No. .....

Diam. 12 Slot size 100 Set from 71 ft. to 91 ft.

Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

(8) WATER LEVEL: Completed well.

Static level 25 ft. below land surface Date 2/1/68

Artesian pressure ..... lbs. per square inch Date .....

(9) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? [X] Yes [ ] No If yes, by whom? STRASSER

Yield: 1030 gal./min. with 18 ft. drawdown after 6 hrs.

" " " "

" " " "

Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.

Artesian flow ..... g.p.m. Date .....

Temperature of water 54° Was a chemical analysis made? [ ] Yes [X] No

(10) CONSTRUCTION:

Well seal—Material used CEMENT

Depth of seal 23 FEET ft.

Diameter of well bore to bottom of seal 20 in.

Were any loose strata cemented off? [ ] Yes [X] No Depth .....

Was a drive shoe used? [X] Yes [ ] No

Did any strata contain unusable water? [ ] Yes [X] No

Type of water? ..... depth of strata .....

Method of sealing strata off .....

Was well gravel packed? [X] Yes [ ] No Size of gravel: 1/4-1/8

Gravel placed from 55 ft. to 95 ft.

(11) LOCATION OF WELL:

County Multnomah Driller's well number 4469

SW ¼ SW ¼ Section 7 T. 1N R. 1E W.M.

Bearing and distance from section or subdivision corner

(12) WELL LOG:

Diameter of well below casing .....

Depth drilled 95 ft. Depth of completed well 95 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
FILL SAND	0	12	
SAND AND GRAVEL	12	23	
SAND AND SILT	23	65	
FINE SAND	65	70	
COARSE SAND	70	95	

Work started JAN 18 1968 Completed FEB 2 1968

Date well drilling machine moved off of well FEB 7 1968

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Wm J Johnson (Drilling Machine Operator) Date FEB 15 1968

Drilling Machine Operator's License No. 57

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME R.I. STRASSER DRILLING Co (Person, firm or corporation) (Type or print)

Address 8110 SE SUNSET LANE PORTLAND ORE.

[Signed] Robert L. Strasser (Water Well Contractor)

Contractor's License No. 10 Date FEB 15 1968

(USE ADDITIONAL SHEETS IF NECESSARY)

STATE ENGINEER
Salem, Oregon

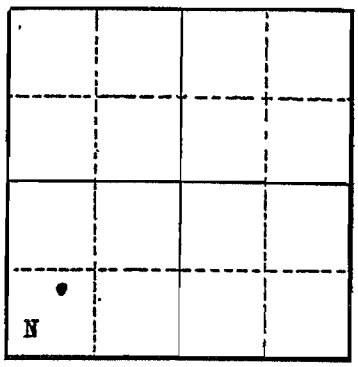
MULT
94 2

Well Record

STATE WELL NO. 1N/1-7N
COUNTY Multnomah
APPLICATION NO. GR-4270

OWNER: McCormick & Baxter Creosoting Co.
MAILING ADDRESS: P. O. Box 3344
CITY AND STATE: Portland, Oregon

LOCATION OF WELL: Owner's No. .....
SW ¼ SW ¼ Sec. 7 T. 1 N. R. 1 E. W., W.M.
Bearing and distance from section or subdivision corner North 13° 38.6' West 4215.6 feet to NW Corner, Section 7.



Altitude at well 20 feet

TYPE OF WELL: Drilled Date Constructed Sept. 1945
Depth drilled 130 feet Depth cased 130 feet
Section 7

CASING RECORD:

12-inch casing set from 0 to 130 feet

FINISH:
casing perforated from 65 to 124 feet
size of perforations not known

AQUIFERS:

sand, gravel, and clay

WATER LEVEL:
23 feet

PUMPING EQUIPMENT: Type Lane Bowler Deep Well Turbine Pump H.P. .....
Capacity 750 G.P.M.

WELL TESTS:
Drawdown 0 ft. after ..... hours 1200 G.P.M.
Drawdown 8 ft. after ..... hours 1300 G.P.M.

USE OF WATER Industrial Temp. ..... °F. ....., 19.....
SOURCE OF INFORMATION GR-4121
DRILLER or DIGGER R. J. Strasser Drilling Co. Portland, Oregon
ADDITIONAL DATA:
Log x Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:

dredged sand	12 to 118	cemented gravel	13 to 12
silt, clay and very fine sand	48 to 70	gravel with a little water	5 to 7
coarse sand with water	24 to 46	cemented gravel	7 to 0
gravel with clay binder	21 to 25		

Printing 80318

STATE ENGINEER
Salem, Oregon

MULT 943

Well Record

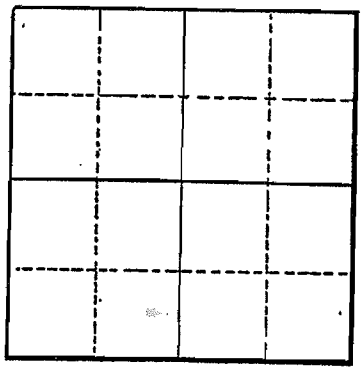
STATE WELL NO. 1N/1-7N1
COUNTY Multnomah
APPLICATION NO. .....

OWNER: McCormick & Baxter Co. MAILING ADDRESS: .....

LOCATION OF WELL: Owner's No. ..... CITY AND STATE: .....

..... ¼ ..... ¼ Sec. ..... T. ..... N. S., R. ..... E. W., W.M.

Bearing and distance from section or subdivision corner .....



Section .....

Altitude at well 30

TYPE OF WELL: Drilled Date Constructed .....

Depth drilled 130 Depth cased 130

CASING RECORD:

12 inch

FINISH:

AQUIFERS:

Sand (Younger alluvium) from 60 to 84
Gravel (Troutdale Formation) from 118 to 123

WATER LEVEL:

23 feet below land surface, September, 1945

PUMPING EQUIPMENT: Type Turbine H.P. .....
Capacity ..... G.P.M.

WELL TESTS:

Drawdown ..... ft. after ..... hours ..... G.P.M.

Drawdown ..... ft. after ..... hours ..... G.P.M.

USE OF WATER Industrial Temp. ..... °F. ....., 19.....
SOURCE OF INFORMATION USGS
DRILLER or DIGGER .....
ADDITIONAL DATA:
Log X Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:

Pumped 1,600 gpm, drawdown 26 feet.
Perforated casing 65-84, 94-104, and 116-124 feet.

State Printing 69318

STATE ENGINEER
Salem, Oregon

State Well No. 1N/1-7N1
County MULTNOMAH
Application No.

Well Log

Owner: McCormick & Baxter Co. Owner's No.

Driller: R. J. Strasser Drilling Co. Date Drilled 1945

CHARACTER OF MATERIAL	(Feet below land surface) From	To	Thickness (feet)
Artificial fill:			
"Dredged sand"	0	12	12
Younger alluvium:			
Silt, clay, and very fine sand	12	60	48
Sand, coarse, water-bearing	60	84	24
Gravel and clay	84	105	21
Troutdale Formation:			
Gravel, cemented	105	118	13
Gravel, water-bearing	118	123	5
Gravel, cemented	123	130	7

Multnomah County

Township 1N

Range 1E

Section 18

NC

1N/1E-18

MULT 987

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED
OCT 18 1965
STATE ENGINEER
SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(please type or print)

State Well No. 1N/1E-18

State Permit No.

(1) OWNER:
Name University of Portland
Address 5000 N. Willamette Blvd.
Portland, Ore.

(2) LOCATION OF WELL:
County Multnomah Driller's well number
¼ ¼ Section T. R. W.M.
Bearing and distance from section or subdivision corner
5000 N. Willamette Blvd.
Portland, Ore.

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☒
12 " Diam. from 13 ft. to 245 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS:
Perforated? ☒ Yes ☐ No
Type of perforator used Mills knife
Size of perforations ½ in. by 2½ in.
336 perforations from 193 ft. to 235 ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Well seal—Material used in seal Bentonite
Depth of seal 40 ft. Was a packer used? No
Diameter of well bore to bottom of seal 16 in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth
Was a drive shoe used? ☒ Yes ☐ No
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 160 ft. below land surface Date 9-30-65
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom?
Yield: 875 gal./min. with 20 ft. drawdown after 8 hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 55° Was a chemical analysis made? ☐ Yes ☒ No

(12) WELL LOG:
Diameter of well below casing 12"
Depth drilled 247 ft. Depth of completed well 247 ft.
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Basement	0	13
Cemented gravel	13	48
Brown sand	48	136
Gravel	136	182
Coarse sand	182	187
Sand & gravel (water bearing)	187	236
Cemented gravel	236	247

Work started 9-10 19 65 Completed 9-30 19 65
Date well drilling machine moved off of well 10-5 19 65

(13) PUMP:
Manufacturer's Name
Type: H.P.

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME A.M. JANNSEN DRILLING CO.
(Person, firm or corporation) (Type or print)
Address 21075 S.W. Tualatin Hiway Aloha, Ore.
Drilling Machine Operator's License No. 236 & 274
[Signed] (Water Well Contractor)
Contractor's License No. Date 10-8 1965

(USE ADDITIONAL SHEETS IF NECESSARY)

STATE ENGINEER
Salem, Oregon

MULT
989

Well Record

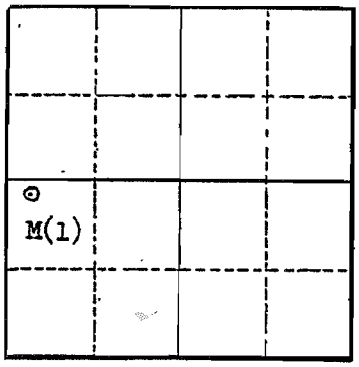
STATE WELL NO. 1N/1-18M(1)
COUNTY Multnomah
APPLICATION NO. GR-393

OWNER: Fibreboard Paper Products Co.
MAILING ADDRESS:
CITY AND STATE: Portland, Oregon

LOCATION OF WELL: Owner's No. 1

NW ¼ SW ¼ Sec. 18 T. 1 N. S., R. 1 E. W., W.M.

Bearing and distance from section or subdivision corner S. 10° 00' E. 495' from W¼ cor. Sec. 18



Altitude at well 32'

TYPE OF WELL: Drilled Date Constructed ?

Depth drilled 425 Depth cased 90

Section 18

CASING RECORD:

8 inch

FINISH:

AQUIFERS:

WATER LEVEL:

?

PUMPING EQUIPMENT: Type Pamona H.P. 10
Capacity G.P.M.

WELL TESTS:
Drawdown ft. after hours G.P.M.
Drawdown ft. after hours G.P.M.

USE OF WATER Cooling and paper making Temp. °F. 19
SOURCE OF INFORMATION GR-393
DRILLER or DIGGER ?
ADDITIONAL DATA:
Log X Water Level Measurements Chemical Analysis Aquifer Test

REMARKS:

State Printing 89216

STATE ENGINEER
Salem, Oregon

State Well No. 1N/1-18M(1)
County Multnomah
Application No. GR-393

Well Log

Owner: Fibreboard Paper Products Corp. Owner's No. #1

Driller: Date Drilled

CHARACTER OF MATERIAL	(Feet below land surface) From	To	Thickness (feet)
Sand	0	40	40
Cemented gravel & boulders	40	60	20
Clay, silt	60	75	15
Hard rock	75	165	90
Soft rock	165	191	26
Very hard rock	191	391	200
Hard rock	391	412	21
Soft rock	412	421	9
Hard rock	421	425	4

STATE ENGINEER
Salem, Oregon

MULT 990

Well Record

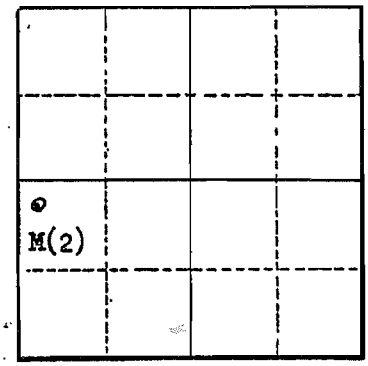
STATE WELL NO. 1N/1-18M(2)
COUNTY Multnomah
APPLICATION NO. GR-393

OWNER: Fibreboard Paper Products Corp.
MAILING ADDRESS: 6350 N. W. Front Street
CITY AND STATE: Portland, Oregon

LOCATION OF WELL: Owner's No. 2

NW ¼ SW ¼ Sec. 18 T. 1 N. S., R. 1 E. W., W.M.

Bearing and distance from section or subdivision corner S. 27° 30' E. 565' from W¼ cor. Sec. 18



Section 18

Altitude at well ?

TYPE OF WELL: drilled Date Constructed 1945

Depth drilled 240 Depth cased ?

CASING RECORD:
?

FINISH:

AQUIFERS:

WATER LEVEL:

PUMPING EQUIPMENT: Type Pacific H.P. 15
Capacity ? G.P.M.

WELL TESTS:
Drawdown ____ ft. after ____ hours ____ G.P.M.
Drawdown ____ ft. after ____ hours ____ G.P.M.

USE OF WATER Cooling and paper making Temp. ____ °F. ____, 19____
SOURCE OF INFORMATION GR-393
DRILLER or DIGGER Tualatin Vally Drilling Company; Aloha, Oregon
ADDITIONAL DATA:
Log x Water Level Measurements ____ Chemical Analysis ____ Aquifer Test ____

REMARKS:

State Printing 89316

Multnomah County

Township 1N

Range 1E

Section 19

STATE OF OREGON

WATER WELL REPORT

(as required by ORS 537.765)

MULT 991

RECEIVED

MAY 26 1989

WATER RESOURCES DEPT.
SALEM, OREGON

11/18/96d

(START CARD) # 9987

Well Number:

(1) OWNER:

Name Chevron USA, Inc.

Address P. O. Box 4168

City Portland State OR Zip 97208

(2) TYPE OF WORK:

☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD

☒ Rotary Air ☒ Rotary Mud ☐ Cable

☐ Other

(4) PROPOSED USE:

☐ Domestic ☐ Community ☒ Industrial ☐ Irrigation

☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval Yes ☐ No ☒ Depth of Completed Well 310 ft.

Explosives used Yes ☐ No ☒ Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
12"	0	81	Cement	0	81	35 sacks +
8"	81	310				gel

How was seal placed: Method ☒ A ☐ B ☒ C ☐ D ☐ E

☐ Other

Backfill placed from ft. to ft. Material

Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	8"	+1	81	250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:

☐ Perforations Method

☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
150	78'		1 hr.
135	58'		1 hr.

Temperature of water Depth Artesian Flow Found

Was a water analysis done? ☐ Yes By whom

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata:

(9) LOCATION OF WELL by legal description:

County Multnomah Latitude ' " Longitude ' "

Township 1N N or S, Range 1 E E or W, WM.

Section 19 SE ¼ NW ¼

Tax Lot Lot Block Subdivision

Street Address of Well (or nearest address) 5501 NW Front Ave.
Portland, Oregon 97208

(10) STATIC WATER LEVEL:

27 ft. below land surface. Date 4/26/89

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found 94'

From	To	Estimated Flow Rate	SWL
94	101	20	27
196	207	40	"
280	289	100	"
289	310	20	"

(12) WELL LOG:

Ground elevation 40'

Material	From	To	SWL
Pavement, rock fill	0	2	
Brown silty sand-occ. clay	2	19	
Black silty sand-occ. clay	19	40	
Gray silt, wood	40	46	
Gray-brown silty clay	46	60	
Blue-gray silty clay	60	68	
Black gravel / broken rock	68	70	
Gray-black basalt, hard	70	94	
Brown basalt & lava, broken	94	101	27
Gray-black basalt, hard, occ. fracture	101	155	
Gray basalt, hard	155	196	
Black-brown basalt & lava, broken	196	207	
Gray basalt, hard	207	280	
Brown basalt, broken	280	289	
Gray-black basalt, hard, occ. broken	289	310	

Date started 4/17/89 Completed 4/26/89

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

WWC Number

Signed Date

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 573

Signed Date 5/24/89

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9999 3/88

WATER WELL REPORT
STATE OF OREGON

MULT 996

RECEIVED
OCT 26 1982
WATER RESOURCES DEPT.
SALEM, OREGON

State Well No. 1N/1E-19a

State Permit No.

(1) OWNER:
Name Northwest Natural Gas Co.
Address 123 NE Flanders St.
City Portland State Ore. 97209

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary Air ☐ Driven ☐
Rotary Mud ☒ Dug ☐
Cable ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☒
Thermal: ☐ Withdrawal ☐ Reinjection ☐

(5) CASING INSTALLED:
Steel ☒ Threaded ☐ Plastic ☐ Welded ☐
10" Diam. from 0 ft. to 20 ft. Gauge
" Diam. from ft. to ft. Gauge

(6) LINER INSTALLED:
" Diam. from ft. to ft. Gauge

(7) PERFORATIONS:
Perforated? ☐ Yes ☐ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Diam. Slot Size Set from ft. to ft.
Diam. Slot Size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
gal./min. with ft. drawdown after hrs.
" " "
r test gal./min. with drill stem at ft. hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
perature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Special standards Yes ☐ No ☐
Well seal—Material used Cement
Well sealed from land surface to 20 ft.
Diameter of well bore to bottom of seal 14 in.
Diameter of well bore below seal 8 3/4 in.
Number of sacks of cement used in well seal 4 sacks
How was cement grout placed? Pumped
Was pump installed? Type HP Depth ft.
Was a drive shoe used? ☐ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of Water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Multnoma Driller's well number
¼ NE ¼ Section 19 T. 1 N R. 1 E W.M.
Tax Lot # Lot Blk Subdivision
Address at well location: NW. Front Ave. @ Kittridge Ave.
PLat 25 - 24

(11) WATER LEVEL: Completed well.
Depth at which water was first found ft.
Static level ft. below land surface. Date
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing
Depth drilled 100 ft. Depth of completed well 0 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Sand	0	12	
Blue mucky sand	12	16	
Wet sand	16	23	
Blue mucky clay	23	30	
Brown mucky clay	30	50	
Brown shaly rock	50	58	
Grey broken rock	58	70	
Broken brown & red rock little clay	70	85	
Grey rock med.	85	95	
Grey basalt hard	95	100	

Work started Oct 21 19 82 Completed Oct 22 19 82
Date well drilling machine moved off of well October 25 19 82

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] (Drilling Machine Operator) Date 19
Drilling Machine Operator's License No. 841

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Hansen Drilling Co. Inc. (Person, firm or corporation) (Type or print)
Address 6711 NE. 58th Ave. Vancouver, Washington 98661
[Signed] (Water Well Contractor)
Contractor's License No. 604 Date October 25, 19 82

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

P 12556-690

NOT A WATER WELL

WATER WELL REPORT
STATE OF OREGON

MULT 997

RECEIVED
OCT 26 1982
WATER RESOURCES DEPT.
SALEM, OREGON

State Well No. 1N/1E-19a

State Permit No. .....

(1) OWNER:
Name: Northwest Natural Gas Co.
Address: 123 Flanders St.
City: Portland State: Ore. 97209

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary Air ☐ Driven ☐
Rotary Mud ☒ Dug ☐
Cable ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☒
Thermal: ☐ Withdrawal ☐ Reinjection ☐

(5) CASING INSTALLED:
Steel ☒ Plastic ☐
Threaded ☐ Welded ☒
10" Diam. from 0 ft. to 20 ft. Gauge .....
..." Diam. from ... ft. to ... ft. Gauge .....

(6) LINER INSTALLED:
..." Diam. from ... ft. to ... ft. Gauge .....

(7) PERFORATIONS:
Perforated? ☐ Yes ☐ No
Type of perforator used
Size of perforations ... in. by ... in.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☐ No
Manufacturer's Name .....
Type ..... Model No. .....
Diam. ..... Slot Size ..... Set from ... ft. to ... ft.
Diam. ..... Slot Size ..... Set from ... ft. to ... ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
... gal./min. with ... ft. drawdown after ... hrs.
" " " "
... test ... gal./min. with drill stem at ... ft. ... hrs.
Bailer test ... gal./min. with ... ft. drawdown after ... hrs.
Artesian flow ... g.p.m.
Temperature of water ... Depth artesian flow encountered ... ft.

(9) CONSTRUCTION:
Special standards: Yes ☐ No ☐
Well seal—Material used: Cement
Well sealed from land surface to: 20 ft.
Diameter of well bore to bottom of seal: 14 in.
Diameter of well bore below seal: 8 3/4 in.
Number of sacks of cement used in well seal: 4 sacks
How was cement grout placed? Pumped
Was pump installed? ... Type ... HP ... Depth ... ft.
Was a drive shoe used? ☐ Yes ☐ No Plugs ... Size: location ... ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of Water? ... depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel: .....
Gravel placed from ... ft. to ... ft.

(10) LOCATION OF WELL:
County: Multnoma Driller's well number
¼ NE ¼ Section 19 T. 1N R. 1E W.M.
Tax Lot # Lot Blk Subdivision
Address at well location: NW. Front Ave. @ Kittridge Ave.
Plat 25 - 24

(11) WATER LEVEL: Completed well.
Depth at which water was first found ... ft.
Static level ... ft. below land surface. Date
Artesian pressure ... lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing .....
Depth drilled 100 ft. Depth of completed well Ø ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Sand	0	12	
Blue mucky sand	12	16	
Wet sand	16	23	
Blue mucky clay	23	30	
Brown mucky clay	30	58	
Grey broken rock Hard	58	68	
Broken brown & red rock Kittle clay	68	95	
Grey basalt	95	100	

Work started Oct. 20 19 82 Completed Oct. 21 19 82
Date well drilling machine moved off of well October 21 19 82

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] ..... Date ....., 19.....
(Drilling Machine Operator)
Drilling Machine Operator's License No. 841

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Hansen Drilling Co.
(Person, firm or corporation) (Type or print)
Address 6711 NE. 58th Ave. Vancouver, Washington 98661
[Signed] Jim Hansen
(Water Well Contractor)
Contractor's License No. 604 Date October 25, 19 82

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

SP*12658-690

WATER WELL REPORT
STATE OF OREGON

MULT 998

RECEIVED
OCT 26 1982
WATER RESOURCES DEPT.
SALEM, OREGON

State Well No. 1N/1E-19 a

State Permit No.

(1) OWNER:
Name: Northwest Natural Gas Co.
Address: 123 NE. Flanders St.
City: Portland State: Ore. 97209

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary Air ☐ Driven ☐
Rotary Mud ☒ Dug ☐
Cable ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☒
Thermal: ☐ Withdrawal ☐ Reinjection ☐

(5) CASING INSTALLED:
Steel ☒ Plastic ☐
Threaded ☐ Welded ☐
9" Diam. from 0 ft. to 20 ft. Gauge
" Diam. from ft. to ft. Gauge

LINER INSTALLED:
" Diam. from ft. to ft. Gauge

(6) PERFORATIONS:
Perforated? ☐ Yes ☐ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Diam. Slot Size Set from ft. to ft.
Diam. Slot Size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom?
gal./min. with ft. drawdown after hrs.
" " "
Air test gal./min. with drill stem at ft. hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Special standards: Yes ☐ No ☐
Well seal—Material used Cement
Well sealed from land surface to 20 ft.
Diameter of well bore to bottom of seal 14 in.
Diameter of well bore below seal 8 3/4 in.
Number of sacks of cement used in well seal 4 sacks
How was cement grout placed? Pumped
Was pump installed? Type HP Depth ft.
Was a drive shoe used? ☐ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of Water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Multnoma Driller's well number
¼ NE ¼ Section 19 T. 1N R. 1E W.M.
Tax Lot # Lot Blk Subdivision
Address at well location: NW. Front Ave. @ Kittridge Ave.
Plat 25 - 24

(11) WATER LEVEL: Completed well.
Depth at which water was first found ft.
Static level ft. below land surface. Date
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing
Depth drilled 100 ft. Depth of completed well 0 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Sand	0	12	
Blue mucky sand	12	16	
Wet sand	16	23	
Blue mucky clay	23	30	
Brown mucky clay	30	50	
Brown shaly rock	50	55	
Gravel large	55	60	
Broken rock	60	68	
Broken brown & red rock little clay	68	95	
Grey basalt	95	100	

Work started Oct. 19 19 82 Completed Oct. 20 19 82
Date well drilling machine moved off of well October 20 19 82

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] (Drilling Machine Operator) Date , 19
Drilling Machine Operator's License No. 841

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Hansen Drilling Co., Inc. (Person, firm or corporation) (Type or print)
Address 6711 NE. 58th Ave. Vancouver, Washington 98661
[Signed] Jim Hansen (Water Well Contractor)
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SP*12658-690

APPENDIX C

Field Methods

APPENDIX C

Field Methods

Field methods used during the Phase 2 investigation were generally consistent with the methods presented in the Phase 2 work plan. This appendix summarizes the field procedures.

C.1 Soil Sampling Methods

C.1.1 General Soil Sample Collection

Soil samples selected for laboratory analysis were placed into clean, laboratory-supplied 8-ounce jars with clean, new stainless steel spoons. Sample jars were labeled and placed in a clean cooler packed with ice. A chain-of-custody form was completed for the samples, enclosed in a zip-lock bag, and placed in the cooler. The cooler was then sealed with custody seals and shipped to CH2M HILL's Quality Analytical Laboratory (QAL) in Redding, California. Selected samples were analyzed for pesticides (EPA 8080), VOCs (EPA 8240), total organic carbon (EPA 9060), and particle size. Details of the sampling and analysis are presented in Table C-1.

Soil boring samples were classified visually in accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure, ASTM D 2487 85) and logged on soil boring log forms (see Appendix D).

C.1.2 Hand Auger Sampling

Boreholes GA-SB06 and GA-SB07 were advanced to depths of approximately 2 and 4 feet, respectively, with a shovel and hand auger. Soil was visually classified and recorded in the field logbook. Soil samples were collected from the lower 0.5 foot of each boring with caution so as not to collect soil that had been in contact with the auger.

C.1.3 Soil Boring Sampling

The October 1996 soil boring work for GA-SB01 through GA-SB05 and for RP-SB18 was performed with a drilling rig equipped with a 4.25-inch-inside-diameter hollow-stem auger. A 5-foot-long continuous-core barrel was used to collect the soil samples. The continuous-core barrel has an inside diameter of approximately 3 inches and can be separated lengthwise into two pieces, similar to a split spoon. Because of poor recovery and difficulty using the continuous-core barrel, the remaining borings (RP-SB16, RP-SB17, and RP-SB19 through RP-SB23) were sampled with a hollow-stem auger equipped with 3-inch-diameter split spoons. Approximately 1.5 feet of soil was collected in each 2.5-foot drilling interval.

TABLE C-1
Soil Sampling and Analysis Summary

Area of Investigation	Sample Designation	Drilling/Sampling Method	Sample Depth (feet bgs)	Date Sampled	Laboratory Analysis				
					Pesticides 8080	Total Organic Carbon 9060	Volatile Organic Compounds 8240	Total Petroleum Hydrocarbons 8015M	Particle Size ASTM D-422
General Acid Plant Area	GA-SB01	HSA-CC	0.5	10/8/96	X				
		HSA-CC	2	10/8/96	X				
		HSA-CC	6	10/8/96	X	X			
		HSA-CC	8	10/8/96					X
	GA-SB02	HSA-CC	2.5	10/8/96	X				
		HSA-CC	4	10/8/96	X	X			
		HSA-CC	6	10/8/96	X				X
	GA-SB03	HSA-CC	2.5	10/8/96	X				
		HSA-CC	4	10/8/96	X				X
		HSA-CC	6	10/8/96	X				
		HSA-CC	8	10/8/96			X		
		HSA-CC	10	10/8/96			X		
	GA-SB04	HSA-CC	0.5	10/8/96	X				
		HSA-CC	2	10/8/96	X				
		HSA-CC	4	10/8/96	X				
		HSA-CC	6	10/8/96	X				
		HSA-CC	10	10/8/96					X
	GA-SB05	HSA-CC	0.5	10/8/96	X				
		HSA-CC	2	10/8/96	X				
		HSA-CC	4	10/8/96	X				
		HSA-CC	6	10/8/96	X	X			
	GA-SB06	Hand auger	2	10/11/96	X				
	GA-SB07	Hand auger	4	10/14/96	X			X	
	GA-SB08	Geoprobe	0.5	12/12/96	X				
		Geoprobe	2	12/12/96	X				
		Geoprobe	4	12/12/96	X				
		Geoprobe	6	12/12/96	X				
	GA-SB09	Geoprobe	0.5	12/13/96	X				
		Geoprobe	2	12/13/96	X				
		Geoprobe	4	12/13/96	X				
		Geoprobe	6	12/13/96	X				

TABLE C-1
Soil Sampling and Analysis Summary

Area of Investigation	Sample Designation	Drilling/Sampling Method	Sample Depth (feet bgs)	Date Sampled	Laboratory Analysis				
					Pesticides 8080	Total Organic Carbon 9060	Volatile Organic Compounds 8240	Total Petroleum Hydrocarbons 8015M	Particle Size ASTM D-422
	GA-SB10	Geoprobe	0.5	12/13/96	X				
		Geoprobe	2	12/13/96	X				
		Geoprobe	4	12/13/96	X				
		Geoprobe	6	12/13/96	X				
	GA-SB11	Geoprobe	0.5	12/13/96	X				
		Geoprobe	2	12/13/96	X				
		Geoprobe	4	12/13/96	X				
		Geoprobe	6	12/13/96	X				
Former Residue Pond	RP-SB16	HSA-SS	5	10/10/96	X				
		HSA-SS	15	10/10/96	X		X		
		HSA-SS	20	10/10/96	X				
	RP-SB17	HSA-SS	10	10/9/96	X				
		HSA-SS	15	10/9/96	X		X		
		HSA-SS	20	10/9/96	X		X		
	RP-SB18	HSA-CC	10	10/9/96	X		X		
		HSA-CC	20	10/9/96	X		X		
		HSA-CC	25	10/9/96	X		X		
	RP-SB19	HSA-SS	15	10/10/96	X				X
		HSA-SS	25	10/10/96	X	X	X		
	RP-SB20	HSA-SS	10	10/10/96					X
		HSA-SS	15	10/10/96	X				
		HSA-SS	20	10/10/96	X	X	X		
Overflow Trench	RP-SB21	HSA-SS	5	10/10/96	X				
		HSA-SS	18.5	10/10/96	X		X		
	RP-SB22	HSA-SS	5	10/11/96	X				
		HSA-SS	10	10/11/96		X			
	RP-SB23	HSA-SS	5	10/11/96	X				
	RP-SB25	Geoprobe	2	12/12/96	X				
	RP-SB26	Geoprobe	10	12/12/96	X				
	RP-SB27	Geoprobe	2	12/12/96	X				
		Geoprobe	20	12/12/96	X				

TABLE C-1
Soil Sampling and Analysis Summary

Area of Investigation	Sample Designation	Drilling/Sampling Method	Sample Depth (feet bgs)	Date Sampled	Laboratory Analysis: Pesticides 8080	Total Organic Carbon 9060	Volatile Organic Compounds 8240	Total Petroleum Hydrocarbons 8015M	Particle Size ASTM D-422
	RP-SB28	Geoprobe	10	12/12/96	X				
		Geoprobe	20	12/12/96	X				
	RP-SB29	Geoprobe	5	12/12/96	X				
	RP-SB30	Geoprobe	5	12/12/96	X				
	RP-SB31	Geoprobe	5	12/12/96	X				
		Geoprobe	14	12/12/96	X				
	RP-SB32	Geoprobe	18	12/12/96	X				
	RP-SB33	Geoprobe	2	12/13/96	X				
		Geoprobe	20	12/13/96	X				
	RP-SB34	Geoprobe	10	12/13/96	X				
	RP-SB37	Geoprobe	10	12/13/96	X				
		Geoprobe	20	12/13/96	X				
Monitoring Wells	GA-MWA1	Air rotary	14	12/10/96	X		X		
		Air rotary	19	12/10/96	X	X	X		
		Air rotary	26	12/10/96	X		X		
	GA-MWA2	Air rotary	20	12/11/96					X
		Air rotary	22	12/11/96		X			
		Air rotary	24	12/11/96	X		X		
		Air rotary	29	12/11/96	X		X		
	GA-MWA3	Air rotary	20	12/11/96					X
		Air rotary	22	12/11/96	X		X		
		Air rotary	24	12/11/96	X	X	X		
		Air rotary	28	12/11/96	X		X		
	GA-MWA4	Air rotary	24	12/13/96	X		X		
		Air rotary	27.8	12/13/96	X		X		
		Air rotary	30	12/13/96	X	X	X		

HSA-CC = Hollow-stem auger with 4 1/4-inch-inner-diameter continuous-core barrel.
HSA-SS = Hollow-stem auger with 3-inch-diameter split spoons.
bgs = Below ground surface.

The borings were abandoned in accordance with State of Oregon abandonment requirements for "other holes" following completion of the drilling (OAR 690-240). The boreholes were backfilled with bentonite chips from total depth to 1 foot bgs; the final 1 foot was filled with concrete flush to the ground surface. In boreholes advanced to depths at or near the water table, the lower 10 to 15 feet of the borehole was grouted and the remainder filled as stated above.

The December 1996 soil boring work for GA-SB08 through GA-SB11 and for RP-SB24 through RP-SB37 was performed using a Geoprobe equipped with a 2-foot-long 1.5-inch-diameter microsampler with dedicated plastic sampling sleeves. Samples were collected by cutting open the plastic sampling sleeve and transferring the material into 8-ounce jars with a clean, new, stainless steel spoon. A new spoon was used for each sample location. Boreholes RP-SB24 through RP-SB28, RP-SB34, and RP-SB35 were sampled at approximately a 2-foot interval (0 to 2 feet, 4 to 6 feet, etc., to the bottom of the borehole). The remaining boreholes were sampled continuously. Boreholes were backfilled with bentonite powder.

C.2 Groundwater Sampling with Geoprobe

The Geoprobe groundwater samples were obtained by hydraulically pushing a 1-inch-inside-diameter steel pipe to the desired depth. The steel pipe was then partially withdrawn, exposing 2 feet of stainless steel screen. Samples were then collected with either a vacuum pump system or a 0.5-inch bailer. Headspace readings of organic vapors were taken in the field using a combination photoionization detector (PID) and flame ionization detector (FID). Headspace readings ranged from approximately 1 to 399 parts per million (ppm). A slight to strong chlorobenzene odor was detected at eight of the 14 boreholes. Eight of the samples were field screened for the presence of dense nonaqueous phase liquid (DNAPL) by using a hydrophobic dye shake test. The dye used was powdered Sudan IV. DNAPL was not detected in the eight samples. Groundwater samples were sent to a laboratory for analysis of VOCs (EPA 8240). Details of the sampling and analysis are presented in Table C-2. Additional information concerning the Geoprobe field investigation is presented in Table C-3.

The boreholes were pressure-grouted with a cement–bentonite grout in accordance with State of Oregon abandonment requirements for "other holes" (OAR 690-240). Borehole GA-GW-6 was pressure-grouted from 31 to 10 feet bgs, then filled with bentonite pellets to the surface because it appeared that grout was being lost to the formation.

C.3 Monitoring Well Installation and Sampling

C.3.1 Drilling and Soil Sampling

Four shallow groundwater monitoring wells (MWA-1, MWA-2, MWA-3, and MWA-4) were installed in the uppermost water-bearing zone during December 1996. The wells were drilled with a 6-inch-diameter, air rotary Tubex drilling rig to depths ranging from approximately 33 to 35 feet. The wells were surveyed for horizontal and vertical elevations

TABLE C-2
Groundwater Sampling and Analysis Summary

Sample Designation	Drilling/Sampling Method	Sample Depth (feet bgs)	Date Sampled	Laboratory Analysis: Pesticides 8080	Laboratory Analysis: Volatile Organic Compounds 8240	Laboratory Analysis: Total Petroleum Hydrocarbons 8015M
Geoprobe Samples						
GA-GW5	Geoprobe	31	10/7/96		X	
GA-GW6	Geoprobe	31	10/8/96		X	
GA-GW7	Geoprobe	31	10/8/96		X	
GA-GW8	Geoprobe	31	10/8/96		X	
GA-GW9	Geoprobe	32	10/9/96		X	
GA-GW10	Geoprobe	32	10/9/96		X	
GA-GW11	Geoprobe	32	10/9/96		X	
GA-GW12	Geoprobe	32	11/21/96		X	
GA-GW13	Geoprobe	31	11/21/96		X	
GA-GW14	Geoprobe	31	11/21/96		X	
GA-GW15	Geoprobe	31	11/22/96		X	
GA-GW16	Geoprobe	31	11/22/96		X	
GA-GW17	Geoprobe	45	11/22/96		X	
GA-GW18	Geoprobe	45	11/22/96		X	
Groundwater Monitoring Wells						
GA-MWA1	Centrifugal pump	13.7[a]	1/2/97	X	X	X
	Centrifugal pump	17.7[a]	3/12/97	X	X	
GA-MWA2	Centrifugal pump	11[a]	1/2/97	X	X	X
	Centrifugal pump	18.8[a]	3/12/97	X	X	
GA-MWA3	Centrifugal pump	13.4[a]	1/2/97	X	X	X
	Centrifugal pump	19.9[a]	3/12/97	X	X	
GA-MWA4	Centrifugal pump	12.7[a]	1/2/97	X	X	X
	Centrifugal pump	19.1[a]	3/12/97	X	X	

[a] Pump intake set at approximately 1/2 foot below surface of water column.
Bgs = below ground surface.

TABLE C-3

Geoprobe Groundwater Sampling - Field Investigation Summary

Sample Designation	Date Sampled	Sample Depth (feet bgs)	DNAPL test with Sudan IV[a] Dye	Headspace FID[b] (ppm)	Headspace PID[c] (ppm)	Remarks
GA-GW5	10/7/96	31	Negative	83	NA	
GA-GW6	10/8/96	31	Negative	210	NA	
GA-GW7	10/8/96	31	Negative	118	NA	
GA-GW8	10/8/96	31	Negative	30	90	Slight odor
GA-GW9	10/9/96	32	NA	NA	1	No odor
GA-GW10	10/9/96	32	Negative	NA	1	
GA-GW11	10/9/96	32	Negative	NA	110	Strong odor
GA-GW12	11/21/96	32	NA	NA	7	No odor
GA-GW13	11/21/96	31	NA	NA	25	Slight odor
GA-GW14	11/21/96	31	Negative	NA	399	Strong odor
GA-GW15	11/22/96	31	NA	NA	53	Slight odor
GA-GW16	11/22/96	31	Negative	NA	238	Strong odor
GA-GW17	11/22/96	45	NA	NA	26	Same location as GW16; slight odor
GA-GW18	11/22/96	45	NA	NA	102	Same location as GW14; strong odor

[a] Sudan IV hydrophobic dye.

[b] FID = Flame ionization detector.

[c] PID = Photoionization detector equipped with an 11.8-electron-volt lamp.

bgs = Below ground surface.

NA = Not analyzed or not applicable.

at ground surface, at the top of the polyvinyl chloride (PVC) well casing, and at the top of the steel protective casing. Elevations were based on the National Geodetic Vertical Datum of 1929. Elf Atochem's site grid was used for horizontal location. A summary of the well construction details and survey results is provided in Table C-4.

Heaving sand was encountered in the boreholes during drilling. Clean water was added to prevent additional heaving when the sand could not be forced out with compressed air, and the well screen could not be pushed to the desired depth. The volume of water added to each well boring ranged from 40 to 140 gallons and is noted on each of the well logs in Appendix E. Water was obtained from the City of Portland municipal distribution system .

Soil samples were collected at 5-foot intervals from the ground surface to the well bottom during drilling of well MWA-1. Continuous sampling and geologic logging was conducted from approximately 20 feet bgs to the bottom of each well during drilling of the remaining three wells. Soil samples from each well borehole were selected for analysis from the split-barrel continuous sampling tube based on field indicators. Eleven of the selected soil samples were analyzed for organochlorinated pesticides (EPA Method 8080) and VOCs (EPA Method 8240). Four samples were analyzed for total organic carbon (EPA Method 9060), and three samples were analyzed for particle-size distribution (ASTM D-422). Quality control samples, including equipment blanks and trip blanks, were collected as described in the Sampling and Analysis Plan in the Phase 2 work plan.

C.3.2 Well Installation

A 2-inch-diameter, No. 10-slot, flush-threaded stainless steel screen was installed in the bottom 10 feet of each well. Ten feet of stainless steel blank casing was installed above the screen, and a 2-inch-diameter, Schedule 40, flush-threaded PVC casing was installed above the stainless steel to the surface. Stainless steel well screen was selected instead of PVC below the water table because PVC is considered potentially incompatible with chlorobenzene at the high concentrations detected in the groundwater during Phase 1.

Colorado silica 10 x 20 sand filter pack was poured into the well annulus from the total well depth to approximately 2 feet above the top of the well screen. The wells were sealed with bentonite chips from above the filter pack to 2 feet bgs. Well MWA-1 is protected at the surface by a flush vault with a watertight cover. The remaining wells are protected by a 3-feet by 3-feet concrete pad and a 6-inch-diameter steel casing with a locking cap extending about 2.5 feet above ground surface. Well construction and geologic logs are included in Appendix E. Well construction details are summarized in Table C-4.

Well construction was performed by a licensed Oregon well constructor in accordance with the design requirements outlined in OAR 690-240 and in accordance with the Oregon Department of Environmental Quality's (DEQ's) *Final Groundwater Monitoring Well Drilling and Construction and Decommissioning* guidance dated August 1992.

C.3.3 Well Development

The monitoring wells were developed on December 16, 1997, by simultaneously pumping and surging with a 2-inch-diameter Grundfos centrifugal pump. Wells were pumped at a rate of up to 5 gallons per minute until water quality measurements (including pH,

TABLE C-4
Well Construction Summary

Well Number	Date Completed	Drilling Method	Depth Drilled (feet bgs)	Borehole Diameter (inches)	Casing Diameter (inches)	Total PVC Casing Length (feet)	Total Stainless Steel Casing Length (feet)	Screened Interval (feet bgs)	Screened Interval Elevation (feet)[a]	Ground Surface Elevation (feet)[a]	Well Measuring Point Elevation (feet)[a,b]	Northing[c]	Easting[c]
MWA-1	12/10/96	Air rotary	33.5	6	2	13.10	20	23-33	11.4-21.4	34.4	34.14	192.67	514.00
MWA-2	12/11/96	Air rotary	32.3	6	2	15.07	20	21.5-31.5	12.0-24.0	33.5	36.48	475.86	816.12
MWA-3	12/11/96	Air rotary	32.1	6	2	15.05	20	20.7-30.7	13.6-23.6	34.3	37.46	328.28	819.97
MWA-4	12/13/96	Air rotary	30.5	6	2	13.05	20	19.5-29.5	14.1-24.1	33.6	36.46	242.36	820.86

bgs = Below ground surface.

[a]Vertical survey data based on the City of Portland Benchmark #2529. To convert to National Geodetic Vertical Datum of 1929, subtract 1.375 feet.

[b]Measuring point elevation corresponds to top of PVC casing on the north side.

[c]Horizontal coordinates referenced to local horizontal datum.

temperature, specific conductance, and turbidity) had stabilized. Pumping times ranged from 59 to 128 minutes. For all wells, the water became silty after surging and then became progressively less silty during pumping. At least five well bore volumes of water were pumped from each well in addition to the equivalent volume of water added by drillers during well construction. Water produced during well development was contained in 55-gallon drums. Well development logs are provided in Appendix E. Table C-5 summarizes well development.

Groundwater purged from well MWA-1 appeared different than other wells: it was opaque and dark brown. The groundwater had a specific conductance of 11,200 micromhos per centimeter (µmhos/cm) and an alkaline pH (11.59). In contrast, groundwater from the remaining three wells was cloudy to very clear and colorless with specific conductance values ranging from 450 to 1,226 µmhos/cm and slightly acidic pH values (between 6.26 and 6.93). These variations in groundwater opacity and pH are commonly observed at chlor alkali plants. Table C-6 presents a summary of the groundwater sampling field investigation.

Downhole organic vapor concentrations in the four wells ranged from <1 to 11 ppm, with the exception of well MWA-4, in which FID readings were off the scale of the instrument (>50,000 ppm). This was interpreted to indicate the presence of methane gas in the well. A second reading was taken in well MWA-4 with a carbon filter attachment on the instrument probe. The activated carbon should filter out larger-sized organic molecules and allow methane to pass through and be detected by the instrument. The FID reading was >50,000 ppm with the carbon filter, suggesting that methane was likely present in well MWA-4 and partly responsible for the high FID reading. Table C-7 summarizes the air monitoring findings.

C.3.4 Groundwater Sampling

Groundwater samples were collected from each of the four wells on January 2, 1997, approximately two weeks following well development activities. A second set of samples was collected March 12, 1997. For both sampling events, samples were collected using a 2-inch-diameter submersible centrifugal pump with new (for January) or dedicated (for March) polyethylene tubing. Groundwater levels were measured prior to well purging with an electric water level indicator. A minimum of three well volumes of water were purged from each well. Specific conductance, temperature, pH, and turbidity measurements were taken at periodic intervals as the wells were purged. Samples were collected after the field parameters had stabilized. Two consecutive readings of no more than a ±10 percent change after the three well volumes had been purged was considered to indicate stability. A discharge rate of less than 0.5 gallon per minute (gpm) was maintained during purging and sample collection. Well sampling field logs are included in Appendix E.

Organic vapor concentration readings were taken downhole and in the breathing zone at each well using a PID/FID. All breathing zone readings were at background levels of 0 to 3 ppm. A second series of downhole readings was taken in all four wells using a carbon filter attachment on the instrument probe. The concentration of organic vapors excluding methane was estimated by subtracting the second downhole reading from the first downhole reading for each well. An estimate could not be obtained for well MWA-4 because the FID flame was extinguished in the low-oxygen environment in the well (8 percent O_2 measured with an oxygen meter).

TABLE C-5
Well Development Summary

Well ID	Date	Purge Volume (gallons)	Purge Time (min)	Purge Rate (gpm)	Surge Time (min)	Temper-ature (°C)	Specific Conductance (µmhos/cm)	pH	Turbidity (NTU)	Comments
MWA-1	12/16/96	102	128	0.5 - 1.0	68	16.8	11,200	11.59	14	Opaque, very dark brown water with slight purple tint; PID = 10.6 ppm (initial casing reading).
MWA-2	12/16/96	183	59	0.9 - 5.0	35	17.6	450	6.26	4	Very clear, colorless; PID and FID = 6 ppm
MWA-3	12/17/96	150	77	0.4 - 4.0	27	14.7	906	6.93	24	Cloudy, light gray; PID = 11 ppm, FID = 8 ppm.
MWA-4	12/17/96	110	101	0.4 - 4.0	29	14.7	1,226	6.78	17	Almost clear; PID < 1 ppm, FID > 50,000 ppm; may indicate methane is present.

Purge volume includes volume of water added during well drilling plus a minimum of three borehole volumes of water. Water quality parameters include the final readings at the end of the purging. Field data sheets included in Appendix K.
gpm = Gallons per minute.
NTU = Nephelometric turbidity units.
PID = Photoionization detector equipped with an 11.8-electron-volt lamp.
FID = Flame ionization detector.
ppm = Parts per million.

TABLE C-6
Groundwater Sampling Field Summary

Well ID	Date	Purge Volume (gallons)	Purge Rate (gpm)	Temper-ature (C)	Specific Conductance (µmhos/cm)	pH	Turbidity (NTU)	Comments
MWA-1	1/2/97	11	0.30	18.7	11,190	11.30	*	Opaque, very dark brown water with slight purple tint
	3/12/97	8.1	0.16	18.6	9,600	11.18	*	Opaque, very dark brown water
MWA-2	1/2/97	10.8	0.30	18.6	253	6.36	12	Clear, colorless
	3/12/97	6.9	0.23	18.5	267	6.35	4.4	Clear, colorless
MWA-3	1/2/97	9.3	0.30	15.9	529	7.24	70	Slightly cloudy, yellowish
	3/12/97	14	0.14	14.0	617	7.37	10	Clear, colorless
MWA-4	1/2/97	9.3	0.40	16.8	1,268	6.96	1.4	Clear, colorless
	3/12/97	8	0.28	16.9	1,501	6.79	3.5	Clear, colorless

* Turbidity reading not possible due to dark, opaque nature of water.
Purge volumes are a minimum of three borehole volumes of water. Water quality parameters include the readings just prior to sampling. Field data sheets included in Appendix E.
gpm = Gallons per minute.
NTU = Nephelometric turbidity units.

TABLE C-7
Air Monitoring Summary

		Initial, No Filter				With Carbon Filter		
		Downhole		Breathing Zone		Downhole		
Well ID	Date	PID (ppm)	FID (ppm)	PID (ppm)	FID (ppm)	PID (ppm)	FID (ppm)	Comments
MWA-1	1/2/97	15	160	0	2.5	0	80	PID/FID with 11.8-eV lamp
	3/12/97	30	NA	NA	NA	NA	NA	OVM with 10.6-eV lamp
MWA-2	1/2/97	3	50	0	3	0	6	PID/FID with 11.8-eV lamp
	3/12/97	0.9	NA	NA	NA	NA	NA	OVM with 10.6-eV lamp
MWA-3	1/2/97	1	11	0	2.5	0	9	PID/FID with 11.8-eV lamp
	3/12/97	0.5	NA	NA	NA	NA	NA	OVM with 10.6-eV lamp
MWA-4	1/2/97	0	Flame out	0	0	0	Flame out	FID would not stay lit; O_2 = 8%, methane = 12%
	3/12/97	0	NA	NA	NA	NA	NA	OVM with 10.6-eV lamp

NA = Not applicable.
PID = Photoionization detector equipped with an 11.8-electron-volt lamp.
FID = Flame ionization detector.
ppm = Parts per million.
eV = Electron volt.
OVM = Organic vapor monitor.

During the groundwater sampling on March 12, 1997, the groundwater was field tested for the presence of DNAPL with hydrophobic dye prior to sampling. A dedicated polyethylene bottom-filling bailer was slowly lowered to the bottom of each well to obtain a groundwater sample, then was slowly raised to the surface. A 20 milliliter (mL) sample of groundwater was extracted from the bottom of the bailer, and a powdered hydrophobic dye (Sudan IV) was added to test for the presence of DNAPL. No DNAPL was detected in the four wells.

In general, the March 1997 groundwater samples were collected using the same methods as described for the January 1997 sampling event. However, purge rates of approximately 0.5 to 0.3 gpm were maintained at each well. In addition, dedicated sample tubing was used at each well.

January 1997 groundwater samples were collected in glass bottles supplied by the lab and were analyzed for organochlorinated pesticides (EPA Method 8080), VOCs (EPA Method 8240), and total petroleum hydrocarbons for diesel (TPH-D) (EPA Method 8015 modified) (see Table C-2). Groundwater samples collected in March 1997 were analyzed using the same procedures except that they were not analyzed for TPH-D.

C.4 Hydrogeologic Investigation Methods

C.4.1 Cone Penetrometer Testing

Cone penetrometer testing (CPT) was conducted to evaluate subsurface conditions and to assist in monitoring well placement. To conduct CPT, the cone penetrometer was hydraulically pushed into the soil at a rate of approximately 3 feet per minute. Tip resistance, sleeve friction, inclination and pore pressure readings were collected at 5-second intervals. These parameters and standard CPT correlation data were used to identify the subsurface profile at the site. Hydraulic pressure dissipation tests were conducted at the three locations to provide vertical groundwater pressure profiles. Test data and results are included in Appendix F.

C.4.2 Aquifer Testing

Aquifer testing completed during Phase 2 consisted of slug insertion and withdrawal tests. A 6-foot-long, 1.3-inch-diameter stainless steel rod with a loop welded to one end was used as the slug for the test. The slug was suspended on new polyethylene line, which was fed through a pulley and tripod set up at the well. An unvented, 10-pounds-per-square-inch vibrating-wire pressure transducer was installed approximately 6 inches above the well bottom, and the data logger was programmed to collect water level readings at 1-second intervals. Readings were collected from approximately 30 seconds prior to slug insertion or withdrawal until the water table recovered to within 0.01 foot of the starting level for each test. The initial depth to water and total well depth at each well were measured manually with an electronic water level probe before the tests were conducted. The slug, transducer, and transducer wire were decontaminated between wells to avoid cross-contamination.

APPENDIX D

Soil Boring Logs and Well Completion Diagrams

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB01 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION General Acid Area (Northwest)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" Hollow Stem Auger with 5' continuos sampler

WATER LEVELS _____ START 10-8-96 FINISH 10-8-96 LOGGER Joel Bowker

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
			2.0		WELL-GRADED SAND, (SW-SM), fine sand with 5 to 10 percent silt, medium to large gravel, pale yellowish-brown, dry, friable.	Large rocks clogging sampler. Unable to collect complete sample.
5.0	5.0					
			5.0		5.0 feet to 8.0 feet POORLY-GRADED SAND, (SP), fine sand with trace silt, pale yellowish-brown, dry to moist, friable.	
					8.0 feet to 8.5 feet SILT, (ML), fine sand, pale yellowish-brown, wet, to moist, iron oxide (mottling) at base.	
10.0	10.0				8.5 feet to 9.5 feet SILTY SAND, (SP), fine sand, pale yellowish- brown, moist, friable, micas.	
					9.5 feet to 10.0 feet SILT, (ML), fine sand, pale yellowish-brown, wet to moist, iron oxide at base (mottling), mica flakes.	
					Bottom of boring at 10 feet.	
15.0						
20.0						
25.0						

Soil samples at 1.5, 2, 6, 8 and 10 feet

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB02 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION General Acid Area (West)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" Hollow Stem Auger with 5' continuos sampler

WATER LEVELS _____ START 10-8-96 FINISH 10-8-96 LOGGER Joel Bowker

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						Top 1 foot black top (asphalt)
			2.5		2.5 feet to 3.0 feet WELL-GRADED SAND, (SW), trace fines, light olive-gray, dry, unconsolidated. 3.0 feet to 5.0 feet POORLY-GRADED SAND, (SP), trace fines, light olive-gray, friable.	OVM = Background
5.0	5.0					
			5.0		5.0 feet to 5.5 feet same as above. 5.5 feet to 7.5 feet SILTY SAND, (SM), fine sand, light olive- gray, moist to wet.	
					7.5 feet to 8.5 feet POORLY-GRADED SAND, (SP), trace fines, light olive-gray, moist to wet. 8.5 feet to 9.5 feet SILTY SAND, (SM), fine sand, light olive- gray, moist to wet. 9.5 feet to 10.0 feet POORLY-GRADED SAND, (SP), trace fines, light olive-gray, moist, friable.	OVM = Background
10.0	10.0				Bottom of boring at 10 feet.	
15.0						
20.0						
25.0						

Soil sampled at 2.5, 4, 6, 8, and 10 feet.

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB03 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION General Acid Area (South of Control House)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" Hollow Stem Auger with 5' continuous sampler

WATER LEVELS _____ START 10-8-96 FINISH 10-8-96 LOGGER Joel Bowker

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						Top 1.5 foot asphalt and concrete rubble.
			2.5		2.5 feet to 4.0 feet WELL-GRADED SAND, (SW), light olive-gray, dry, unconsolidated.	
	5.0				4.0 feet to 5.0 feet POORLY-GRADED SAND, (SP), fined sand with trace silt, light olive-gray, dry to moist, friable.	
5.0					5.0 feet to 7.0 feet same as above.	
			3.5		7.0 feet to 7.5 feet SILTY SAND, (SM), fine sand, light olive- gray, moist, friable.	Strong odor from soil OVM = background in breathing space Downhole OVM = 400 to 500 ppm.
	10.0				7.5 feet to 10.0 feet POORLY-GRADED SAND, (SP), fine sand with trace silt, light olive-gray, moist, friable.	
10.0					Bottom of boring at 10 feet.	
15.0						
20.0						
25.0						

Soil sampled at 2.5, 4, 6, 8, and 10 feet.

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB04

SOIL BORING LOG

PROJECT Elf Atochem LOCATION General Acid Area (Southeast)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" Hollow Stem Auger with 5' continuous sampler

WATER LEVELS _____ START 10-8-96 FINISH 10-8-96 LOGGER Joel Bowker

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION	COMMENTS
0			3.5		1.5 feet to 2.5 feet WELL-GRADED SAND, (SW), medium-light gray, dry, unconsolidated. 2.5 feet to 5.0 feet POORLY-GRADED SAND, (SP), fine sand with trace silt, light olive-gray, dry, friable.	OVM = Background
5.0	5.0					
			3.5		6.5 feet to 7.0 feet WELL GRADED SAND, (SW), trace silt, light olive-gray, dry to moist, unconsolidated. 7.0 feet to 7.5 feet SILT, (ML), moderate yellowish-brown, moist to wet, medium stiff. 7.5 feet to 10.0 feet WELL-GRADED SAND, (SW), moderate brown, moist, unconsolidated.	OVM = Background
10.0	10.0				Bottom of boring at 10 feet.	
15.0						
20.0						
25.0						

Soil sampled at 0.5, 2, 5, 7.5 and 10 feet

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB05 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION General Acid Area (Northeast)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" Hollow Stem Auger with 5' continuous sampler

WATER LEVELS _____ START 10-8-96 FINISH 10-8-96 LOGGER Joel Bowker

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0			5.0		0 feet to 0.5 feet WELL-GRADED SAND, (SW), light olive-gray, dry, unconsolidated. 0.5 feet to 5.0 feet POORLY-GRADED SAND, (SP), trace fines, light olive-gray, dry, friable.	OVM = Background
5.0	5.0					
			5.0		5.0 feet to 5.5 feet same as above. 5.5 feet to 6.5 feet SILTY SAND, (SM), light olive-gray, moist, friable. 6.5 feet to 8.0 feet SILT, (ML), moderate yellowish-brown, moist to wet, medium stiff. 8.0 feet to 9.0 feet POORLY-GRADED SAND, (SP), medium gray, moist, friable. 9.0 feet to 10.0 feet SILT, (ML) light olive-gray, dry to moist, stiff.	OVM = Background
10.0	10.0				Bottom of boring at 10 feet.	
15.0						
20.0						
25.0						

Soil samples at 0.5, 2, 4, 5, 8 and 10 feet.

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB06 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION General Acid Area (North of Warehouse)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Hand Auger

WATER LEVELS _____ START 10-11-96 FINISH 10-11-96 LOGGER Valerie Panek

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					0 to 0.5 foot Crushed stone and backfill	OVM = 0
					0.5 foot to 2.0 feet WELL-GRADED SAND, (SW), medium sand with silt and gravel, some fine sand and pebbles, yellowish brown.	No pink visibile
					Bottom of boring at 2 feet.	
5.0						
10.0						
15.0						
20.0						
25.0						

Soil sampler at 2 feet.

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB07 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION General Acid Area (South end of Process Plant)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Hand Auger

WATER LEVELS _____ START 10-14-96 FINISH 10-14-96 LOGGER John Childs

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					0 to 1.5 feet Backfill crushed stone.	
					1.5 feet to 2.5 feet POORTLY-GRADED SAND, (SP), medium sand, brown.	
					2.5 feet to 4.0 feet SILTY SAND, (SM), fine sand, brown, moist.	
					Bottom of boring at 4 feet.	
5.0						
10.0						
15.0						
20.0						
25.0						

Soil sampled at 4 feet.

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB08 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION E. of overflow trench area, S. of E-W Rail Spu

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Hand Auger

WATER LEVELS _____ START 12-12-96 FINISH 12-12-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	0.5	0005			0 to 0.5 foot, POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	
	2.0	0020			0.5 to 1 foot, same as above. 1 to 2 feet, SILT, (ML), brown, moist, firm.	
	4.0	0040			2 to 2.5 feet, POORLY GRADED SAND, (SP), fine to medium sand, brown/black, moist, medium dense. 2.5 to 3 feet, SILT, (ML), gray, moist, firm.	Apperance: Fill Material
5.0	6.0	0060			3 to 4 feet, POORLY GRADED SAND WITH GRAVEL, (SP), fine to medium sand, brown, moist, medium dense.	
	8.0	0080			POORLY GRADED SAND, (SP), fine sand, gray, moist, medium dense. Same as above.	
10.0	10.0	0100			POORLY GRADED SAND, (SP), fine sand, brown, moist, medium dense.	
					Bottom of boring at 10 feet.	
15.0						
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB09

SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION North Side of Truck Turnaround

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Hand Auger

WATER LEVELS _____ START 12-13-96 FINISH 12-13-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	0.5	0005			0 to 0.5 foot, fill material.	
	2.0	0020			POORLY GRADED SAND, (SP), fine sand, brown, moist, medium dense.	
	4.0	0040			POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	
5.0	6.0	0060			Same as above.	
	8.0	0080			Same as above.	
	10.0	0100			Same as above.	
10.0					Bottom of boring at 10 feet.	
15.0						
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB10

SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Evaporation Area

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Hand Auger

WATER LEVELS _____ START 12-13-96 FINISH 12-13-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	0.5	0005			0 to 0.5 foot, fill material. 0.5 to 2 feet SILTY SAND, (SM), brown, moist, medium dense.	
	2.0	0020				
	4.0	0040			Same as above.	OVM = 7.5 ppm +
5.0	6.0	0060			POORLY GRADED SAND WITH SILT, (SP-SM), fine to medium sand, brown, moist, medium dense.	Organic matter few pebbles
	8.0	0080			Same as above.	
	10.0	0100			SILT, (ML), gray, moist, firm.	
10.0					Bottom of boring at 10 feet.	
15.0						
20.0						
25.0						

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	GA-SB11 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Evaporation Area

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Hand Auger

WATER LEVELS _____ START 12-13-96 FINISH 12-13-96 LOGGER Valerie Panek

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0	0005			Fill Material	
	4.0	0020			SILTY SAND, (SM), fine to medium sand, brown, wet, medium density.	
5.0	6.0	0040			SANDY SILT, (ML), brown, wet, soft.	
	8.0	0060			Same as above.	
	9.0	0080			Same as above.	Gray/brown silt interbeds
	10.0	0100			Same as above.	
10.0					Bottom of boring at 10 feet.	
15.0						
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB16

SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Residue Pond (North)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" HSA with 3" Split Spoon

WATER LEVELS _____ START 10-10-96 FINISH 10-10-96 LOGGER Valerie Panek

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0					
	3.5		1.0	9-13-10 (23)	SILTY SAND, (SM), fine sand, yellowish-gray, mosit, meduim dense.	
	4.5					
5.0	6.0		0.8	13-14-15 (29)	5.2 feet to 5.5 feet POORLY-GRADED SAND, (SP), medium sand, yellowish-gray, wet, friable, medium dense. 5.5 feet to 6.0 feet grayish brown.	OVM = 0
	7.0					
	8.5		1.5	6-6-5 (11)	POORLY-GRADED SAND, (SP), medium sand, dark yellowish-brown, moist medium dense.	
	9.5					
10.0	11.0		1.3	10-25-16 (41)	POORLY-GRADED SAND, (SP), medium sand, light brownish-gray, moist, dense.	OVM = 0.13 Starting to appear pink
	12.0					
	13.5		1.0	10-11-13 (24)	Same as above, medium dense.	
	14.5					
15.0	16.0		1.3	9-9-10 (19)	14.7 feet to 15.2 feet POORLY-GRADED SAND, (SP), medium grained, light brown, moist, medium dense. 15.2 feet to 16.0 feet same as above with pale red color.	OVM = 0.13 Red-DDT evident
	17.0					
	18.5		1.3	14-16-17 (33)	Same as above, pale brown.	Red coloring lightening to pinkish
	19.5					
20.0	21.0		1.3		Same as above.	OVM = 1.0
					Bottom of boring at 21 feet.	
25.0						

Soil [illegible] intervals

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB17 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Residue Pond (North)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" HSA with 3" Split Spoon

WATER LEVELS _____ START 10-9-96 FINISH 10-9-96 LOGGER Joel Bowker

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0				0 to 0.5 foot Gravel backfill	OVM = 1.0 = Background
	3.5		1.3	8-9-10 (19)	POORLY-GRADED SAND, (SP), fine sand with trace silt, light gray, moist, friable, medium dense.	
	4.5					
5.0	6.0		1.2	8-9-11 (20)	WELL-GRADED SAND, (SW), medium sand, medium-gray, moist, medium dense.	
	7.0					
	8.5		1.5	8-9-11 (20)	Same as above.	
	9.5					
10.0	11.0		1.5	8-9-10 (19)	Same as above, light gray.	Pink tint to soil
	12.0					
	13.5		1.5	9-13-9 (22)	Same as above, light gray.	OVM = background Pink tint to soil
	14.5					
15.0	16.0		1.5	8-10-8 (18)	14.5 feet to 15.0 feet same as above, light gray. 15.0 feet to 16.0 feet same as above but grayish red.	Red soil at 15 feet
	17.0					
	18.5		1.5	8-9-10 (19)	Same as above.	
	19.5					
20.0	21.0		1.5	8-8-9 (17)	Same as above, light brownish-gray. Bottom of boring at 21 feet.	Red lighter than above
25.0						Soil sampled at 5 foot intervals

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB18
	SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Residue Pond (West)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" HSA with 5 foot continuous sampler

WATER LEVELS _____ START 10-9-96 FINISH 10-9-96 LOGGER Joel Bowker

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					1.5 feet to 3.0 feet WELL-GRADED SAND, (SW), brownish-gray, moist, medium stiff.	Hard drilling
			3.5		3.0 feet to 4.5 feet SILTY SAND, (SM) fine sand, light-gray, friable.	
					4.5 feet to 5.0 feet SILTY SAND, (SM), coarse sand, brownish-gray, moist, firable.	
5.0	5.0					Organic material (wood)
						OVM = 25 in soil (SW)
			3.0		7.0 feet to 9.0 feet WELL-GRADED SAND, (SW), brownish-gray, moist, medium stiff.	OVM = 300 (ML + SM)
					9.0 feet to 9.5 feet SILTY SAND, (SM), fine sand, light gray, wet, medium stiff.	
10.0	10.0				9.5 feet to 10.0 feet SILT, (ML), yellowish-gray, wet, medium stiff, friable.	
			2.5		12.5 feet to 13.0 feet SILTY SAND, (SM), yellowish-gray, wet, medium stiff.	OVM = 1000 +
					13.0 feet to 14.0 feet SILT, (ML), medium dark gray, wet, stiff.	
					14.0 feet to 15.0 feet SILTY SAND, (SM), yellowish gray, moist, medium stiff.	
15.0	15.0				15.0 feet to 18.0 feet SILT, (ML), dark gray to light brownish- gray, moist to wet, stiff.	
			5.0		18.0 feet to 20.0 feet WELL-GRADED SAND, (SW), coarse sand, moderate olive-brown, moist to wet, loose.	OVM = 1140
20.0	20.0					
			2.5		22.5 feet to 25.0 feet WELL-GRADED SAND, (SW), moderate olive- brown, wet, loose.	
25.0	25.0				Bottom of boring at 25 feet.	OVM = 440 Driller believes to be at water table, heave of fine-grained sand in augers Observed no pink/red color in soil

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB19 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Residue Pond (South)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" HSA with 3" Split Spoon

WATER LEVELS _____ START 10-10-96 FINISH 10-10-96 LOGGER Valerie Panek

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0					
	3.5		0.5	11-15-16 (31)	SILTY SAND, (SM), medium sand, very light gray, dry, friable, dense.	
	4.5					
5.0	6.0		1.3	5-6-7 (13)	4.7 feet to 5.0 feet WELL-GRADED SAND, (SW), medium sand, light gray, dry. 5.0 feet to 6.0 feet SILTY SAND, (SM), light olive gray, moist, medium dense.	OVM = 0
	7.0					
	8.5		1.3	9-9-12 (21)	POORLY-GRADED SAND, (SP), medium sand, olive-brown, moist, medium dense.	
	9.5					
10.0	11.0		1.5	12-15-11 (26)	Same as above, slighty more moist and brown.	OVM = 0.8
	12.0					
	13.5		1.3	15-11-15 (26)	Same as above.	
	14.5					
15.0	16.0		1.5	11-15-7 (22)	Same as above.	OVM = 0
	17.0					
	18.5		1.5	7-9-10 (19)	Same as above.	
	19.5					
20.0	21.0		1.5		Same as above.	OVM = 0
	22.0					
	23.5		1.5	11-15-18 (33)	Same as above.	
	24.0					
25.0	25.5		1.5	11-13-14 (27)	24.3 feet to 24.8 feet same as above. 24.8 feet to 25.5 color change from light olive-gray to yellowish-gray to medium-gray at water table.	Water table
					Bottom of boring at 25.5 feet.	

Soil sampled at 5 foot intervals

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB20 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Residue Pond (East)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" diameter Hollow Stem Auger with 3" Split Spoon

WATER LEVELS _____ START 10-10-96 FINISH 10-10-96 LOGGER Valerie Panek

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0					
	3.5		0.5		Gravel backfill	White precipitate 1 inch thick disk of hard, lime-green material, smells like lysol.
5.0	7.0					OVM = 50
	8.5		1.3	8-9-9 (18)	POORLY-GRADED SAND, (SP), medium sand, dark yellowish-brown, moist, medium dense.	OVM = 2 Soil sampled at 8 feet
	9.5					
10.0	11.0		1.5	8-9-9 (18)	Same as above.	
	12.0					
	13.5		1.5	5-7-9 (16)	12.3 feet to 12.8 feet same as above, fining downward. 12.8 feet to 13.5 SILTY SAND, (SM).	
	14.5					
15.0	16.0		1.5	3-3-4 (7)	POORLY-GRADED SAND, (SP), medium sand, dark yellowish-brown, moist, loose.	Organic material
	17.0					
	18.5		1.3	5-5-6 (11)	Same as above.	
	19.5					
20.0	21.0		1.5	5-6-6 (12)	19.8 feet to 20.3 feet same as above. 20.3 feet to 20.8 feet moderate brown. 20.8 feet to 21.0 feet light olive-gray.	
	22.0					
	23.5		1.5	5-6-6 (12)	POORLY-GRADED SAND, (SP), medium sand, light brownish-gray, moist, medium dense.	Slightly pink above water table
	25.0		1.4	5-6-6 (12)	23.9 feet to 24.4 feet mottled light brownish-gray with moderate olive-brown 24.4 feet to 25.0 feet gray, wet.	Less pink (more gray) than above
25.0					Bottom of boring at 25 feet.	Water Table

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB21 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" HSA with 3" Split Spoon

WATER LEVELS _____ START 10-11-96 FINISH 10-11-96 LOGGER Valerie Panek

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					Surface - gravel backfill	
	2.0					
	3.5		1.3	10-13-14 (27)	2.2 feet to 2.5 feet gravel backfill 2.5 feet to 3.5 SILTY SAND, (SM), moist, medium dense.	OVM = 3 Red color at 2.5 feet and below
	4.5					
5.0	6.0		1.0	10-9-19 (19)	5.0 feet to 5.1 feet WELL-GRADED SAND, (SW), some cobbles and silt, dark brown. 5.1 feet to 6.0 feet POORLY-GRADED SAND, (SP), medium sand, medium dense.	Pink color
	7.0					
	8.5		1.5		Same as above.	Pink
	9.5					
10.0	11.0		1.5		Same as above with yellow hue.	Pink
	12.0					
	13.5		1.2		Same as above.	Pink
	14.5					
15.0	16.0		1.5		Same as above.	Pink
	17.0					
	18.5		1.5		Same as above.	Pink
	19.5					
20.0	21.0		1.5		Same as above. Bottom of boring at 21 feet.	Pink
25.0						

Soil sampled at 5 foot intervals

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB22

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Trench (West of RPSB21)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" HSA with 3" Split Spoon

WATER LEVELS _____ START 10-11-96 FINISH 10-11-96 LOGGER Valerie Panek

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	4.5					
5.0	6.0		1.5		4.5 feet to 4.7 feet SANDY SILT, (ML), fine sand, yellowish-brown, moist, plastic. 4.7 feet to 5.5 feet SILT, (ML), yellowish gray, plastic.	No pink visible
	7.0				5.5 feet to 6.0 feet POORLY-GRADED SAND, (SP), medium sand, dusky yellow.	
	8.5		1.5		7.0 feet to 8.5 feet POORLY-GRADED SAND, (SP), medium sand, dusky yellow grading to dark brown.	
	9.5					
10.0	10.0		0.5		9.5 feet to 10.0 feet SILT, (ML), yellowish-gray, wet, plastic. Bottom of boring at 10 feet.	
15.0						
20.0						
25.0						

Soil samples at 5 and 10 feet

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB23 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Trench (East of RPSB21)

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT 8" HSA with 3" Split Spoon

WATER LEVELS _____ START 10-11-96 FINISH 10-11-96 LOGGER Valerie Panek

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0					
	3.5		1.3		POORLY-GRADED SAND, (SP), medium sand, olive-gray.	
	4.5					
5.0	6.0		1.5		Same as above.	No pink visible
	7.0					
	8.5		1.5		Same as above.	
	9.5					
10.0	11.0		1.5		Same as above.	
					Bottom of boring at 11 feet.	
15.0						
20.0						
25.0						

soil samples at and 10 feet

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB24 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-12-96 FINISH 12-12-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0	0020			SILTY SAND, (SM), fine to medium sand, brown, moist, medium dense.	
	4.0					
5.0	6.0	0050			Same as above.	
	9.0					
10.0	11.0	0100			Same as above.	
					Bottom of boring at 11 feet.	
15.0						
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB25
	SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-12-96 FINISH 12-12-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0	0020			0 to 0.5 foot, fill material.	
	4.0				SILTY SAND, (SM), fine to medium sand, brown, moist, medium dense.	
5.0	6.0	0050			Same as above.	
	9.0					
10.0	11.0	0100			Same as above.	
					Bottom of boring at 11 feet.	
15.0						
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB26

SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-12-96 FINISH 12-12-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
5.0	4.0				POORLY GRADED SAND, (SP), fine-medium sand, brown, moist, medium dense.	
	6.0	0050				4 to 5 feet, Pink Coloration
	9.0					
10.0	11.0	0100				
					Bottom of boring at 11 feet.	
15.0						
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
115946.FW.ZZ	RP-SB27	SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-12-96 FINISH 12-12-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0	0020			0 to 0.25 foot, gravel fill. 0.25 to 1 foot, POORLY GRADED SAND WITH SILT, (SP-SM), fine to medium sand, brown, moist, medium dense. 1 to 2 feet, POORLY GRADED SAND, (SP), fine sand, gray, moist, medium density.	
	4.0					
5.0	6.0	0050			POORLY GRADED SAND, (SP), fine sand, olive, moist, medium dense.	
	9.0					
10.0	11.0	0100			POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	Pink Coloration
	14.0					
15.0	16.0	0150			Same as above.	Pink Coloration
	19.0					
20.0	21.0	0200			Same as above.	Pink Appearance, Groundwater Encountered
					Bottom of boring at 21 feet.	
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB28

SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-12-96 FINISH 12-12-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	4.0					
5.0	6.0	0050			4 to 4.5 feet, SILT WITH SAND, (ML), gray, moist, firm. 4.5 to 5.0 feet, SILT, (ML), gray, moist, firm. 5 to 6 feet, POORLY GRADED SAND WITH SILT, (SP-SM), fine to medium sand, brown, moist, dense.	4 to 4.5 feet, Faint Pink Coloration
	9.0					
10.0	11.0	0100			POORLY GRADED SAND WITH SILT, (SP-SM), fine to medium sand, dark brown, moist, medium dense.	
	14.0					
15.0	16.0	0150			POORLY GRADED SAND, (SP), fine to medium sand, gray/brown, moist, medium dense.	Faint Pink Coloration
	19.0					
20.0	21.0	0200			Same as above.	Pink Coloration, Groundwater Encountered
					Bottom of boring at 21 feet.	
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB29 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-12-96 FINISH 12-12-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0				0 to 1 foot, fill material. 1 to 2 feet, POORLY GRADED SAND WITH SILT, (SP-SM), brown, moist, medium dense.	
	4.0				Same as above.	
5.0	6.0	0050			Same as above.	4 to 4.5 feet, Faint Pink Coloration
	8.0				Same as above.	
10.0	10.0				Same as above.	
	12.0	0100			Same as above.	
	14.0				Same as above.	
15.0					Bottom of boring at 14 feet.	Faint Pink Coloration
20.0						Pink Coloration, Groundwater Encountered
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB30

SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-12-96 FINISH 12-12-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					0 to 1 foot fill material. 1 to 2 feet, POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense. 2 to 3 feet, same as above. 3 to 4 feet, SILT WITH SAND, (ML), gray, moist, firm.	
	4.0					
5.0		0050			Same as above.	
	6.0				6 to 7 feet, SILT, (ML), gray, moist, firm.	Thin lenses of pink coloration
	8.0				7 to 8 feet, POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	
		0800			Same as above	
10.0	10.0					
	12.0				Same as above	
		0140			Same as above	
	14.0					
15.0					Bottom of boring at 14 feet.	
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
115946.FW.ZZ	RP-SB31	SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-12-96 FINISH 12-12-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0				0 to 1 foot, fill material. 1 to 2 feet, POORLY GRADED SAND, (SP), fine to medium sand, gray/brown, moist, medium dense.	1 to 2 feet, Pink Coloration.
	4.0				Same as above.	Same as above
5.0	6.0	0050			Same as above.	Same as above
	8.0				6 to 7 feet, SANDY SILT WITH GRAVEL, (MH), gray, moist, firm, with white precipitate and organic matter. 7 to 8 feet, POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	6 to 7 feet, Same as above 7 to 8 feet, Faint Pink Coloration
10.0	10.0	0100			POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense, with white precipitate and organic matter.	
	12.0				POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	
	14.0	0140			Same as above	
15.0					Bottom of boring at 14 feet.	
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB32

SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-12-96 FINISH 12-12-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0				0 to 1 foot, fill material. 1 to 2 feet, POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense. 2 to 4 feet, SILT WITH SAND, (ML), brown, moist, firm.	
	4.0					
5.0	6.0	0050			Same as above. 6 to 7 feet, SILT, (ML), gray, wet, soft. 7 to 8 feet, POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	
	8.0					
10.0	10.0	0100			Same as above.	
	12.0				Same as above.	
	14.0	0150			Same as above.	
15.0	16.0				Same as above.	
	18.0	0180			POORLY GRADED SAND, (SP), fine to medium sand, gray, moist, medium dense.	Faint Pink Coloration
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB33

SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-13-96 FINISH 12-13-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0				0 to 1 foot, fill material. 1 to 2 feet, POORLY GRADED SAND, (SP), fine to medium sand, gray, moist, medium dense.	Pink Coloration
	4.0				POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	Pink Coloration
5.0	6.0	0050			4 to 5.5 feet, same as above. 5.5 to 6 feet, POORLY GRADED SAND, (SP), fine to medium sand, dark gray, moist, medium dense.	4 to 4.5 feet, Pink Coloration
	8.0				POORLY GRADED SAND, (SP), fine to medium sand, brown/gray, moist, medium dense.	
10.0	10.0	0100			Same as above.	8.75 to 9 feet, Pink Lense
	12.0				Same as above.	10.5 to 10.75 feet, Pink Lense
	14.0				Same as above.	
15.0	16.0	0150			POORLY GRADED SAND, (SP), fine to medium sand, gray, moist, medium dense.	
	18.0				Same as above.	
20.0	20.0	0200			POORLY GRADED SAND, (SP), fine to medium sand, gray, wet, medium dense.	Groundwater Encountered
					Bottom of boring at 20 feet.	
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB34 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-13-96 FINISH 12-13-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0				0 to 1 foot, fill material. 1 to 2 feet, POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	Pink Coloration
	4.0				Same as above.	Pink Coloration 4 to 4.5 feet, Pink Coloration
5.0	6.0	0050			Same as above.	
	8.0				Same as above.	
	10.0	0100			Same as above.	
10.0						
	14.0					
15.0	16.0	0150			POORLY GRADED SAND, (SP), fine to medium sand, gray, moist, medium dense.	
	18.0					
	20.0	0200			POORLY GRADED SAND, (SP), fine to medium sand, gray, wet, medium dense.	Groundwater Encountered
20.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB35 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-13-96 FINISH 12-13-96 LOGGER Steve O'Malley

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0	0020			0 to 1 foot, fill material. 1 to 2 feet, POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	
	4.0					
5.0	6.0				POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	Sample Not Collected
	8.0					
	10.0	0100			Same as above.	
10.0	14.0					
15.0	16.0	0150			Same as above.	
	18.0					
	20.0	0200			POORLY GRADED SAND, (SP), fine to medium sand, brown, wet, medium dense.	Groundwater Encountered
20.0						
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB36 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-13-96 FINISH 12-13-96 LOGGER Valerie Panek

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0	0020			0 to 1.5 feet, gravel, cobbled fill. 1.5 to 2 feet, brown sand, damp, fine to medium.	
	4.0				POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	
5.0	6.0				Same as above.	
	8.0				Same as above.	
	10.0				Same as above.	
10.0	12.0				Same as above.	
	14.0					
15.0	16.0	0150			14 to 14.5 feet, POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense. 14.5 to 16 feet, POORLY GRADED SAND, (SP), fine sand, brown/gray, moist, medium dense.	Abrupt color change Slight MCB odor
	18.0				POORLY GRADED SAND, (SP), fine to medium sand, gray, moist, medium dense.	
	20.0	0200			POORLY GRADED SAND, (SP), fine to medium sand, gray, wet, medium dense.	Groundwater Encountered
20.0					Bottom of boring at 20 feet.	
25.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
115946.FW.ZZ	RP-SB37 SHEET 1 OF 1

SOIL BORING LOG

PROJECT Elf Atochem LOCATION Overflow Trench

ELEVATION _____ DRILLING CONTRACTOR Geo-Tech Explorations

DRILLING METHOD AND EQUIPMENT Geoprobe with disposable plastic sample sleeve

WATER LEVELS _____ START 12-13-96 FINISH 12-13-96 LOGGER Valerie Panek

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY FEET	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	2.0				0 to 0.5 foot, fill material. 0.5 to 2 feet, POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	1.75 to 2 feet, Faint Pink Coloration
	4.0				2 to 2.5 feet, same as above. 2.5 to 4 feet, SILT, (ML), gray, moist, firm, interbedded brown silt.	Faint Pink Coloration
5.0	6.0	0050			POORLY GRADED SAND, (SP), fine sand, brown, moist, medium dense.	Faint Pink Coloration
	8.0				POORLY GRADED SAND, (SP), fine to medium sand, brown, moist, medium dense.	Pink Coloration
10.0	10.0	0100			Same as above.	Pink Coloration
	12.0				Same as above.	Faint Pink Coloration
	14.0				Same as above.	Faint Pink Coloration
15.0	16.0	0150			Same as above.	15 to 15.5 feet, Pink Lense
	18.0				Same as above.	Pink Coloration
20.0	20.0	0200			Same as above.	Faint Pink Coloration Groundwater Encountered
					Bottom of boring at 20 feet.	
25.0						

PROJECT NUMBER	BORING NUMBER	
115946.FW.ZZ	MWA-1	SHEET 1 OF 1

SOIL BORING LOG

PROJECT :	Elf Atochem	LOCATION :	Portland, Oregon
ELEVATION :	34.14 ft (PVC), 34.44 ft (casing)	DRILLING CONTRACTOR :	Environmental West Exploration
DRILLING METHOD AND EQUIPMENT USED :		Tubex - Air rotary, 6-inch diameter	
WATER LEVELS :	17.62 feet from TOC, 12/12/96	START : 12/11/96 END: 12/11/96	LOGGER : Heidi Hoffmann

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
5	4-6	2 feet	SS-1	3-3-3-3	Sandy Silt, SM,tan, saturated, soft, laminated, Fe-oxide staining along laminae, mica, no odor, OVM = 0 ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
10	9-11	2 feet	SS-2	1-2-3-5	Sandy Silt, ML, dk green, reduced, saturated, soft, finely laminated, dk green and dk brown layers, mica, sand vs silt content changes along laminae, bottom 3 inches are clean sand, moist, no odor, OVM = 0.2 ppm (background)	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
15	14-16	2-feet	SS-3	2-3-3-3	Silty Sand, SM, dk greenish brown, saturated, laminated, sand is fine, mica, few pin-sized oily spots, no odor, OVM = 0 ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
20	19-21	2-feet	SS-4	3-6-8-13	Sand with Silt, SM, dk brown to greenish brown, saturated, laminated, silt content 5-10%, mica, few pin-sized oily spots concentrated at 20 feet, no odor	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0% Heaving Sands
30	30-31	2-feet	SS-5		Sand, SP, black, saturated, medium, loose, 5% lighter quartz, feidspars, no mica, strong H2S odor, OVM = 0 ppm	Heaving sands
35					Bottom of Hole = 33.5 feet	

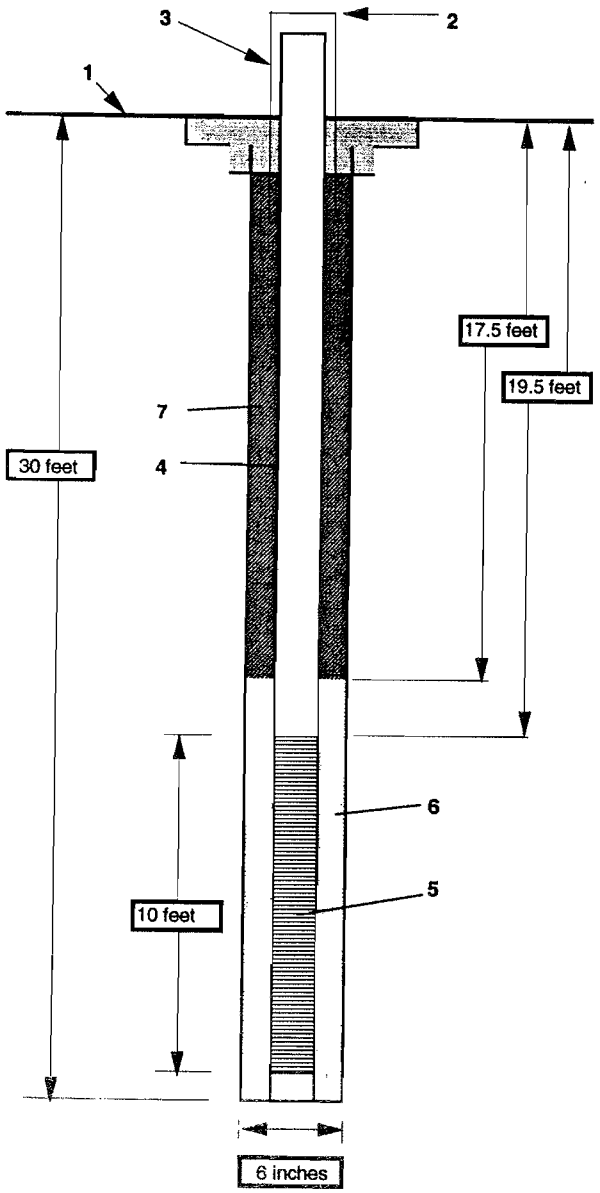
APPENDIX E

Well Development and Groundwater Sampling Field Sheets

PROJECT NUMBER	BORING NUMBER		
115946.FW.ZZ	MWA-4	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : Elf Atochem		LOCATION :	Portland, Oregon
ELEVATION : 36.46 ft (PVC)		DRILLING CONTRACTOR :	Environmental West Explorations
DRILLING METHOD AND EQUIPMENT USED :		Tubex, Air Rotary, 6-inch diameter	
WATER LEVELS : 21.30 feet from top of casing, 12/13/96		START : 12/13/96 END : 12/13/96	LOGGER : Heidi Hoffmann



1- Ground elevation at well: 33.60 feet

2- Top of casing elevation: 36.42 feet
a) vent hole? No

3- Wellhead protection cover type: Above ground 6-inch mild steel casing with locking cap; dollar cap on PVC well
Concrete pad - 3 feet by 3-feet

4- Diameter/type of well casing: 2-inch flush-threaded sch. 40 PVC, with 10-feet of stainless casing above screen

5- Type/slot size of screen: 2-inch diameter, 10-slot, stainless steel, Johnson, screen

6- Type screen filter: 10 X 20 Colorado Silica Sand
a) Quantity used: 3 100-lb bags

7- Type of seal: Hole-Plug 3/8-inch
a) Quantity used: 3 50-lb bags

Development method: Pump and surge

Development time: 2 hours

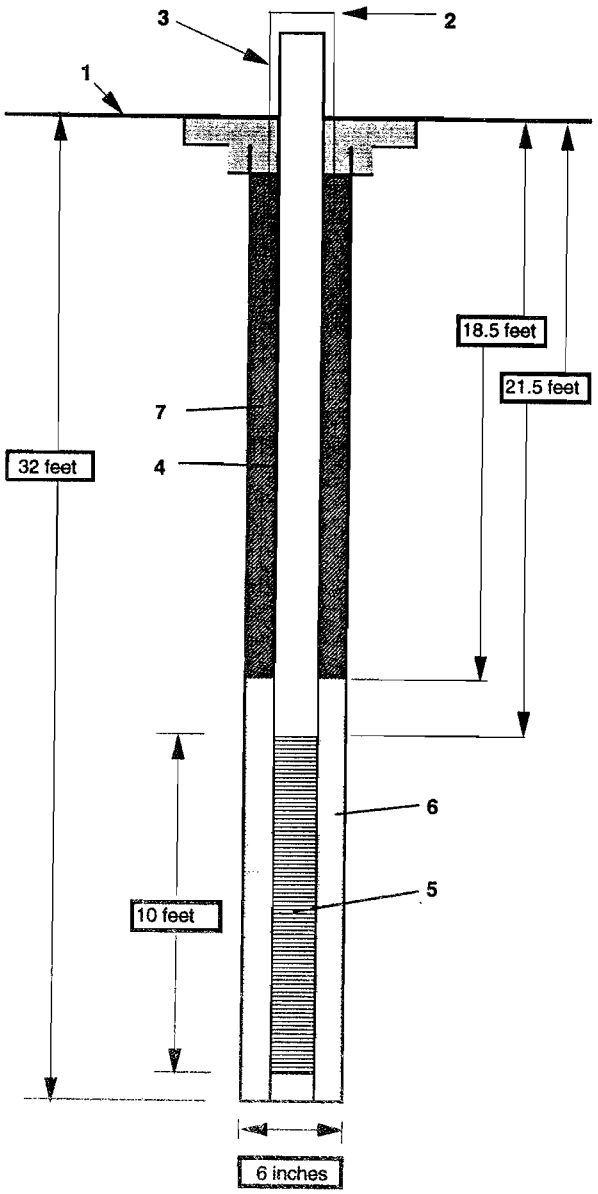
Estimated purge volume: 110 gallons

Comments: 60 gallons of water added during well drilling

PROJECT NUMBER	BORING NUMBER		
115946.FW.ZZ	MWA-2	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : Elf Atochem		LOCATION :	Portland, Oregon
ELEVATION : 36.48 ft (PVC)		DRILLING CONTRACTOR :	Environmental West Explorations
DRILLING METHOD AND EQUIPMENT USED :		Tubex, Air Rotary, 6-inch diameter	
WATER LEVELS : 20.60 feet from top of casing, 12/13/96		START : 12/11/96 END : 12/11/96	LOGGER : Heidi Hoffmann



1- Ground elevation at well: 33.50 feet

2- Top of casing elevation: 36.39 feet
a) vent hole? No

3- Wellhead protection cover type: Above ground 6-inch mild steel casing with locking cap; dollar cap on PVC well
Concrete pad - 3 feet by 3-feet

4- Diameter/type of well casing: 2-inch flush-threaded sch. 40 PVC, with 10-feet of stainless casing above screen

5- Type/slot size of screen: 2-inch diameter, 10-slot, stainless steel, Johnson, screen

6- Type screen filter: 10 X 20 Colorado Silica Sand
a) Quantity used: 3 100-lb bags

7- Type of seal: Hole-Plug 3/8-inch
a) Quantity used: 3 50-lb bags

Development method: Pump and surge

Development time: 1 hour

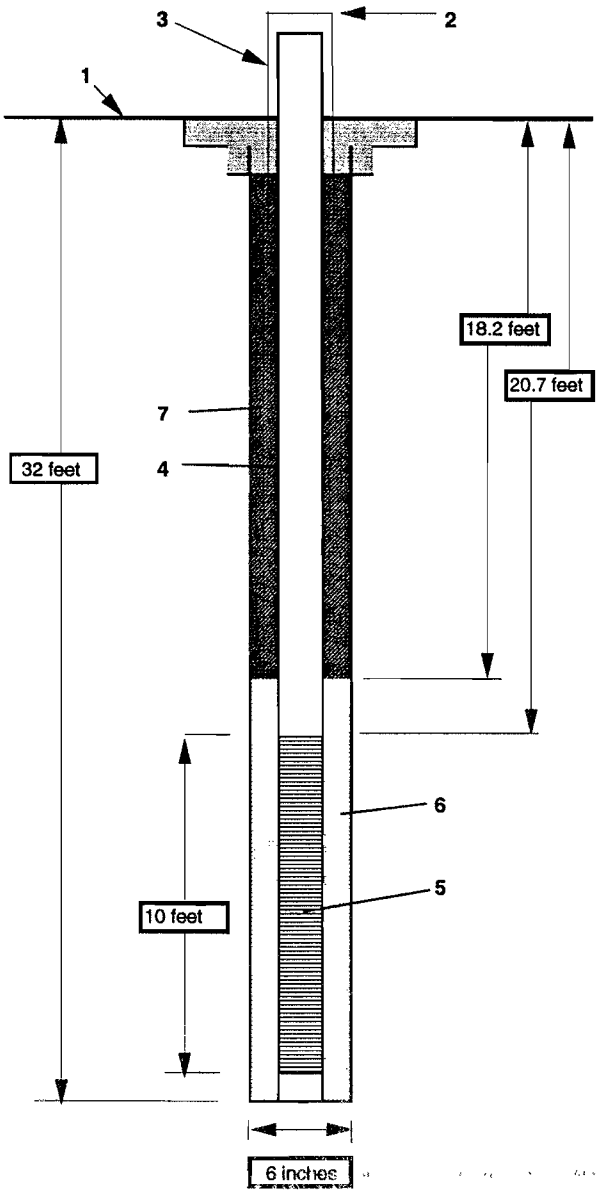
Estimated purge volume: 185 gallons

Comments: 140 gallons of water added during well drilling

PROJECT NUMBER	BORING NUMBER		
115946.FW.ZZ	MWA-3	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : Elf Atochem		LOCATION :	Portland, Oregon
ELEVATION : 37.46 ft (PVC)		DRILLING CONTRACTOR :	Environmental West Explorations
DRILLING METHOD AND EQUIPMENT USED :		Tubex, Air Rotary, 6-inch diameter	
WATER LEVELS : 22.44 feet from top of casing, 12/13/96		START : 12/12/96 END : 12/12/96	LOGGER : Heidi Hoffmann



1- Ground elevation at well: 34.30 feet

2- Top of casing elevation: 37.40 feet
a) vent hole? No

3- Wellhead protection cover type: Above ground 6-inch mild steel casing with locking cap; dollar cap on PVC well
Concrete pad - 3 feet by 3-feet

4- Diameter/type of well casing: 2-inch flush-threaded sch. 40 PVC, with 10-feet of stainless casing above screen

5- Type/slot size of screen: 2-inch diameter, 10-slot, stainless steel, Johnson, screen

6- Type screen filter: 10 X 20 Colorado Silica Sand
a) Quantity used: 3 100-lb bags

7- Type of seal: Hole-Plug 3/8-inch
a) Quantity used: 3 50-lb bags

Development method: Pump and surge

Development time: 1.3 hours

Estimated purge volume: 150 gallons

Comments: 90 gallons of water added during well drilling

PROJECT NUMBER	BORING NUMBER	
115496.FW.ZZ	MWA-4	SHEET 1 OF 1

SOIL BORING LOG

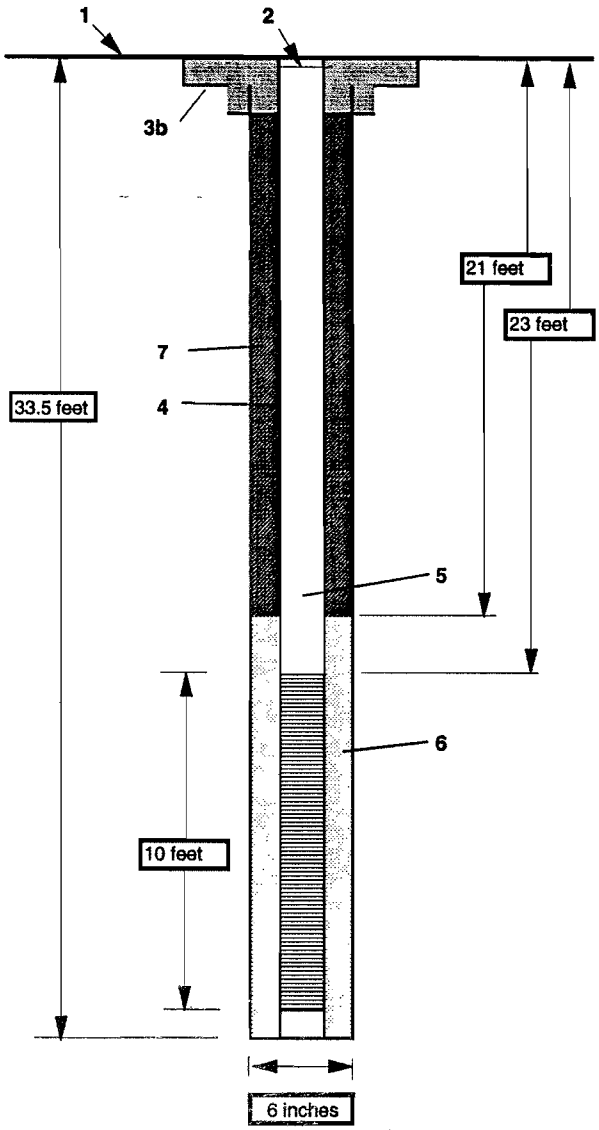
PROJECT :	Elf Atochem	LOCATION :	Portland, Oregon
ELEVATION :	36.46 ft (PVC), 36.42 ft (Protective casing)	DRILLING CONTRACTOR :	Environmental West Exploration
DRILLING METHOD AND EQUIPMENT USED :		Tubex - Air rotary, 6-inch diameter	
WATER LEVELS :	21.30 feet from TOC, 12/13/96	START : 12/13/96 END: 12/13/96	LOGGER : Heidi Hoffmann

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
5						
10					Silt, ML, brown, very soft, moist. No sample - based on cuttings	Downhole and Breathing Space: O_2=20.9% OVM = 0.5ppm LEL = 0%
15					Silty Gravel, GM, brown, moist, soft, no odor. No sample - based on cuttings.	Downhole and Breathing Space: O_2=20.9% OVM = 0.5ppm LEL = 0%
20	20-22	2 inches	SS-1	3-6-10-13	Silty gravel, GM, fill material, brown, moist, no odor, OVM = 0ppm	Downhole and Breathing Space: O_2=20.9% OVM = 0.5ppm LEL = 0%
25	24-26	2 feet	SS-2	1-2-10-14	Sand, SP, rusty to black, saturated, loose, 5% light grains medium sand, 1"silt layer at 25.5,slight odor, OVM = 0ppm	Downhole and Breathing Space: O_2=20.9% OVM = 0.5ppm LEL = 0%
	27.8-29.8	2 feet	SS-3	1-1-1-1	Sand, SP, dk brown, saturated, loose, 5% light grains medium sand, slight odor, OVM = 0 ppm	Downhole and Breathing Space: O_2=20.9% OVM = 0.5ppm LEL = 0%
30	30-32	2 feet	SS-4		30-31' Sand, SP, brown with creamy colored clay pieces, medium, loose 31-32': 2"laminated Silt with organic carbon, 4" brown laminated silt, 3" cream colored clay, 3" sand at bottom. Strong odor OVM = 22 ppm	
35					Bottom of hole = 32 feet	

PROJECT NUMBER	BORING NUMBER		
115946.FW.ZZ	MWA-1	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : Elf Atochem		LOCATION :	Portland, Oregon
ELEVATION : 34.14 ft (PVC)		DRILLING CONTRACTOR :	Environmental West Explorations
DRILLING METHOD AND EQUIPMENT USED :		Tubex, Air Rotary, 6-inch diameter	
WATER LEVELS : 17.62 feet from top of casing, 12/12/96		START : 12/11/96 END : 12/11/96	LOGGER : Heidi Hoffmann



1- Ground elevation at well: 34.40 feet

2- Top of casing elevation: 34.40 feet
a) vent hole? No

3- Wellhead protection cover type: Sherwood flush mount box with locking dollar cap
a) weep hole? No
b) concrete pad dimensions: 2-feet diameter sloping away from well

4- Diameter/type of well casing: 2-inch flush-threaded sch. 40 PVC, with 10-feet of stainless blank casing above screen

5- Type/slot size of screen: 2-inch diameter, 10-slot, stainless steel, Johnson, screen

6- Type screen filter: 10 X 20 Colorado Silica Sand
a) Quantity used: 3 100-lb bags

7- Type of seal: Hole-Plug 3/8-inch
a) Quantity used: 6 50-lb bags

Development method: Pump and surge

Development time: 2 hours

Estimated purge volume: 105 gallons

Comments: 40 gallons of water added during well drilling

PROJECT NUMBER	BORING NUMBER	
115946.FW.ZZ	MWA-2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT :	Elf Atochem	LOCATION :	Portland, Oregon
ELEVATION :	36.48 ft (PVC), 36.39 ft (Protective casing)	DRILLING CONTRACTOR :	Environmental West Exploration
DRILLING METHOD AND EQUIPMENT USED :		Tubex - Air rotary, 6-inch diameter	
WATER LEVELS :	20.60 feet from TOC, 12/13/96	START : 12/12/96 END: 12/12/96	LOGGER : Heidi Hoffmann

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
5						Drill casing dropped from 5-10 feet, very soft silt
10					Silt, ML, brown, satuated, very soft. No sample-based on cuttings.	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
15					Silt, ML, brown, saturated, soft, no odor. No sample.	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
20	20-22	2 feet	SS-1	2-3-5-12	Silty gravel, GM, fill material, brown, saturated, some gray silt, slight odor, OVM = 0ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
	22-24	2 feet	SS-2	4-10-14-12	Sand, SP, dark brown and black, saturated, loose, 5% light grains, medium sand, no odor, OVM = 0ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
25	24-26	2 feet	SS-3	6-7-11-13	Sand, SP, rusty to black, saturated, loose, 5% light grains, medium sand, 1"silt layer at 25.5,slight odor, OVM=0ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
	27-29	2 feet	SS-4	2-4-6-9	Sand, SP, dk brown, rusty, saturated, loose, 5% light grains medium sand, 1"clay layer at 28', slight odor, OVM = 15ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
30	29-31	2 feet	SS-5		Sand, SP, dark brown, rusty, saturated, loose, 5% light grains, 10% silt, medium sand, slight odor, OVM = 14ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
35					Bottom of hole = 32 feet	

PROJECT NUMBER	BORING NUMBER	
115946.FW.ZZ	MWA-3	SHEET 1 OF 1

SOIL BORING LOG

PROJECT :	Elf Atochem	LOCATION :	Portland, Oregon
ELEVATION :	37.46 ft (PVC), 37.40 ft (Protective casing)	DRILLING CONTRACTOR :	Environmental West Exploration
DRILLING METHOD AND EQUIPMENT USED :		Tubex - Air rotary, 6-inch diameter	
WATER LEVELS :	22.44 feet from TOC, 12/13/96	START : 12/12/96 END: 12/12/96	LOGGER : Heidi Hoffmann

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
5						
10					Silt, ML, brown, moist, very soft. No sample - based on cuttings.	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
15					Silty Gravel, GM, brown, moist, soft, no odor. No sample - based on cuttings	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
20	20-22	3 inches	SS-1	2-3-5-4	Silty gravel, GM, fill material, brown, moist, no odor, OVM = 0ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
	22-24	8 inches	SS-2	2-3-4-6	Silty gravel, GM, fill material, brown, moist, no odor, OVM = 0ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
25	24-26	2 feet	SS-3		Sand, SP, rusty to black, saturated, loose, 5% light grains medium sand, 1"silt layer at 25.5,slight odor, OVM = 0ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
	27.5-29.5	2 feet	SS-4	2 for 2 feet	Sand, SP, dk brown, saturated, loose, 5% light grains medium sand, slight odor, OVM = 0 ppm	Downhole and Breathing Space: O_2=20.9% OVM=0.5ppm LEL=0%
30						
35					Bottom of hole = 32 feet	

CH2M HILL WELL DEVELOPMENT FIELD LOG

Well I.D.: MWA1

Client: ATOChem	Well Dia:(in.): 2"
Project #:	Sand Pack Dia (in.): 6"
Developed By: MDA; VAP	Bore Hole Dia (in.): 6"
	Total Gallons Removed: ~105
Standing Well Volume (gallons @ 30% porosity): 7.3 gal.	
Note: 40 gal of H_2O added during Construction	
Start: Date 12/16/96 Time:	DTW (ft. from TOC): 17.82 Total Depth(ft. from TOC): ~~33.18+.3~~ 33.18
Stop: Date / / Time:	DTW (ft. from TOC): 4.7 Total Depth(ft. from TOC): ~~33.18+.3~~ 33.4
Development Method / Comments: 2" Grundfos [(.3)15.72] + 2.6 = ~~18.33~~ 7.3	
2" in 6" = 1.31 gal/FT Ann. Space x 12 = 15.72 + [(33.18 - 17.82) x .17 = 2.6]	

Time	DTW ft. from TOC	Volume Removed (gallons)	Spec. Cond. (micromohs/cm)	Temp. (oC)	Ph	Hg ~~Eh~~	Purge Rate (gal/min)	Continuous Surging (Y/N)	Clarity/ Color/Remarks
0946						150	~0.5	Y	Cleaning Bottom of Well. 10.6 PID Initial Casing 0.2 PPM
0950 0958	 18.05		13,490	15.9	11.93		~~~0.75~~ ~1.0	Y	Dark brown, some oil on surface, no sediment visible - sediment settled to bottom after setting
1005	18.20	~18	11,410	15.8	11.76		~~~0.7~~ 1.0	Y	Dark brown, cloudy, Sheen
	Sediment in Bottom of Cup looks like silt								droplets on top After Setting
10:24	18.15	~36	11,070	16.5	11.61		~~~0.7~~ ~1.0	Y	OPAQUE, DARK Brown No Sheen
10:38 1054	18.13 18.10	~55 ~73	10,680 12,590	16.4	11.55 11.80		~~~0.7~~ ~1.0	Y	Same as above - less sediment " Same silt/sand sediment less than above
						~~130~~ 117	0.5	N	Pump Above Screen
FID DRUM = BG Well Casing FLI = 10 PPM PID " = BG PID = 1 PPM									
1124	18.05	~89	11,280	~~15.7~~	11.62	117	0.5	N	19 NTU's still opaque Very Dark Brown
1137		~95	11,200	16.1	11.60		0.5	N	16 NTU's very dark brown, opaque
FID DRUM = Background Well casing = 7 ppm PID PID DRUM = Background Well casing = 1 ppm PID									
1149 1154	18.02 Pump off	~102	11,200	16.8	11.59	117	0.5	N	14 NTU's very dark

See MWA2 for Instrument Calibration
Back of Pg 1

CH2M HILL WELL DEVELOPMENT FIELD LOG

Well I.D.: MWA2

Client: ELP Atochem | Well Dia:(in.): 2"
Project #: 115946.FW.22 | Sand Pack Dia (in.): 6"
Developed By: MDA, VAP | Bore Hole Dia (in.): 6"
Total Gallons Removed:
Standing Well Volume (gallons @ 30% porosity): 6.9 gal
Note: 140 gal. H_2O added during construction
Start: Date 2/16/96 Time: DTW (ft. from TOC): 22.25' Total Depth(ft. from TOC): 35.10' (34.8+0.3
Stop: Date / / Time: DTW (ft. from TOC): Total Depth(ft. from TOC): 35.20' (34.9+0.3
Development Method / Comments: 2" Grundfos 12.85' x 0.17 gal/ft = 2.18 gal in casing
(0.3)(1.31 x 12ft) = 4.72 4.72+2.18 = 6.89 gal total volume annulus + casing

Time	DTW ft. from TOC	Volume Removed (gallons)	Spec. Cond. (micromohs/cm)	Temp. (oC)	Ph	Eh NO/H3	Purge Rate (gal/min)	Surging (Y/N)	Clarity/ Color/Remarks
13:45	PID + FID ≅ 6 ppm downhole					250	~~A~~3	Y	Silty, very cloudy, light brown PID ~ 8ppm FID ~ 4 over drum
13:54		~27	~~480~~ invalid	18.2	6.26	250	~3.0	Y	Silty, VC, light brown
13:57						260	"	Y	
1359	22.70	~40	~~#6535~~	18.2	6.13	"	~3	Y	Silty, VC, light brown, greyish hue
1403		~65	512	18.1	6.2	300		Y	
1407		~83	615	18.1	6.11	"	~5	Y	Same as above
			—			"	"	N	Turbidity 190 NTU's when not surging
1413	22.80	110	725	18.2	6.12	"	~5.0	Y	FID = 15 PID = 2 Drum silty, light brown
			—			320	3 "	Y	
1426	22.95	~149	500	18.0	6.23	"	~4.5	N	95 NTU's ~~clear~~ Cloudy color
1424		165	—			110		N	
1430		~173	440	17.9	6.22	"	0.9	N	Slightly cloudy, colorless 10.6 NTU's
			—						
1441		183	450	17.6	6.26	"	0.9	N	Very Clear 3.65 NTU's colorless
1444	Pump off								

Cont. on C.O. on Back

pH =

Orion 290A # 3099 4.00, 7.05 & 10.18 Slope = 98.1

45130 Specific Conductance
1,000 µS to 1000 µS Standard

Temp. On ~~Orion~~ 45130

Turbidity - Hf Scientific ART-15CE
to 0.02 Reference.

CH2M HILL WELL DEVELOPMENT FIELD LOG

windy 35°F

Well I.D.: MWA3

Client: ELF ATOCHEM	Well Dia:(in.): 2"
Project #: 115946.FW.ZZ	Sand Pack Dia (in.): 6"
Developed By: MDA, VAP	Bore Hole Dia (in.): 6"
	Total Gallons Removed: ~150
Standing Well Volume (gallons @ 30% porosity): 6.74	
2" Grundfos w/ 1/2" PE Tubing	Note: 90 gal H_2O added during well construction
Start: Date 12/17/96 Time:	DTW (ft. from TOC): 22.95 Total Depth(ft. from TOC): 34.85
Stop: Date / / Time:	DTW (ft. from TOC): Total Depth(ft. from TOC): 34.80

Development Method / Comments: 2" Grundfos with 1/2 inch ID poly tubing
11.9 ft × 0.17 gal/ft = 2.02 gal in casing

(0.3)(1.31 × 12') = 4.72 gal annulus 4.72 + 2.02 = 6.74 Total Vol (gal)

Time	DTW ft. from TOC	Volume Removed (gallons)	Spec. Cond. (micromohs/cm)	Temp. (oC)	Ph	~~Eh~~ H_3	Purge Rate (gal/min)	Continuous Surging (Y/N)	Clarity/ Color/Remarks
0945	Pump	on				300	~4	Y	initial well casing FID = 28 PPM PID = 11 "
0948		~12	860	15.0	6.81		"	Y	very cloudy - light brown, lots of silt and sand
0952		~27	859	15.2	7.01		"	Y	
0956		~50	840	15.2	6.95		"	Y	very cloudy - light brown, silty
1002	23.28	~80	878	15.1	6.95	"	"	Y	DRUM FID = 0 PID = 0.8 PPM well casing FID = .5 PID = 1.5
1012		~112	880	15.1	6.96	120	~0.8	N	Pump above screen 370 NTU's
1022		~119	886	14.7	6.93	"	"	N	Cloudy, light gray, 100 NTU
1033		128	888	14.7	6.99	"	"	N	Cloudy, light gray, 46 NTU's
1043						"	"	N	26 NTUS
1047									22 NTUS
1048		~135	904	14.3	6.94	112 Hz	~0.4	N	—
1053								N	15 NTUS
11:02	Pumpoff	~150	906	14.7	6.93	"			24 NTUS

Instrument Cal [illegible]

pH = 4.00, 7.01, 10.21 Slope = 97.8 @ 8.1 °C

Turbidity - HF Scientific ART

CH2M HILL WELL DEVELOPMENT FIELD LOG

Very windy, clear, 35°F

Well I.D.: MW-4

Client: ELF ATOCHEM	Well Dia:(in.): 2"
Project #: 115946.FW.ZZ	Sand Pack Dia (in.): 6"
Developed By: MDA, VAP	Bore Hole Dia (in.): 6"
	Total Gallons Removed: 110
Standing Well Volume (gallons @ 30% porosity): 6.61 gal	
Note: 60 gal. water added during well construction	
Start: Date 12/17/96 Time:	DTW (ft. from TOC): 22.0 Total Depth(ft. from TOC): 33.15
Stop: Date / / Time:	DTW (ft. from TOC): Total Depth(ft. from TOC): 33.55

Development Method / Comments: 2" Grundfos, 1/2" ID poly tubing

1.89 + 4.72 = 6.61 gal

11.15 ft × 0.17 gal/ft = 1.89 gal in casing

2" to 6" ~ 1.31 gal/ft annulus space = (1.31 × 12') = 15.72 × 0.3 porosity = 4.72 gal

Time	DTW ft. from TOC	Volume Removed (gallons)	Spec. Cond. (micromohs/cm)	Temp. (oC)	Ph	Eh	Purge Rate (gal/min)	Surging (Y/N)	Clarity/ Color/Remarks
1238	Pump ON					300			Initial well casing (Methane?) *PID > 50,000 PPM PID - <1
1243		20	1098	15.6	—	-	~4	Y	Light Brown, Cloudy very
1245	Pump off								
1245		DRUM	PID - 3.0 PPM PID = @ BG			well casing	PID = > 50,000 PID = BG		
1250	23.15	~48	1095	15.6	6.65	200	~3	Y	Light Brown, Very Cloudy
1256		55	1056	15.2	6.85	160	~1.5	Y	Light Brown, VC
1304	22.9	~65	1065	15.1	6.68	"		Y	"
1307						112	~	N	
1314	22.3	~78	1084	14.9	6.74	"	0.66	N	Light brown, Cloudy; 650 NTU's
1321		~	1120	14.4	6.77	107	0.4	N	Cloudy, light brown
~~1334~~						"	"	N	114 NTU's
1345							"	N	66 NTU's
1351		~95	1055	14.4	6.75	"	"	N	40 NTU's
1402	22.05	~100				"	"	N	27 NTU's
1411								N	73 NTU's Pump problems
1416		~110						N	25 NTU's
1419		110	1226	14.7	6.78	"	"	N	20 NTU's Almost clear
									17 NTU's

* Used Activated C... > 50,000 PPM i.e. Methane

CH2M HILL WELL SAMPLING FIELD LOG
Elf Atochem Acid Plant

Date: 1-2-97

Project #: 115946.FW.ZZ

Well I.D.: MW A1

Field Team: Mike Abbott; Ukleie Panek Well Casing Dia.(in) = 2

Total Depth(ft) 33.40 BMP (-) DTW(ft) 13.44 (X 0.17 gal\ft) = Well Casing Volume(gal) = 3.4

Field Conditions: Overcast, 50°F, light breeze

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

Purge Method: Transient 2" Grundfos pump with (new) dedictated 1/4" polyethylene tubing

Pump Suction Depth(ft): 14'

Purge water disposal: Drums

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Specific Conduct. (uS/cm)	Temp. (o C)	pH	Purge Rate (gpm)	DTW (ft)	92+3 *Clarity/ Color/Remarks
10 :31	Pump on	9,150	15.5	11.40	.33	13.44	Very Dark Brown Purple- Opaque
							Note: Turbidity meter Shows 0.3 NTUs
10 :46							But Can't See Light From Flashlight Through Sample
10 :47	4	11,150	18.0	11.30	.30	—	Very Dark Brown Purple- Opaque
10 :59	7	11,010	18.6	11.29	"	—	" " "
11 :07	~11	11,190	18.7	11.30	"		" " "
11 :08	Start Sampling						
11 :15	End Sampling						
11 :15	~13	11,160	*20.0		.30 @ 100 ml/min	—	" " "

*Clarity codes: VC=Very cloudy Cl=Cloudy SC=Slightly Cloudy VSC=Very Slightly Cloudy C=Clear CC=Crystal Clear

* Heated by pump during VOC 100 ml/min Sampling

Laboratory Analytical Program
Elf Atochem Acid Plant

Sampling Information

Date: 1 / 2 / 97	Start Time: 11 : 08
Method: From purge tubing	

Sample I.D.	MS/MSD	Dupli.	(Circle) Number of sample containers	Volume of each container	Type	Pres.	Shipping Date	Analytical Method
GA-MWAL-1	—		1	2.5L	Glass	Ø	1-2-97	Pesticides 8080
"	—		3	40mL	VOAs	HCL	↓	VOCs 8240
"	—		1	1L	Glass	Ø	↓	TPH 8015M
GA-TB1			3	40mL	VOAs	HCL	"	Trip Blank 8240 VOCs
Duplicate I.D./Time :								

Calibration Data

Refer to: MW	Sheet 2 of 2 on / /	for calibration data.
pH Meter: Orion 290A, CH2M HILL I.D.# 3099, 4.00, 7.04 Slope = 98.6 @ 14.4		
Specific Conductance Meter: YSI Model 30, SN96D48412, Set meter to 1,000 uS/cm standard.		
Temperature Meter: On YSI 30		
Turbidimeter:HF Scientific DRt-15CE, Calibrated to 0.02 NTUs reference standard.		

Comments:

Shipping Method: Federal Express Laboratory: CH2M HILL, Redding

CH2M HILL WELL SAMPLING FIELD LOG
Elf Atochem Acid Plant

Date: 3-12-97

Project #: 115946.FW.ZZ

Well I.D.: MWA1

Field Team: MDA, UAP

Well Casing Dia.(in) = 2"

Total Depth(ft) 33.40 (-) DTW(ft) 17.46 (X 0.17 gal\ft) = Well Casing Volume(gal) = 2.7

Field Conditions: overcast, 40°F, Breezy

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

Purge Method: Transient 2" Grundfos pump with new (dedicated) 1/4" polyethylene tubing

Pump Suction Depth(ft): ~~18'~~ 18.0'

Purge water disposal: Drums

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Specific Conduct. (uS/cm)	Temp. (o C)	pH	Purge Rate (gpm)	Turbidity (NTUs)	DTW (ft)	*Clarity/ Color/Remarks
09 40	Pump ON						17.46	100 Hz, very Dark Brown, opaque
09 41	~.2	7,440	14.8	11.41	0.2	0.18*	—	" " "
09 55	2.7 ~~5.18~~	8,870	17.9	11.17	0.18	*	17.50	OVM = 5-15 ppm ~~over~~ in bucket OVM = 0 over bucket
10 10	5.4	9,200	18.7	11.16	0.18	*	17.48	
10 27	8.1	9,600	18.6	11.18	0.16	*	17.47	very dark brown, opaque
		~~9,560~~	~~21.4~~	~~11.12~~		*		
	10:30 Start Sampling							
	10:42 Pump off End Sampling							
10.42		9560	21.4	11.12		*	—	

*Clarity codes: VC=Very cloudy Cl=Cloudy SC=Slightly Cloudy VSC=Very Slightly Cloudy AC=Almost Clear C=Clear CC=Crystal Clear

* Turbidity reading ~~may~~ 15 not be valid - water is opaque but low reading = 0.2 NTUs

Laboratory Analytical Program
Elf Atochem Acid Plant

Sampling Information

Date: 3 / 12 / 97 Start Time: 09:40

Method: From purge tubing

Sample I.D.	MS/MSD	Dupli.	(Circle) Number of sample containers	Volume of each container	Type	Pres.	Shipping Date	Analytical Method
GA-MWA1-1-0397	—		2	1 L	Glass	Ø	3/12	Pesticides 8080
"	—		3	40mL	VOA	HCl	"	VOCs 8240
Duplicate I.D./Time								

Calibration Data

Refer to: MW This well Sheet 2 of 2 on / / for calibration data.

pH Meter: Orion 290A, CH2M HILL I.D.SN 6735 4.00 & 7.05 & 10.17 @ slope = 98.2 @ 11.2°C

Specific Conductance Meter: YSI Model 30, ID#3520, Set meter to 1,000 uS/cm standard. ✓

Temperature Meter: On YSI 30

Turbidimeter:HF Scientific DRt-15CE,ID#3955, Calibrated to 0.02 NTUs reference standard. ✓

Comments: Before sampling w/ 2" Grundfos lowered bailer to the bottom of well and obtaine sample to test for the presence of DNAPL w/ Hydrophobic Dye. Took sample from the bottom of the bailer with VOC Valve device. No DNAPL.

Shipping Method: Federal Express Laboratory: CH2M HILL - Redding

CH2M HILL WELL SAMPLING FIELD LOG
Elf Atochem Acid Plant

Date: 1-2-97

Project #: 115946.FW.ZZ

Well I.D.: MWAZ

Field Team: Mike Abbott, Valerie Panek

Well Casing Dia.(in) = 2

Total Depth(ft) 35.20 (-) DTW(ft) 14.00 (X 0.17 gal\ft) = Well Casing Volume(gal) = 3.6

Field Conditions: Partly sunny, 55°, occas. showers

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

Purge Method: Transient 2" Grundfos pump with (new) / dedictated 1/4" polyethylene tubing

Pump Suction Depth(ft):

Purge water disposal: Drums

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Specific Conduct. (uS/cm)	Temp. (o C)	pH	Purge Rate (gpm)	DTW (ft)	*Clarity/ Color/Remarks
13:56		263	18.6	6.39	~0.3	14.00	Clear, colorless 17 NTU's
14:07	3.6	250	18.6	6.34	"		Clear, colorless 12 NTU's
14:18	7.2	253	18.8	6.34	"		" 12 NTU's
14:29	10.8	253	18.6	6.36	"		" 12 NTU's
							~~13 NTU~~
14:30	Start Sampling						
14:39	End Sampling						
14:35	~12	256	18.9	6.34			100ml/min Vocs 13 NTU

*Clarity codes: VC=Very cloudy Cl=Cloudy SC=Slightly Cloudy VSC=Very Slightly Cloudy C=Clear CC=Crystal Clear

Laboratory Analytical Program
Elf Atochem Acid Plant

Sampling Information

Date: 1 / 2 / 97	Start Time: 14:30							
Method: From purge tubing								
Sample I.D.	MS/MSD	Dupli.	(Circle) Number of sample containers	Volume of each container	Type	Pres.	Shipping Date	Analytical Method
GA-MWA2-1			1	2.5L	Glass	Ø	1-	8080 Pesticides
11			3	40mL	Glass	HCl		8240 VOC
11			1	1 L	Glass	Ø		8015M THP
Duplicate I.D./Time —								

Calibration Data

Refer to: MW **Sheet 2 of 2 on / / for calibration data.**

pH Meter: Orion 290A, CH2M HILL I.D.# 3099.

Specific Conductance Meter: YSI Model 30, SN96D48412, Set meter to 1,000 uS/cm standard.

Temperature Meter: On YSI 30

Turbidimeter:HF Scientific DRt-15CE, Calibrated to 0.02 NTUs reference standard.

Comments: No DNAPL Present - hydrophobic dye test w/bailer (see notes MWA1 for details of methods
oops - this goes on 3/97 ↗

Shipping Method: Federal Express Laboratory: CH2M HILL - Redding

CH2M HILL WELL SAMPLING FIELD LOG
Elf Atochem Acid Plant

Date: 3-12-97

Project #: 115946.FW.ZZ

Well I.D.: MWA2

Field Team: Mike Abbott — Valerie Panek Well Casing Dia.(in) = 2

Total Depth(ft) 35.20 (-) DTW(ft) 21.77 (X 0.17 gal\ft) = Well Casing Volume(gal) = 2.28

Field Conditions: Showers, 40° F breezy

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

Purge Method: Transient 2" Grundfos pump with new / dedicated 1/4" polyethylene tubing

Pump Suction Depth(ft): 22.2' initial - lowered to 22.6' at 11:57

Purge water disposal: Drums

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Specific Conduct. (uS/cm)	Temp. (o C)	pH	Purge Rate (gpm)	Turbidity (NTUs)	DTW (ft)	*Clarity/ Color/Remarks
11 28	Pump On						21.77	clear
11 30	~0.2	265.7	16.0	6.39	~0.25	15.8	—	clear, colorless 105 H_3
11 36	Pump off - low flow problems - will turn on in 3 min. at 111 H_3							
11 39	Pump ON							
11 46	2.3	264.4	18.5	6.39	0.17	13.4	21.96	111 H_3 Clear, Colorless
11 57	4.6	266.2	18.7	6.37	0.21	5.6	22.2	Had to lower pump suction to 22.6'
12 07	6.9	267.3	18.5	6.35	0.23	4.4	22.13	
	Start Sampling 12:10							
	End Sampling 12:20							
12 20							21.85	Lost flow, no aftersample possible

*Clarity codes: VC=Very cloudy Cl=Cloudy SC=Slightly Cloudy VSC=Very Slightly Cloudy AC=Almost Clear C=Clear CC=Crystal Clear

Laboratory Analytical Program
Elf Atochem Acid Plant

Sampling Information

Date: 3 / 12 / 97 Start Time: 12:10

Method: From purge tubing

Sample I.D.	MS/MSD	Dupli.	(Circle) Number of sample containers	Volume of each container	Type	Pres.	Shipping Date	Analytical Method
GA-MWA2-1-0397			2	1 L	Glass	Ø		8080 Pesticides
"			3	40mL	VOA	HCl		8240 VOC
Duplicate I.D./Time								

Calibration Data

Refer to: MW Sheet 2 of 2 on / / for calibration data.

pH Meter: Orion 290A, CH2M HILL I.D.

Specific Conductance Meter: YSI Model 30, ID#3520, Set meter to 1,000 uS/cm standard.

Temperature Meter: On YSI 30

Turbidimeter:HF Scientific DRt-15CE.ID#3955, Calibrated to 0.02 NTUs reference standard.

Comments: No DNAPL w/dye

(see sample methods in comments MWA1)

Shipping Method: Federal Express Laboratory: CH2M HILL - Redding

CH2M HILL WELL SAMPLING FIELD LOG
Elf Atochem Acid Plant

Date: 1-2-97

Project #: 115946.FW.ZZ

Well I.D.: MWA3

Field Team: Mike Abbott, Valerie Panek Well Casing Dia.(in) = 2

Total Depth(ft) 34.80 bmp (-) DTW(ft) 16.51 (X 0.17 gal\ft) = Well Casing Volume(gal) = 3.11

Field Conditions:

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

Purge Method: Transient 2" Grundfos pump with (new) / dedictated 1/4" polyethylene tubing

Pump Suction Depth(ft):

Purge water disposal: Drums

Comments/Exceptions to SAP:

* Problems maintaining flow

Time	Purge Volume (gallons)	Specific Conduct. (uS/cm)	Temp. (o C)	pH	Purge Rate (gpm)	DTW (ft)	*Clarity/ Color/Remarks
11:52	pump on	594	15.4	7.16	3 (100 MS)	16.51	Clear Turbidity 14.9 NTU's
12:09	3.1	570	15.5	7.24	~0.2		29 NTU's Slightly cloudy, yellowish
12:20	6.2	568	15.6	7.24	~0.3		88 NTU's Cloudy, yellowish
	9.3	529	15.9	7.24	"		70 NTUs
12:39	Start Sampling						
12:56	End Sampling						
12:56		534	14.0	7.13			23 NTU s Slightly Cloudy

*Clarity codes: VC=Very cloudy Cl=Cloudy SC=Slightly Cloudy VSC=Very Slightly Cloudy C=Clear CC=Crystal Clear

Laboratory Analytical Program
Elf Atochem Acid Plant

Sampling Information

Date: 1 / 2 / 97 | Start Time: ~~11:52~~ 12:39 Sample

Method: From purge tubing

Sample I.D.	MS/MSD	Dupli.	(Circle) Number of sample containers	Volume of each container	Type	Pres.	Shipping Date	Analytical Method
GA-MWA3-1		Y	2	2.5 L	Glass	Ø	1-2-97	Pesticides 8080
"		Y	6	40mL	"	HCl	"	VOC's 8240
"		Y	2	1 L	"	Ø	"	TPH 8015 Mod
Duplicate I.D./Time GA-MWA3-2 12:40								

Calibration Data

Refer to: MW **Sheet 2 of 2 on / / for calibration data.**

pH Meter: Orion 290A, CH2M HILL I.D.# 3099,

Specific Conductance Meter: YSI Model 30, SN96D48412, Set meter to 1,000 uS/cm standard.

Temperature Meter: On YSI 30

Turbidimeter:HF Scientific DRt-15CE, Calibrated to 0.02 NTUs reference standard.

Comments:

Shipping Method: Federal Express [illegible] CH2M HILL - Redding

CH2M HILL WELL SAMPLING FIELD LOG
Elf Atochem Acid Plant

Date: 3-12-97

Project #: 115946.FW.ZZ

Well I.D.: MWA3

Field Team: Mike Abbott, Valerie Panek Well Casing Dia.(in) = 2

Total Depth(ft) 34.80 (-) DTW(ft) 23.04 (X 0.17 gal\ft) = Well Casing Volume(gal) = 2.0

Field Conditions: Showers, 40°F, breezy

Decontamination: Alconox + tap wash: Tap rinse: DI rinse

PURGE INFORMATION

Purge Method: Transient 2" Grundfos pump with new / dedictated 1/4" polyethylene tubing

Pump Suction Depth(ft): 23.8'

Purge water disposal: Drums

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Specific Conduct. (uS/cm)	Temp. (o C)	pH	Purge Rate (gpm)	Turbidity (NTUs)	DTW (ft)	*Clarity/ Color/Remarks
13:22	Pump	ON	3					
13:24	~0.2	541	11.8	7.13	~0.2	69	23.04	115 Hz Slightly cloudy Brownish / yellow
13:32	2.2	616	13.0	7.33	0.22	40	23.04	
13:39	4.0	616	13.0	7.36	0.26	20	23.04	OVM = 0 ppm downhole and in bucket Water Colorless, VSC
13:48	6.0	616	13.7	7.36	0.22	14	23.04	water colorless, VSC
13:59	8.0	617	13.3	7.37	0.18	12	—	112 Hz - Try to ↓ turbidity Clear
14:10	11.0	~~616~~	~~13.2~~		~~0.27~~	10	—	
14:14	12.0	616	13.2	7.37	0.25	9	23.04	106 Hz
14:28	14.0	617	14.0	7.37	0.14	10	23.04	
14:30	Start Sampling	1430						
	End Sampling	[illegible]						
14:36	~16	[illegible]	[illegible]	[illegible]	[illegible]	9	23.04	*

*Clarity codes: VC=Very [illegible] CI=Cloudy SC=[illegible] AC=[illegible] Slightly Cloudy AC=[illegible] CC=Crystal Clear

* Could smell [illegible] fumes so waited for wind to shift and until we could not smell fumes, then sampled [illegible]

Laboratory Analytical Program
Elf Atochem Acid Plant

Sampling Information

Date: 3 / 12 / 97 Start Time: :

Method: From purge tubing

Sample I.D.	MS/MSD	Dupli.	(Circle) Number of sample containers	Volume of each container	Type	Pres.	Shipping Date	Analytical Method
GA-MWA3-1-0397			2	1 L	Glass	Ø		8080 Pesticides
"			3	40 mL	VOA	HCl		8240 VOC's
Duplicate I.D./Time								

Calibration Data

Refer to: MW Sheet 2 of 2 on / / for calibration data.

pH Meter: Orion 290A, CH2M HILL I.D.

Specific Conductance Meter: YSI Model 30, ID#3520, Set meter to 1,000 uS/cm standard.

Temperature Meter: On YSI 30

Turbidimeter:HF Scientific DRt-15CE,ID#3955, Calibrated to 0.02 NTUs reference standard.

Comments: No DNAPL w/dye

(see sample methods under comments MWA1)

Shipping Method: Federal Express Laboratory CH2M HILL - Redding

CH2M HILL WELL SAMPLING FIELD LOG
Elf Atochem Acid Plant

Date: 1-2-97

Project #: 115946.FW.ZZ

Well I.D.: MW4

Field Team: Mike Abbott, Valerie Panek Well Casing Dia.(in) = 2"

Total Depth(ft) 33.55 (-) DTW(ft) 15.51 (X 0.17 gal\ft) = Well Casing Volume(gal) = 3.1

Field Conditions: Sunny, 55°

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

Purge Method: Transient 2" Grundfos pump with (new) / dedicated 1/4" polyethylene tubing

Pump Suction Depth(ft):

Purge water disposal: Drums

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Specific Conduct. (uS/cm)	Temp. (o C)	pH	Purge Rate (gpm)	DTW (ft)	*Clarity/ Color/Remarks
15:10		900	16.0	7.03	100 ml ~0.3	15.51	Clear, Colorless, 11 NTU's
15:20	3.1	—	~~—~~	—	105 ml 112 ml	—	*would not sustain @ 100 ml
15:30	4.0 6.2	~~1165~~ 1222	16.8 16.9	7.01 6.96	~0.4 "		3 NTU's 1.8 NTU's Clear, Colorless
15:40	9.3	1268	16.8	6.96	"		Clear, Colorless, 1.4 NTU's
			~~RD~~				
15:46	Start Sampling						
	End Sampling						
15:46		1281	17.3	6.97	"		pump off 2 NTU's

*Clarity codes: VC=Very cloudy Cl=Cloudy SC=Slightly Cloudy VSC=Very Slightly Cloudy C=Clear CC=Crystal Clear

Laboratory Analytical Program
Elf Atochem Acid Plant

Sampling Information

Date: 1/2/97	Start Time: 15:45							
Method: From purge tubing								
Sample I.D.	MS/MSD	Dupli.	(Circle) Number of sample containers	Volume of each container	Type	Pres.	Shipping Date	Analytical Method
GA-MWA4-1			2	2.5L	Glass	Ø	1-2-97	8080
"			6	40mL	"	HCl	"	8240
"			2	1L	"	Ø	"	8015M
Duplicate I.D./Time GA-MWA4-3 15:50			EQUIPMENT BLANK					

Calibration Data

Refer to: MW **Sheet 2 of 2 on / / for calibration data.**

pH Meter: Orion 290A, CH2M HILL I.D.# 3099,

Specific Conductance Meter: YSI Model 30, SN96D48412. Set meter to 1,000 uS/cm standard.

Temperature Meter: On YSI 30

Turbidimeter:HF Scientific DRt-15CE, Calibrated to 0.02 NTUs reference standard.

Comments:

Shipping Method: Federal Express Laboratory: CH2M HILL - Redding

CH2M HILL WELL SAMPLING FIELD LOG
Elf Atochem Acid Plant

Date: 3-12-97

Project #: 115946.FW.ZZ

Well I.D.: MW44

Field Team: Mike Abbott / Valerie Panek — Well Casing Dia.(in) = 2

Total Depth(ft) 33.55 (-) DTW(ft) 21.92 (X 0.17 gal\ft) = Well Casing Volume(gal) = 1.98

Field Conditions: 40°F, breezy, cloudy + hailstorms

Decontamination: Alconox + tap wash: Tap rinse: DI rinse

PURGE INFORMATION

Purge Method: Transient 2" Grundfos pump with new / dedicated 1/4" polyethylene tubing

Pump Suction Depth(ft): 22.2' initial, then 22.6' at 15:1

Purge water disposal: Drums

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Specific Conduct. (uS/cm)	Temp. (o C)	pH	Purge Rate (gpm)	Turbidity (NTUs)	DTW (ft)	*Clarity/ Color/Remarks
1459	Pump On						21.92	105 H_3
1500	~0.1	1636	14.2	6.82	~0.2	144	21.88	Problems with flow, to 108 H_3 Yellow-brown, cloudy, some silt
15:02	Pump off due to flow problems							
15:04	Pump on							107 H_3 OVM=0 in well casing and in sample bucket
15 09	Pump off - No Flow (1.1 gal)							
15 12	Pump On							Lowered pump to 22.6'; 118 H_3
15 15	2.0	1557	16.8	6.80	0.30	27	22.03	Colorless, slightly cloudy
15 24	4.5	1525	17.0	6.80	0.28	8	22.10	Clear, colorless
15 31	6.0 7.0	1498 —	16.8 —	6.81 —	0.21 —	5 4.1	— —	"
15 38	8.0	1501	16.9	6.79	0.28	3.5		
:	Start Sampling 15:40							
:	End Sampling 15:50							
15:50	~10	1494	17.0	6.83	0.28	3.8	21.94	

*Clarity codes: VC=Very cloudy Cl=Cloudy SC=Slightly Cloudy VSC=Very Slightly Cloudy AC=Almost Clear C=Clear CC=Crystal Clear

Laboratory Analytical Program
Elf Atochem Acid Plant

Sampling Information

Date: 3 / 12 / 97 Start Time: 15 : 40

Method: From purge tubing

Sample I.D.	MS/MSD	Dupli.	(Circle) Number of sample containers	Volume of each container	Type	Pres.	Shipping Date	Analytical Method
GA-MWA4-1-0397			2	1 L	Glass	6		8080 Pesticides
11			1	40 mL	VOA	HCl		8240 Voc
GA-MWA4-4-0397	Trip Blank		12					
GA-MWA4-3-0397	Equipment Blank		[illegible]		16:10			
Duplicate I.D./Time GA-MW99-2-0397 08:00								

Calibration Data

Refer to: MW Sheet 2 of 2 on / / for calibration data.

pH Meter: Orion 290A, CH2M HILL I.D.

Specific Conductance Meter: YSI Model 30, ID#3520, Set meter to 1,000 uS/cm standard.

Temperature Meter: On YSI 30

Turbidimeter:HF Scientific DRt-15CE,ID#3955, Calibrated to 0.02 NTUs reference standard.

Comments: NO DNAPL w/dye

used QAL water for Equip blank

Shipping Method: Federal Express Laboratory: CH2M HILL - Redding

APPENDIX F

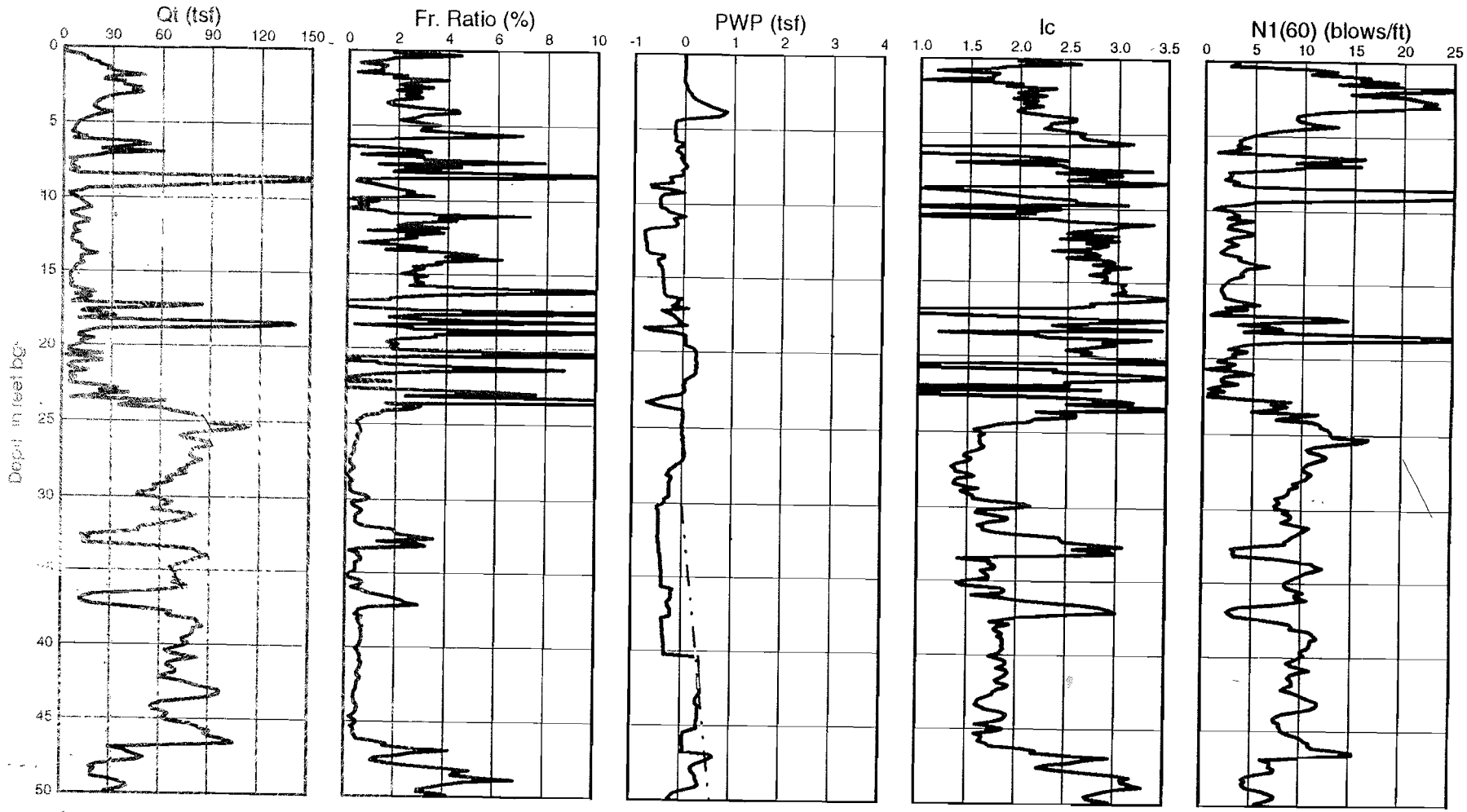
Cone Penetrometer Testing Results

Cone Penetration Test - CPT-1

Test Date : Oct 07, 1996
Location : Elf Atochem, Portland, Oregon

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 30.00



Qt normalized for unequal end area effects

Fr Ratio = 100*Fr/(Qt-Sigmav)
Gamma = 110.1 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Claycy silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. 115946.FW ZZ DATE: October 16, 1996 DRAWN BY: Keith Brown

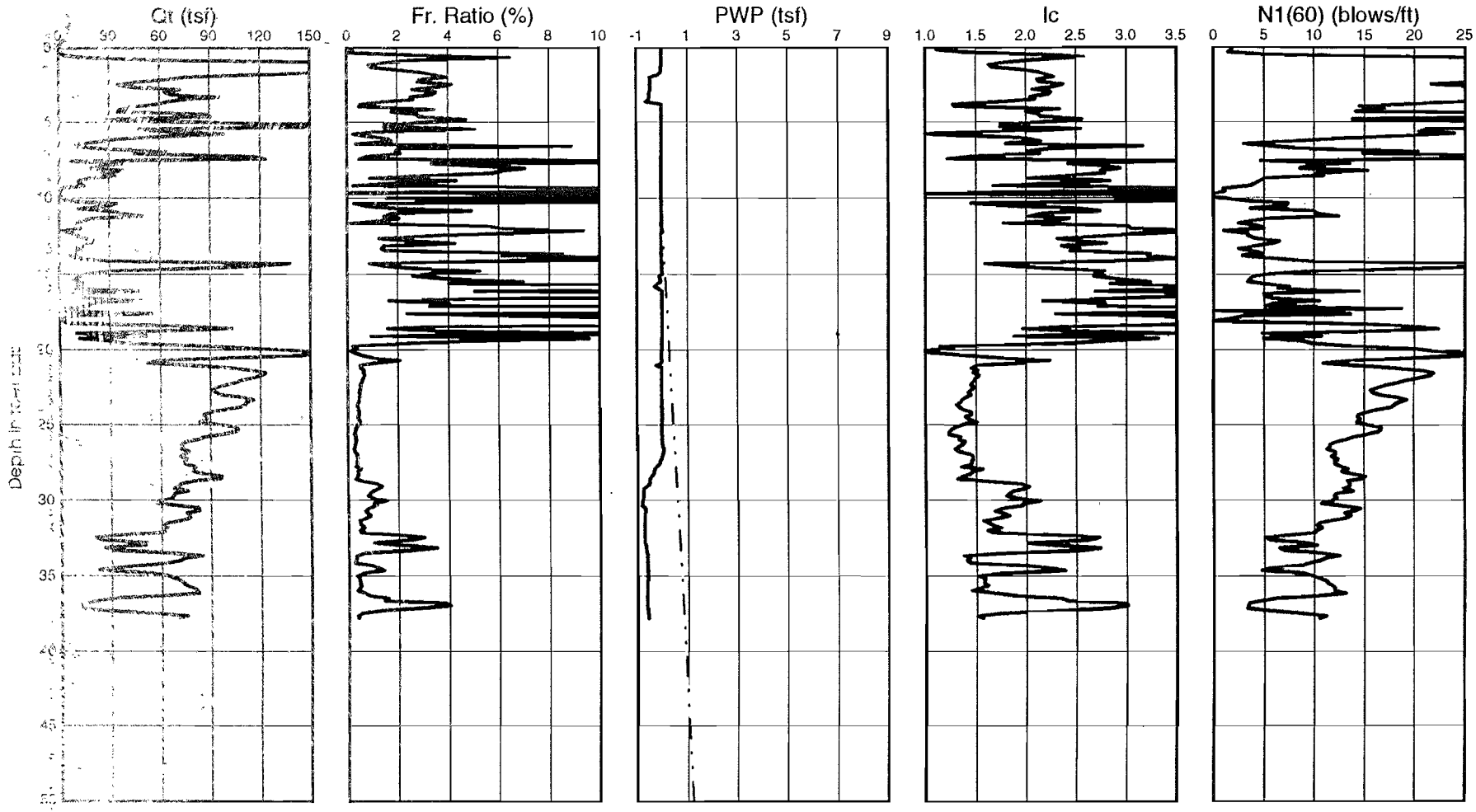
CH2M-Hill

Cone Penetration Test - CPT-2

Test Date : Oct 07, 1996
Location : Elf Atochem, Portland, Oregon

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 11.00



Qt normalized for overburden stress

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 110.1 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO 115645.FW.ZZ DATE: October 16, 1996 DRAWN BY: Keith Brown

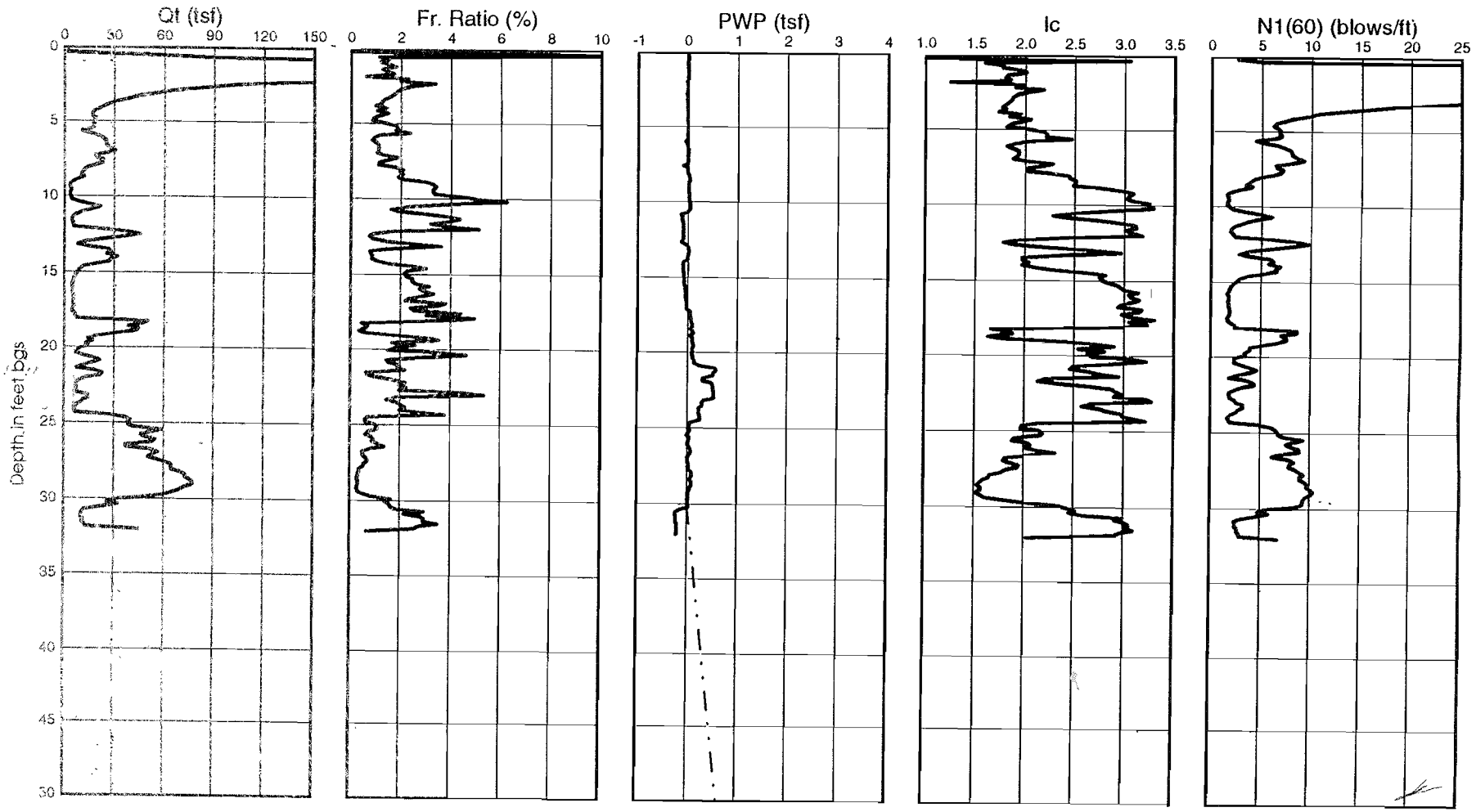
CH2M-Hill

Cone Penetration Test - CPT-3

Test Date : Oct 08, 1996
Location : Elf Atochem, Portland, Oregon

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 30.00



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 110.1 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

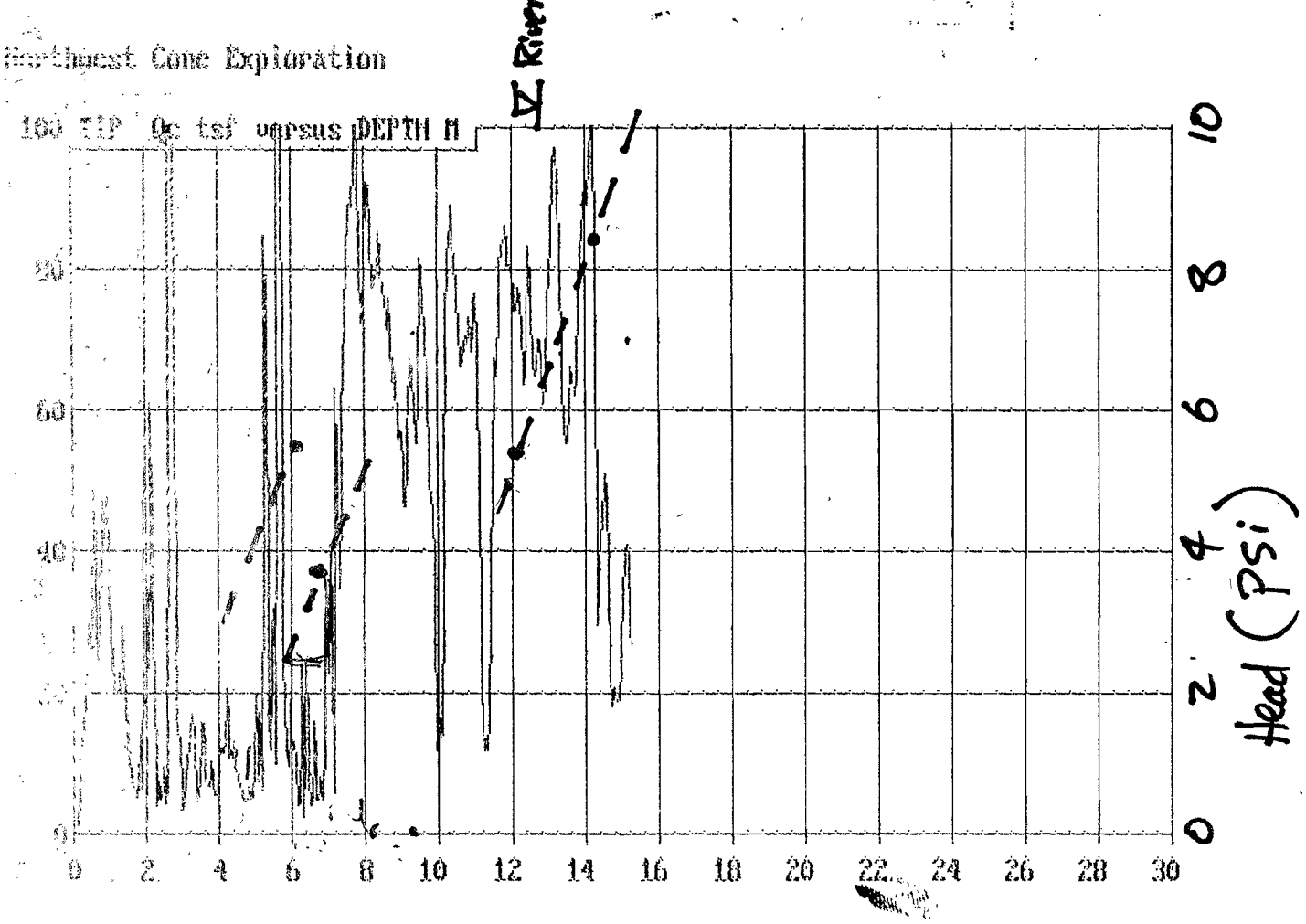
After Jefferies and Davies (1993)

PROJECT NO 175946.FW ZZ DATE: October 16, 1996 DRAWN BY: Keith Brown

CH2M-Hill

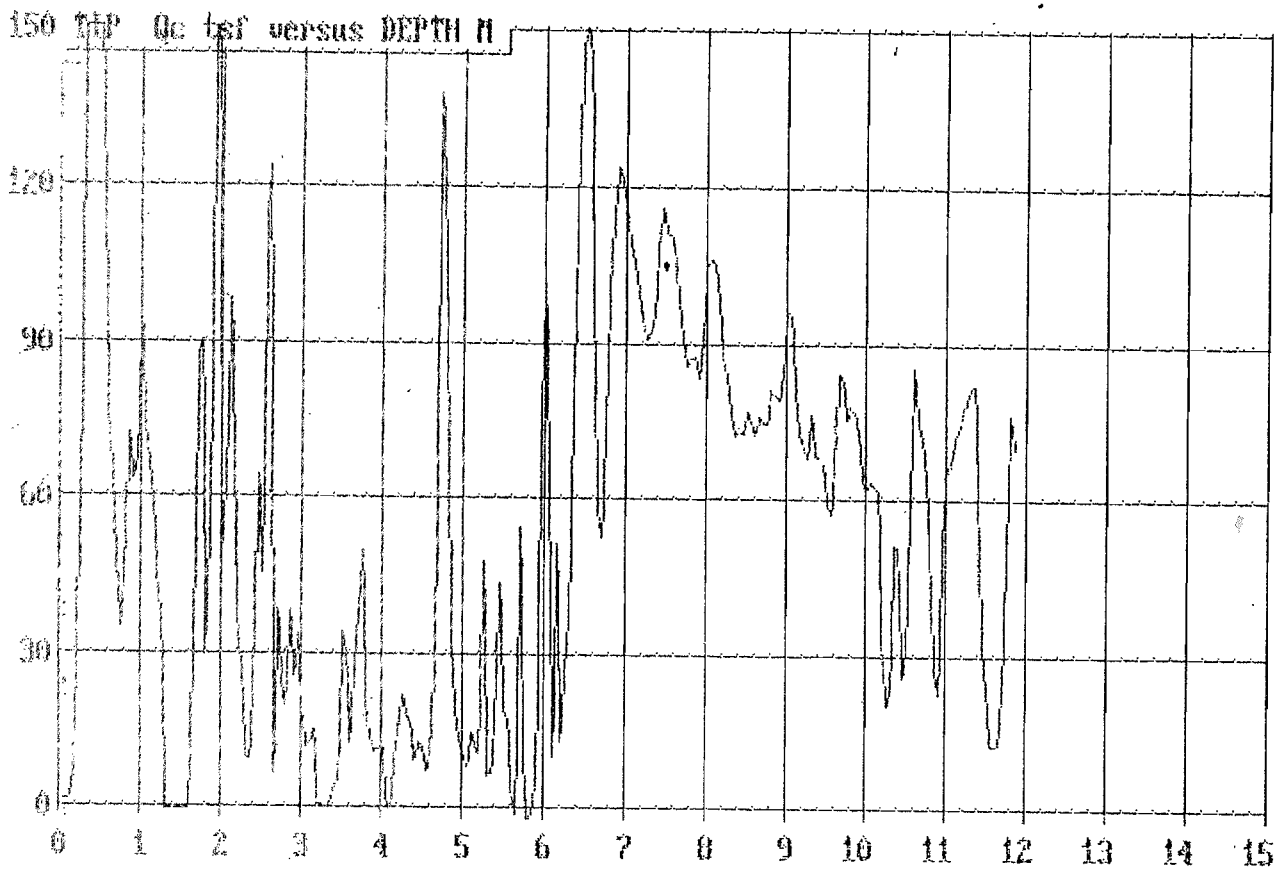
SOUNDING DATA IN FILE CPT-44 10-07-96 09:23
OPERATOR : BROWN LOCATION : CPT-1
CONE ID : 668 JOB No. : 96-33

Northwest Cone Exploration



SOUNDING DATA IN FILE CPT-45 10-07-96 15:45
OPERATOR : BROWN LOCATION : CPT-2
CONE ID . 600 JOB No. : 96-33

Northwest Cone Exploration



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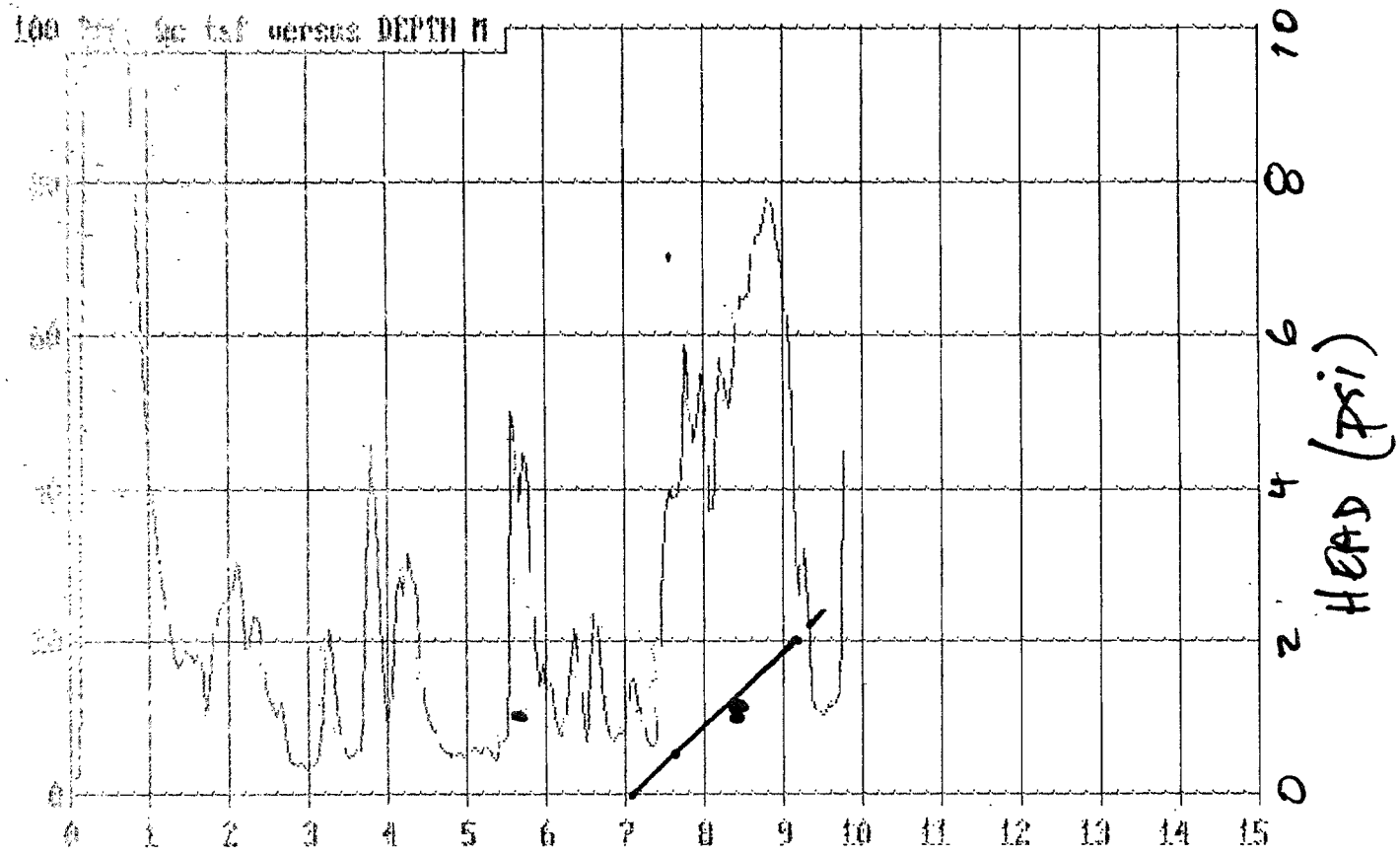
[illegible] : 600 JOB No. : 96-33

[illegible] Cone Exploration



SOUNDING DATA IN FILE CPT-44 10-07-96 09:23

OPERATOR : BROWN LOCATION : CPT-1

CONE ID : 608 JOB No. : 96-33

Northwest Cone Exploration

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
0.05	0.2	1.6	0.029	1.80	0.1	0.5	?	?
0.10	0.3	1.4	0.060	4.43	0.2	1.0	clay	4
0.15	0.5	3.8	0.161	1.84	0.1	0.6	clayey silt to silty clay	4
0.20	0.7	14.0	0.200	1.43	0.2	1.0	sandy silt to clayey silt	5
0.25	0.8	15.2	0.071	0.47	0.2	0.5	sandy silt to clayey silt	6
0.30	1.0	21.4	0.323	1.51	0.0	0.5	sandy silt to clayey silt	7
0.35	1.1	22.2	0.296	1.33	0.0	0.1	sandy silt to clayey silt	9
0.40	1.3	29.3	0.403	1.37	0.0	0.1	sandy silt to clayey silt	10
0.45	1.5	26.6	0.091	0.34	-0.0	0.0	sandy silt to clayey silt	12
0.50	1.6	34.4	0.800	2.32	-0.0	0.0	sandy silt to clayey silt	14
0.55	1.8	48.9	0.882	1.80	-0.1	0.0	sandy silt to clayey silt	14
0.60	2.0	27.5	1.096	3.99	0.2	0.0	sandy silt to clayey silt	13
0.65	2.1	24.7	0.609	2.47	0.6	0.0	clayey silt to silty clay	14
0.70	2.3	36.9	0.749	2.03	0.7	0.0	sandy silt to clayey silt	13
0.75	2.5	36.8	1.233	3.35	1.1	0.0	sandy silt to clayey silt	15
0.80	2.6	46.7	0.894	1.92	1.9	0.0	sandy silt to clayey silt	16
0.85	2.8	41.5	1.193	2.87	2.0	0.0	sandy silt to clayey silt	17
0.90	3.0	48.1	1.094	2.28	2.8	0.0	sandy silt to clayey silt	16
0.95	3.1	33.1	0.970	2.93	4.3	0.0	sandy silt to clayey silt	14
1.00	3.3	27.4	0.505	1.84	5.8	0.0	sandy silt to clayey silt	11
1.05	3.4	23.1	0.355	1.54	7.5	0.0	sandy silt to clayey silt	9
1.10	3.6	20.7	0.364	1.76	9.2	0.0	sandy silt to clayey silt	8
1.15	3.8	19.1	0.550	2.88	11.8	0.0	clayey silt to silty clay	9
1.20	3.9	18.2	0.786	4.31	11.1	0.0	silty clay to clay	12
1.25	4.1	21.0	0.919	4.37	9.8	0.0	silty clay to clay	15
1.30	4.3	29.3	0.876	2.99	0.2	0.2	clayey silt to silty clay	12
1.35	4.4	22.7	0.616	2.71	-2.4	0.2	clayey silt to silty clay	11
1.40	4.6	17.2	0.354	2.06	-2.6	0.2	clayey silt to silty clay	8
1.45	4.8	12.6	0.361	2.86	-2.7	0.2	clayey silt to silty clay	6
1.50	4.9	9.7	0.347	3.57	-2.6	0.2	silty clay to clay	7
1.55	5.1	8.3	0.241	2.90	-2.7	0.1	clay	8
1.60	5.2	7.0	0.194	2.78	-2.7	0.1	clay	7
1.65	5.4	6.8	0.282	4.18	-2.5	0.1	clay	6
1.70	5.6	5.7	0.340	6.57	-2.5	0.1	clay	7
1.75	5.7	8.8	0.404	4.59	-2.6	0.1	silty clay to clay	6
1.80	5.9	14.2	-0.100	-0.71	-0.2	0.1	?	?
1.85	6.1	6.6	-0.553	-8.42	0.0	0.1	?	?
1.90	6.2	45.9	-0.808	-1.76	-1.3	0.1	?	?
1.95	6.4	52.2	0.614	1.18	-2.3	0.5	silty sand to sandy silt	14
2.00	6.6	36.0	1.014	2.67	-1.2	1.4	sandy silt to clayey silt	15

Soil interpretation reference: Robertson & Campanella-1983, based on SBT Normalized Soil Behavior Chart and Pore Pressure data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
2.05	6.7	23.5	0.765	3.26	-0.4	1.5	sandy silt to clayey silt	16
2.10	6.9	60.9	0.303	0.50	-0.9	1.7	sandy silt to clayey silt	14
2.15	7.1	26.6	0.784	2.95	-0.6	1.7	sandy silt to clayey silt	14
2.20	7.2	18.4	0.548	2.98	-0.0	2.0	silty clay to clay	10
2.25	7.4	4.0	0.281	7.08	0.8	2.1	silty clay to clay	6
2.30	7.5	7.6	0.089	1.17	0.5	1.6	clay	5
2.35	7.7	5.1	0.212	4.14	-0.7	1.7	silty clay to clay	4
2.40	7.9	4.8	0.104	2.17	-0.1	1.7	silty clay to clay	4
2.45	8.0	9.2	0.161	1.74	-0.5	1.6	clay	6
2.50	8.2	4.3	0.443	10.33	-3.8	1.6	clay	7
2.55	8.4	9.2	0.810	8.77	-3.6	1.6	silty sand to sandy silt	18
2.60	8.5	156.1	0.623	0.40	-3.2	0.9	sand to silty sand	26
2.65	8.7	166.5	0.569	0.34	-3.3	0.0	sand	29
2.70	8.9	124.3	1.236	0.99	-8.8	0.0	sand to silty sand	31
2.75	9.0	92.7	1.428	1.54	-2.5	0.0	sand to silty sand	22
2.80	9.2	58.1	1.105	1.90	0.2	0.8	silty sand to sandy silt	18
2.85	9.4	14.7	0.375	2.55	-5.9	0.9	sandy silt to clayey silt	11
2.90	9.5	11.4	0.257	2.25	-6.5	0.6	silty clay to clay	6
2.95	9.7	3.5	0.101	2.90	-6.7	0.4	silty clay to clay	4
3.00	9.8	5.4	-0.018	-0.33	-6.5	0.4	sensitive fine grained	3
3.05	10.0	8.7	0.099	1.14	-6.6	0.4	sensitive fine grained	4
3.10	10.2	11.1	0.044	0.40	-6.6	0.4	sandy silt to clayey silt	4
3.15	10.3	12.4	0.095	0.77	-5.0	0.4	sandy silt to clayey silt	5
3.20	10.5	15.1	-0.010	-0.06	-4.2	0.4	sandy silt to clayey silt	6
3.25	10.7	16.9	0.242	1.44	-1.6	0.2	sandy silt to clayey silt	5
3.30	10.8	10.5	0.168	1.60	0.5	0.2	clayey silt to silty clay	5
3.35	11.0	4.8	0.307	6.37	-2.7	0.2	clay	7
3.40	11.2	5.8	0.190	3.26	-2.1	0.3	clay	6
3.45	11.3	9.5	0.385	4.05	-1.6	0.2	silty clay to clay	7
3.50	11.5	16.0	0.362	2.26	-2.4	0.2	clayey silt to silty clay	7
3.55	11.6	15.8	0.297	1.91	-9.2	0.2	clayey silt to silty clay	6
3.60	11.8	7.3	0.265	3.64	-10.9	0.2	clayey silt to silty clay	5
3.65	12.0	8.9	0.651	0.74	-10.8	0.2	silty clay to clay	4
3.70	12.1	6.8	0.234	3.45	-10.8	0.2	silty clay to clay	5
3.75	12.3	10.3	0.224	2.18	-10.6	0.2	silty clay to clay	5
3.80	12.5	6.5	0.159	2.46	-10.6	0.2	silty clay to clay	5
3.85	12.6	5.7	0.090	1.58	-10.3	0.2	sensitive fine grained	3
3.90	12.8	5.8	0.027	0.38	-10.3	0.2	sensitive fine grained	3
3.95	13.0	8.2	0.198	2.39	-10.2	0.3	silty clay to clay	5
4.00	13.1	10.7	0.318	2.96	-10.2	0.3	clayey silt to silty clay	5
4.05	13.3	12.1	0.173	1.43	-8.5	0.3	silty clay to clay	7
4.10	13.5	11.6	0.437	3.77	-7.4	0.3	silty clay to clay	8
4.15	13.6	19.2	0.715	3.73	-5.3	0.3	clay	15
4.20	13.8	20.1	0.513	2.77	-3.1	0.3	clay	15
4.25	13.9	21.1	0.635	3.01	-2.8	0.3	clay	14
4.30	14.1	15.8	0.356	2.25	-2.6	0.3	clay	11
4.35	14.3	11.0	0.202	1.84	-2.5	0.3	silty clay to clay	8
4.40	14.4	10.8	0.344	3.19	-2.4	0.3	silty clay to clay	7
4.45	14.6	9.8	0.350	3.57	-2.3	0.3	silty clay to clay	8
4.50	14.8	7.4	0.274	3.70	-2.2	0.3	silty clay to clay	5

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
4.55	14.9	6.6	0.131	1.92	-5.7	0.3	silty clay to clay	4
4.60	15.1	5.3	0.141	2.70	-5.5	0.3	silty clay to clay	4
4.65	15.3	4.6	0.108	2.23	-5.6	0.3	clay	5
4.70	15.4	4.7	0.106	2.25	-5.5	0.3	clay	5
4.75	15.6	5.1	0.130	2.54	-5.3	0.3	silty clay to clay	3
4.80	15.7	6.2	0.133	2.17	-5.4	0.3	clay	5
4.85	15.9	5.0	0.217	4.36	-5.3	0.3	clay	5
4.90	16.1	5.7	0.594	10.34	-5.2	0.3	clay	7
4.95	16.2	12.7	0.800	6.31	-4.4	0.3	clay	12
5.00	16.4	19.9	0.623	3.12	-0.1	0.7	silty clay to clay	9
5.05	16.6	7.6	0.116	1.53	-1.8	0.6	clayey silt to silty clay	7
5.10	16.7	17.3	0.276	1.60	-1.2	0.7	?	?
5.15	16.9	11.0	-1.161	-10.60	-3.0	0.6	?	?
5.20	17.1	5.7	-1.007	-17.62	1.5	0.6	?	?
5.25	17.2	64.6	0.144	0.17	-5.8	0.5	sand to silty sand	12
5.30	17.4	62.0	1.726	2.78	-4.0	1.3	sandy silt to clayey silt	21
5.35	17.6	15.2	2.491	16.40	-2.5	1.7	clay	28
5.40	17.7	12.0	0.342	2.85	-1.9	1.7	clay	18
5.45	17.9	30.0	0.489	1.63	-0.6	1.3	sandy silt to clayey silt	9
5.50	18.0	32.0	0.917	2.87	-1.1	1.2	clayey silt to silty clay	11
5.55	18.2	9.9	0.306	3.13	1.2	1.2	silty sand to sandy silt	19
5.60	18.4	138.0	0.426	0.31	-10.6	1.8	silty sand to sandy silt	31
5.65	18.5	141.1	3.125	2.21	-9.0	3.9	silty sand to sandy silt	41
5.70	18.7	110.3	3.099	2.81	-2.0	6.3	sandy silt to clayey silt	35
5.75	18.9	23.3	2.666	11.43	0.8	6.6	clayey silt to silty clay	24
5.80	19.0	16.7	0.558	3.34	1.0	6.6	clay	16
5.85	19.2	11.0	0.355	3.23	0.9	6.6	silty clay to clay	8
5.90	19.4	9.8	0.163	1.67	0.9	6.3	clayey silt to silty clay	6
5.95	19.5	19.2	0.292	1.52	0.9	6.3	clayey silt to silty clay	6
6.00	19.7	11.7	0.218	1.87	2.9	6.2	clayey silt to silty clay	7
6.05	19.8	13.0	0.209	1.61	3.6	6.2	clayey silt to silty clay	5
6.10	20.0	7.8	0.123	1.58	3.9	6.2	clayey silt to silty clay	4
6.15	20.2	4.1	0.117	2.83	3.9	5.8	clay	5
6.20	20.3	4.3	0.759	17.63	3.8	5.8	clayey silt to silty clay	5
6.25	20.5	24.1	-0.112	-0.46	3.7	5.9	clayey silt to silty clay	5
6.30	20.7	2.4	-0.101	-4.26	4.2	5.3	?	?
6.35	20.8	18.0	0.190	1.05	3.8	5.8	sandy silt to clayey silt	6
6.40	21.0	24.3	0.307	1.27	4.0	5.8	sandy silt to clayey silt	6
6.45	21.2	6.8	0.259	3.77	3.6	5.8	clayey silt to silty clay	6
6.50	21.3	3.9	0.239	6.12	3.6	5.8	clay	5
6.55	21.5	6.0	0.173	2.89	3.1	5.8	silty clay to clay	6
6.60	21.7	16.1	0.186	1.16	2.0	6.5	clayey silt to silty clay	4
6.65	21.8	5.0	0.012	0.23	0.6	6.4	sensitive fine grained	4
6.70	22.0	5.0	-0.038	-0.77	0.8	6.4	sensitive fine grained	3
6.75	22.1	8.2	0.125	1.52	0.2	6.4	?	?
6.80	22.3	5.0	-0.188	-3.79	0.6	6.3	?	?
6.85	22.5	4.8	-0.572	-11.98	0.8	6.0	?	?
6.90	22.6	23.4	0.239	1.02	0.9	5.9	clayey silt to silty clay	10
6.95	22.8	11.6	0.605	5.34	1.6	6.6	clay	26
7.00	23.0	22.3	1.647	7.13	-0.3	6.6	silty clay to clay	21

Soil interpretation chart based on Robertson & Campanella (1983), based on 60% hammer efficiency and [illegible] average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
7.05	23.1	40.1	0.931	2.32	-7.2	6.3	clay	27
7.10	23.3	20.6	2.176	10.55	-9.9	5.6	clay	21
7.15	23.5	6.1	1.449	23.95	-7.4	6.0	clay	29
7.20	23.6	62.8	0.970	1.55	-4.6	7.5	clayey silt to silty clay	18
7.25	23.8	42.7	1.237	2.90	0.2	7.4	sandy silt to clayey silt	18
7.30	23.9	34.7	0.876	2.53	0.3	7.4	sandy silt to clayey silt	18
7.35	24.1	61.4	0.882	1.44	0.2	7.5	silty sand to sandy silt	17
7.40	24.3	67.5	0.902	1.34	0.3	7.6	silty sand to sandy silt	22
7.45	24.4	75.4	0.556	0.74	0.3	7.5	sand to silty sand	18
7.50	24.6	83.3	0.491	0.59	0.2	7.5	sand to silty sand	20
7.55	24.8	88.9	0.386	0.43	-0.2	7.5	sand to silty sand	21
7.60	24.9	88.6	0.426	0.48	0.2	8.0	sand to silty sand	21
7.65	25.1	88.9	0.493	0.55	0.2	7.4	sand to silty sand	23
7.70	25.3	114.7	0.678	0.59	0.1	7.5	sand to silty sand	25
7.75	25.4	109.9	0.635	0.58	0.1	7.6	sand to silty sand	25
7.80	25.6	91.4	0.454	0.50	0.4	7.6	sand to silty sand	22
7.85	25.8	78.3	0.342	0.44	0.1	7.6	sand to silty sand	19
7.90	25.9	72.4	0.325	0.45	0.4	7.6	sand to silty sand	18
7.95	26.1	74.6	0.314	0.42	0.5	7.6	sand to silty sand	18
8.00	26.2	84.9	0.321	0.38	0.5	7.6	sand to silty sand	20
8.05	26.4	92.1	0.296	0.32	0.5	7.6	sand to silty sand	21
8.10	26.6	90.9	0.278	0.31	0.9	7.6	sand to silty sand	21
8.15	26.7	81.9	0.275	0.34	0.8	7.6	sand to silty sand	20
8.20	26.9	77.6	0.219	0.28	0.4	7.6	sand to silty sand	19
8.25	27.1	78.6	0.144	0.18	0.3	7.6	sand to silty sand	19
8.30	27.2	78.6	0.112	0.14	-0.2	7.5	sand to silty sand	19
8.35	27.4	80.7	0.142	0.18	-1.4	7.5	sand	16
8.40	27.6	85.1	0.170	0.20	-2.3	7.5	sand to silty sand	20
8.45	27.7	79.1	0.236	0.30	-3.4	7.5	sand to silty sand	13
8.50	27.9	76.7	0.252	0.33	-3.6	7.5	sand to silty sand	18
8.55	28.1	75.7	0.127	0.17	-4.2	7.5	sand to silty sand	18
8.60	28.2	71.7	0.089	0.12	-2.8	7.5	sand to silty sand	18
8.65	28.4	76.0	0.102	0.13	-3.0	7.5	sand to silty sand	17
8.70	28.5	87.4	0.118	0.13	-3.5	7.5	sand to silty sand	17
8.75	28.7	84.0	0.186	0.22	-3.4	7.5	sand to silty sand	16
8.80	28.9	67.3	0.099	0.15	-3.5	7.5	sand to silty sand	15
8.85	29.0	62.7	0.109	0.17	-3.4	7.5	sand to silty sand	15
8.90	29.2	65.8	0.101	0.16	-3.5	7.5	sand to silty sand	14
8.95	29.4	67.3	0.112	0.17	-3.5	7.5	sand to silty sand	14
9.00	29.5	68.6	0.177	0.31	-3.5	7.5	sand to silty sand	13
9.05	29.7	78.2	0.358	0.46	-4.6	7.5	silty sand to sandy silt	16
9.10	29.8	69.1	0.424	0.61	-4.1	7.5	silty sand to sandy silt	16
9.15	30.0	58.1	0.449	0.77	-4.1	7.5	sand to silty sand	13
9.20	30.2	61.8	0.457	0.74	-5.3	7.5	sand to silty sand	13
9.25	30.3	67.4	0.366	0.54	-6.0	7.5	sand to silty sand	14
9.30	30.5	64.2	0.279	0.44	-6.3	7.5	sand to silty sand	
9.35	30.7	58.2	0.382	0.65	-6.4	7.5	sand to	
9.40	30.8		0.3		-6.1	7.5	sand to	
9.45	31.0				-6.3	7.5		
9.50	31.2				-6.5	7.5		

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
9.55	31.3	78.1	0.316	0.40	-6.4	7.5	sand to silty sand	19
9.60	31.5	74.5	0.268	0.39	-6.3	7.5	sand to silty sand	18
9.65	31.7	69.7	0.325	0.47	-6.4	7.5	sand to silty sand	16
9.70	31.8	60.3	0.505	0.84	-6.4	7.5	silty sand to sandy silt	13
9.75	32.0	49.1	0.934	1.90	-6.5	7.5	silty sand to sandy silt	17
9.80	32.2	47.0	0.866	1.83	-6.5	7.5	sandy silt to clayey silt	18
9.85	32.3	46.5	0.933	2.01	-6.5	7.5	sandy silt to clayey silt	15
9.90	32.5	26.6	0.684	2.57	-6.4	7.5	sandy silt to clayey silt	11
9.95	32.6	12.0	0.359	2.99	-6.4	7.5	clayey silt to silty clay	9
10.00	32.8	17.3	0.199	1.15	-6.1	7.5	clayey silt to silty clay	7
10.05	33.0	13.7	0.334	2.44	-6.1	7.5	clayey silt to silty clay	7
10.10	33.1	14.0	0.388	2.78	-6.0	7.5	sandy silt to clayey silt	10
10.15	33.3	54.4	0.280	0.52	-6.1	7.5	sand to silty sand	11
10.20	33.5	74.9	0.101	0.13	-5.9	7.5	sand to silty sand	17
10.25	33.6	82.6	0.423	0.51	-5.8	7.5	sand to silty sand	19
10.30	33.8	84.3	0.423	0.50	-5.6	7.4	sand to silty sand	20
10.35	34.0	88.3	0.551	0.62	-5.6	7.5	sand to silty sand	20
10.40	34.1	82.8	0.477	0.58	-5.6	7.1	sand to silty sand	20
10.45	34.3	80.2	0.307	0.38	-5.5	7.1	sand to silty sand	19
10.50	34.4	75.2	0.299	0.40	-5.5	7.1	sand to silty sand	18
10.55	34.6	70.0	0.282	0.40	-5.4	7.1	sand to silty sand	17
10.60	34.8	66.3	0.261	0.39	-5.4	7.1	sand to silty sand	16
10.65	34.9	67.7	0.104	0.15	-5.5	7.1	sand to silty sand	16
10.70	35.1	69.9	0.064	0.09	-5.4	7.1	sand to silty sand	17
10.75	35.3	70.5	0.106	0.15	-5.4	7.1	sand to silty sand	17
10.80	35.4	69.2	0.392	0.57	-5.4	7.2	sand to silty sand	17
10.85	35.6	73.2	0.491	0.67	-5.4	7.0	sand to silty sand	17
10.90	35.8	68.4	0.385	0.56	-2.3	7.0	sand to silty sand	17
10.95	35.9	75.8	0.196	0.26	-2.8	7.0	sand to silty sand	18
11.00	36.1	76.7	0.494	0.64	-2.7	7.0	sand to silty sand	17
11.05	36.3	60.7	0.536	0.88	-2.7	7.0	silty sand to sandy silt	13
11.10	36.4	45.8	0.599	1.31	-2.9	7.0	silty sand to sandy silt	13
11.15	36.6	19.8	0.338	1.70	-3.8	7.0	sandy silt to clayey silt	10
11.20	36.7	14.1	0.268	1.89	-3.7	7.0	clayey silt to silty clay	7
11.25	36.9	11.5	0.228	1.98	-3.7	7.0	clayey silt to silty clay	6
11.30	37.1	12.6	0.310	2.46	-3.8	7.0	clayey silt to silty clay	7
11.35	37.2	19.5	0.169	0.87	-2.9	7.0	sandy silt to clayey silt	9
11.40	37.4	39.0	0.203	0.52	-2.8	7.1	silty sand to sandy silt	12
11.45	37.6	55.6	0.259	0.47	-3.0	7.1	sand to silty sand	13
11.50	37.7	67.5	0.269	0.40	-5.3	7.0	sand to silty sand	15
11.55	37.9	64.9	0.428	0.66	-5.2	7.0	sand to silty sand	15
11.60	38.1	66.5	0.329	0.49	-5.1	7.1	sand to silty sand	17
11.65	38.2	61.3	0.435	0.53	-5.0	7.1	sand to silty sand	15
11.70	38.4	83.5	0.506	0.60	-5.0	7.1	sand to silty sand	20
11.75	38.5	83.7	0.574	0.68	-4.9	7.1	sand to silty sand	20
11.80	38.7	86.4	0.543	0.63	-4.9	7.1	sand to silty sand	20
11.85	38.9	80.6	0.536	0.66	-4.9	7.1	sand to silty sand	20
11.90	39.0	60.7	0.532	0.88	-4.8	7.0	sand to silty sand	13
11.95	39.2	79.7	0.529	0.66	-4.7		sand to silty sand	19
12.00	39.4		0.507	0.64	-4.7	7.0	sand to silty sand	19

Soil Interpretation after Robertson & Campanella (1983) Note: Soil Behavior Type and SPT based evaluations

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
12.05	39.5	73.9	0.462	0.62	-4.5	7.0	sand to silty sand	18
12.10	39.7	74.5	0.437	0.59	-4.7	7.0	sand to silty sand	18
12.15	39.9	77.5	0.439	0.57	-4.6	7.2	sand to silty sand	18
12.20	40.0	74.8	0.314	0.42	-4.5	7.0	sand to silty sand	18
12.25	40.2	63.8	0.345	0.43	-4.5	7.0	sand to silty sand	17
12.30	40.4	63.8	0.359	0.56	5.2	7.0	sand to silty sand	16
12.35	40.5	66.8	0.400	0.60	5.3	7.0	sand to silty sand	16
12.40	40.7	73.9	0.455	0.62	5.2	7.0	sand to silty sand	18
12.45	40.8	83.3	0.478	0.57	5.2	7.0	sand to silty sand	18
12.50	41.0	72.6	0.476	0.66	5.2	7.0	sand to silty sand	18
12.55	41.2	66.1	0.410	0.62	5.2	7.0	sand to silty sand	16
12.60	41.3	64.9	0.369	0.57	5.2	7.0	sand to silty sand	16
12.65	41.5	67.8	0.361	0.53	5.3	7.0	sand to silty sand	16
12.70	41.7	70.3	0.328	0.47	5.4	7.0	sand to silty sand	17
12.75	41.8	70.0	0.348	0.50	5.3	7.0	sand to silty sand	16
12.80	42.0	63.2	0.383	0.61	5.3	7.0	sand to silty sand	15
12.85	42.2	60.5	0.326	0.54	5.4	7.0	sand to silty sand	15
12.90	42.3	68.5	0.329	0.48	5.5	7.0	sand to silty sand	16
12.95	42.5	76.5	0.357	0.47	5.5	7.0	sand to silty sand	18
13.00	42.7	80.1	0.384	0.48	5.7	7.0	sand to silty sand	19
13.05	42.8	87.2	0.371	0.43	5.5	7.0	sand to silty sand	21
13.10	43.0	95.8	0.366	0.38	4.3	7.0	sand to silty sand	22
13.15	43.1	97.1	0.362	0.37	4.6	7.0	sand	18
13.20	43.3	95.6	0.336	0.35	4.5	7.0	sand to silty sand	22
13.25	43.5	89.2	0.343	0.38	4.5	7.2	sand to silty sand	21
13.30	43.6	78.2	0.301	0.38	5.3	7.0	sand to silty sand	18
13.35	43.8	62.2	0.284	0.47	5.1	7.3	sand to silty sand	16
13.40	44.0	56.7	0.289	0.51	5.1	7.3	sand to silty sand	14
13.45	44.1	55.4	0.260	0.47	5.1	7.3	sand to silty sand	13
13.50	44.3	56.6	0.252	0.45	5.1	7.3	sand to silty sand	14
13.55	44.5	62.5	0.231	0.37	5.1	7.3	sand to silty sand	15
13.60	44.6	65.9	0.135	0.21	4.8	7.0	sand to silty sand	15
13.65	44.8	64.7	0.211	0.33	4.8	7.0	sand to silty sand	15
13.70	44.9	62.2	0.310	0.50	4.7	7.0	sand to silty sand	16
13.75	45.1	68.1	0.276	0.41	5.0	7.3	sand to silty sand	17
13.80	45.3	78.5	0.285	0.36	5.3	7.0	sand to silty sand	18
13.85	45.4	85.4	0.307	0.36	1.1	7.0	sand to silty sand	20
13.90	45.6	86.7	0.311	0.36	0.9	7.0	sand to silty sand	21
13.95	45.8	91.1	0.325	0.36	1.0	7.0	sand to silty sand	21
14.00	45.9	88.2	0.396	0.44	0.8	7.0	sand to silty sand	22
14.05	46.1	86.9	0.456	0.52	0.5	7.0	sand to silty sand	22
14.10	46.3	91.5	1.054	1.17	1.8	7.0	sand to silty sand	23
14.15	46.4	103.8	1.776	1.69	2.2	7.0	sand to silty sand	24
14.20	46.6	105.2	.591	1.46	1.1	7.0	silty sand to sandy silt	40
14.25	46.8	82.9	.421	0.51	0.9	7.0	sandy silt to clayey silt	25
14.30	46.9	44.7	1.134	2.53	2.1	7.0	sandy silt to clayey silt	17
14.35	47.1	38.1	0.965	2.53	3.5	7.0	silty clay to clayey silt	14
14.40	47.2	41.4	....	....	3.4	7.0	clayey silt to silty clay	16
14.45	47.4	45.6	....	....	3.4	7.0	silty clay to clay	17
14.50	47.6	45.3	....	....	3.4	7.0	silty clay to clay	17

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
14.55	47.7	45.8	0.717	1.57	3.5	7.4	silty sand to sandy silt	14
14.60	47.9	32.5	0.721	2.22	3.3	7.4	sandy silt to clayey silt	13
14.65	48.1	21.6	0.736	3.41	3.7	7.4	clayey silt to silty clay	12
14.70	48.2	18.3	0.789	4.33	4.4	7.4	silty clay to clay	13
14.75	48.4	20.9	0.812	3.89	4.7	7.4	silty clay to clay	12
14.80	48.6	19.3	0.721	3.74	4.8	7.3	silty clay to clay	13
14.85	48.7	18.7	0.850	4.55	5.0	7.3	clay	18
14.90	48.9	19.3	1.134	5.86	5.4	7.4	clay	21
14.95	49.0	28.3	1.260	4.45	5.5	7.3	silty clay to clay	18
15.00	49.2	35.0	1.308	3.74	3.6	7.3	clayey silt to silty clay	17
15.05	49.4	40.2	1.313	3.27	0.6	7.3	clayey silt to silty clay	19
15.10	49.5	41.0	1.143	2.79	-1.3	7.3	sandy silt to clayey silt	15
15.15	49.7	36.7	1.007	2.74	-2.1	7.3	?	?
15.20	49.9	27.5	?	?	-2.6	7.2	?	?
15.25	50.0	26.9	?	?	-2.4	7.4	?	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .15 m sliding data average

SOUNDING DATA IN FILE CPT-44 10-07-96 09:23

OPERATOR : BROWN LOCATION : CPT-1

CONE ID : 608 JOB No. : 96-33

Northwest Cone Exploration

DEPTH meters	DEPTH feet	TIME sec	DISSIPATION OF Fw psi AT INTERVAL 5 sec											
6.25	20.5	0.0	2.8	2.5	2.8	2.5	2.5	2.8	2.8	2.7	2.8	2.8	2.8	3.0
		60.0	2.9	2.9	2.9	3.0	3.0	2.9	3.0	3.0	3.1	3.2	3.2	3.0
		120.0	3.1	3.1	3.3	3.3	3.2	3.4	3.4	3.4	3.5	3.4	3.4	3.5
		180.0	3.6	3.5	3.6	3.6	3.5	3.7	3.5	3.6	3.7	3.7	3.7	3.7
		240.0	3.8	3.9	3.9	3.8	3.9	4.0	3.9	3.9	4.0	4.1	4.0	4.0
		300.0	4.1	4.1	4.1	4.2	4.1	4.3	4.2	4.2	4.1	4.3	4.3	4.4
		360.0	4.4	4.3	4.4	4.4	4.3	4.3	4.3	4.4	4.5	4.4	4.4	4.5
		420.0	4.5	4.4	4.5	4.6	4.6	4.6	4.5	4.6	4.6	4.7	4.7	4.6
		480.0	4.7	4.7	4.7	4.8	4.5	4.8	4.8	4.8	4.9	4.8	4.9	4.8
		540.0	4.8	4.9	4.8	5.0	5.1	4.9	5.1	4.9	5.0	4.9	4.9	5.0
		600.0	4.9	4.9	4.9	4.8	4.9	4.8	4.8	4.9	4.9	4.9	4.9	5.0
		660.0	5.0	4.9	5.0	5.0	4.9	5.1	5.0	5.1	5.1	5.0	5.0	5.0
		720.0	5.1	5.0	5.1	5.0	5.1	5.2	5.2	5.1	5.1	5.1	5.2	5.2
		780.0	5.2	5.2	5.1	5.2	5.2	5.2	5.2	5.2	5.2	5.3	5.4	5.2
		840.0	5.2	5.3	5.1	5.3	5.3	5.3	5.4	5.6	5.3	5.5	5.3	5.5
		900.0	5.2	5.3	5.2	5.4	5.4	5.3	5.3	5.4	5.4	5.4	5.4	5.3
		960.0	5.3	5.3	5.3	5.3	5.4	5.4	5.3	5.3	5.3	5.5	5.5	5.5
		1020.0	5.4	5.4	5.3	5.4	5.5	5.4	5.4	5.4	5.4	5.4	5.5	5.4
		1080.0	5.5	5.5	5.5	5.6	5.4	5.5	5.4	5.4	5.5	5.6	5.5	5.6
		1140.0	5.6	5.5	5.6	5.6	5.6	5.7	5.6	5.6	5.5			

psi

DEPTH meters	DEPTH feet	TIME sec	DISSIPATION OF Fw psi AT INTERVAL 5 sec										
7.05	23.1	0.0	-6.9	-6.7	-6.7	-6.7	-6.6	-6.5	-6.5	-6.4	-6.3	-6.1	-6.1	-6.0
		60.0	-6.1	-5.7	-5.8	-5.8	-5.6	-5.5	-5.6	-5.4	-5.2	-5.2	-5.0	-5.0
		120.0	-4.8	-4.9	-4.7	-4.8	-4.6	-4.5	-4.4	-4.3	-4.2	-4.0	-4.1	-3.9
		180.0	-4.0	-4.0	-3.8	-3.8	-3.8	-3.5	-3.4	-3.4	-3.3	-3.3	-3.2	-3.0
		240.0	-3.0	-2.9	-2.9	-2.8	-2.8	-2.8	-2.5	-2.4	-2.3	-2.4	-2.2	-2.0
		300.0	-2.1	-2.0	-2.0	-1.9	-1.9	-1.7	-1.6	-1.6	-1.4	-1.4	-1.4	-1.2
		360.0	-1.1	-1.1	-1.2	-1.0	-0.9	-0.9	-0.9	-0.8	-0.8	-0.7	-0.8	-0.6
		420.0	-0.4	-0.4	-0.4	-0.4	-0.2	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	0.1
		480.0	0.2	0.0	0.2	0.2	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.7
		540.0	0.7	0.7	0.8	0.8	0.9	1.0	0.9	1.0	1.1	1.1	1.0	1.2
		600.0	1.2	1.2	1.3	1.4	1.4	1.4	1.4	1.6	1.4	1.5	1.7	1.7
		660.0	1.6	1.6	1.6	1.7	1.8	1.8	1.9	1.8	2.0	1.9	2.1	2.1
		720.0	2.0	2.2	2.1	1.9	2.2	2.3	2.2	2.2	2.2	2.2	2.4	2.3
		780.0	2.4	2.3	2.4	2.5	2.5	2.4	2.4	2.5	2.6	2.5	2.6	2.7
		840.0	2.5	2.7	2.7	2.8	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.7
		900.0	2.9	2.8	2.9	2.9	3.0	2.9	3.0	2.9	3.1	3.0	3.0	3.0
		960.0	3.1	3.0	3.1	3.0	3.2	3.1	3.1	3.2	3.1	3.2	3.2	3.2
		1020.0	3.1	3.3	3.2	3.2	3.3	3.2	3.3	3.2	3.2	3.2	3.2	3.3
		1080.0	3.3	3.3	3.3	3.3	3.3	3.4	3.3	3.4	3.5	3.4	3.5	3.5
		1140.0	3.4	3.4	3.5	3.5	3.4	3.5	3.6	3.5	3.5	3.5	3.4	3.5
		1200.0	3.5	3.4	3.6	3.5	3.5	3.4	3.6	3.5	3.6	3.5	3.6	3.5
		1260.0	3.6	3.6	3.5	3.5	3.6	3.6	3.6	3.7	3.5	3.7	3.6	3.7
		1320.0	3.6	3.6	3.6	3.5	3.6	3.7	3.7	3.6	3.7	3.6	3.6	3.8
		1380.0	3.7	3.7	3.7	3.8	3.6	3.7	3.8	3.6	3.6	3.6	3.6	3.7
		1440.0	3.7	3.6	3.7	3.7	3.7	3.7	3.7	3.8	3.7	3.8	3.8	3.8
		1500.0	3.7	3.8	3.8	3.7	3.7	3.7	3.8	3.7	3.7	3.7	3.8	3.8
		1560.0	3.7	3.8	3.7	3.8	3.6	3.7	3.8	3.9	3.8	3.7	3.8	3.7
		1620.0	-0.3	-3.2										
12.25	40.2	0.0	-4.5	-4.3	-4.3	-4.3	-4.3	-4.2	-4.2	-4.1	-3.9	-4.1	-3.9	-3.9
		60.0	-3.9	-3.8	-3.8	-3.7	-3.7	-3.7	-3.5	-3.4	-3.4	-3.4	-3.3	-3.4
		120.0	-3.3	-3.2	-3.0	-3.1	-3.0	-3.0	-3.0	-2.8	-2.8	-2.8	-2.7	-2.6
		180.0	-2.5	-2.5	-2.4	-2.3	-2.3	-2.2	-2.3	-2.2	-2.0	-2.1	-1.8	-1.9
		240.0	-1.9	-1.8	-1.8	-1.7	-1.5	-1.8	-1.4	-1.4	-1.4	-1.2	-1.1	-1.2
		300.0	-1.1	-1.0	-1.0	-1.0	-0.8	-0.7	-0.7	-0.5	-0.6	-0.5	-0.4	-0.4
		360.0	-0.1	-0.2	-0.2	-0.2	-0.2	0.0	0.2	0.1	0.3	0.2	0.3	0.5
		420.0	0.4	0.6	0.6	0.7	0.8	0.8	0.8	1.0	0.9	1.2	1.1	1.3
		480.0	1.3	1.3	1.5	1.4	1.5	1.7	1.7	1.7	1.7	1.8	1.8	2.0
		540.0	2.0	2.1	2.2	2.1	2.2	2.4	2.3	2.4	2.5	2.5	2.6	2.6
		600.0	2.7	2.8	2.9	2.8	2.9	2.9	3.0	3.1	3.0	3.2	3.2	3.6
		660.0	3.3	3.4	3.5	3.4	3.5	3.6	3.5	3.8	3.8	3.8	3.8	3.8
		720.0	3.8	3.9	4.0	4.0	4.1	4.0	4.1	4.2	4.2	4.1	4.2	4.2
		780.0	4.4	4.3	4.3	4.3	4.5	4.4	4.5	4.5	4.6	4.6	4.7	4.7
		840.0	4.5	4.6	4.7	4.6	4.7	4.6	4.6	4.6	4.9	4.9	4.9	4.9
		900.0	5.0	4.9	4.9	5.0	5.0	5.1	5.0	5.0	5.1	5.1	5.1	5.1
		960.0	5.1	5.1	5.1	5.1	5.1	5.2	5.2	5.2	5.2	5.2	5.2	5.2
		1020.0	5.3	5.3	5.3	5.3	5.3	5.2	5.3	5.3	5.4	5.4	5.4	5.4
		1080.0	5.7	5.5	5.5	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.5	5.7
		1140.0	5.5	5.6	5.4	5.5	5.4	5.4	5.4	5.5	5.5	5.6	5.7	5.5
		1200.0	5.6	5.4	5.6	5.4	5.6	5.4	5.6	5.6	5.5	5.6	5.6	5.7

DEPTH meters	DEPTH feet	TIME sec	DISSIPATION OF Pw psi AT INTERVAL 5 sec											
12.25	40.2	1260.0	5.1											
14.25	46.8	0.0	0.5	0.9	1.2	1.5	1.8	2.0	2.3	2.6	2.7	3.0	3.2	3.6
		60.0	3.8	4.0	4.3	4.5	4.7	4.9	5.0	5.4	5.4	5.6	5.8	5.7
		120.0	5.8	5.8	5.8	6.0	6.1	6.1	6.3	6.4	6.5	6.6	6.7	6.8
		180.0	6.9	6.9	7.0	7.2	7.1	7.1	7.2	7.2	7.3	7.5	7.4	7.4
		240.0	7.4	7.6	7.6	7.7	7.5	7.6	7.7	7.7	7.8	7.8	7.7	7.9
		300.0	7.8	7.9	8.0	8.0	7.9	8.0	7.9	8.1	8.1	8.1	8.0	8.2
		360.0	8.0	8.1	8.1	8.2	8.1	8.2	8.3	8.2	8.1	8.3	8.2	8.2
		420.0	8.1	8.2	8.3	8.3	8.2	8.3	8.2	8.3	8.4	8.3	8.2	8.2
		480.0	8.4	8.2	8.3	8.2	8.3	8.3	8.4	8.3	8.2	8.4	8.4	8.4
		540.0	8.4	8.3	8.3	8.4	8.4	8.4	8.3	8.4				

SOUNDING DATA IN FILE CPT-45 10-07-96 15:45

OPERATOR : BROWN LOCATION : CPT-2

CONE ID : 608 JOB No. : 96-33

Northwest Cone Exploration

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Fw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
0.05	0.2	1.2	0.003	0.24	-0.1	0.7	?	?
0.10	0.3	1.2	0.000	0.02	-0.1	1.1	sensitive fine grained	1
0.15	0.5	3.3	0.109	2.80	-0.1	1.4	clay	?
0.20	0.7	16.7	1.078	6.44	-0.1	0.7	clayey silt to silty clay	13
0.25	0.8	60.0	1.689	2.82	-0.0	1.4	silty sand to sandy silt	30
0.30	1.0	206.1	2.921	1.42	0.0	0.0	sand	42
0.35	1.1	396.7	3.480	0.88	-0.2	1.2	sand	62
0.40	1.3	368.9	3.742	1.01	-0.7	0.3	sand	65
0.45	1.5	248.8	4.764	1.91	-0.4	0.2	sand to silty sand	63
0.50	1.6	165.9	4.657	2.53	-0.7	0.1	silty sand to sandy silt	56
0.55	1.8	111.6	3.920	3.51	-2.0	0.1	sandy silt to clayey silt	45
0.60	2.0	75.3	2.958	3.93	-6.4	0.1	sandy silt to clayey silt	32
0.65	2.1	62.7	1.736	2.86	-6.2	0.1	sandy silt to clayey silt	23
0.70	2.3	46.0	1.289	2.81	-6.2	0.1	clayey silt to silty clay	23
0.75	2.5	35.2	1.453	4.13	-6.3	0.1	clayey silt to silty clay	20
0.80	2.6	45.4	1.591	3.51	-6.3	0.1	clayey silt to silty clay	24
0.85	2.8	72.4	1.866	2.61	-6.3	0.1	sandy silt to clayey silt	23
0.90	3.0	63.4	2.222	3.50	-6.6	0.1	sandy silt to clayey silt	26
0.95	3.1	68.1	2.279	3.35	-7.0	0.2	sandy silt to clayey silt	29
1.00	3.3	96.1	2.429	2.53	-7.0	0.2	sandy silt to clayey silt	30
1.05	3.4	72.9	1.914	2.63	-7.4	0.2	silty sand to sandy silt	25
1.10	3.6	65.0	0.932	1.43	-8.9	0.2	silty sand to sandy silt	21
1.15	3.8	57.6	0.308	0.53	-0.0	0.2	sand to silty sand	13
1.20	3.9	43.7	-0.133	-0.30	-0.1	0.2	sand to silty sand	11
1.25	4.1	36.5	-0.137	-0.38	-0.1	0.3	?	?
1.30	4.3	-0.2	-0.141	56.24	-0.1	0.3	?	?
1.35	4.4	-0.3	-0.150	46.88	-0.0	0.3	?	?
1.40	4.6	-0.4	-0.150	41.61	-0.1	0.3	?	?
1.45	4.8	-0.5	-0.151	28.45	-0.1	0.3	?	?
1.50	4.9	-0.6	-0.152	25.78	-0.1	0.3	?	?
1.55	5.1	-0.6	0.210	-35.64	-0.1	0.3	?	?
1.60	5.2	-0.5	1.255	-246.06	-0.1	0.3	clay	11
1.65	5.4	35.3	0.625	1.77	-0.1	0.5	clayey silt to silty clay	20
1.70	5.6	88.2	2.404	2.73	-0.1	0.5	sandy silt to clayey silt	27
1.75	5.7	90.6	2.609	2.88	-0.0	2.7	sandy silt to clayey silt	27
1.80	5.9	29.0	1.357	4.67	-0.0	2.7	clayey silt to silty clay	28
1.85	6.1	58.4	2.236	3.83	-0.0	3.5	sandy silt to clayey silt	30
1.90	6.2	151.2	2.266	1.50	-0.0	4.4	silty sand to sandy silt	38
1.95	6.4	145.7	2.152	1.48	-0.1	2.8	silty sand to sandy silt	37
2.00	6.6	48.1	2.421	5.04	-0.1	4.3	silty sand to sandy silt	28

Soil Interpretation reference: Robertson & Campanella-1988. Based on Fr% versus Qc. Fr% is a sliding data average.

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
2.05	6.7	65.0	0.636	1.07	-0.1	2.5	silty sand to sandy silt	22
2.10	6.9	98.4	0.226	0.23	-0.1	3.7	sand to silty sand	18
2.15	7.1	62.3	0.550	0.88	-0.1	2.9	sand to silty sand	16
2.20	7.2	36.7	0.583	1.59	-0.2	3.8	silty sand to sandy silt	13
2.25	7.4	24.9	0.436	1.75	-0.0	3.6	sandy silt to clayey silt	9
2.30	7.5	9.8	0.033	0.34	-0.1	3.6	?	?
2.35	7.7	9.3	-0.737	-8.56	-0.2	3.0	?	?
2.40	7.9	23.8	-0.479	-2.01	-0.2	3.1	?	?
2.45	8.0	64.0	-1.212	-1.89	-0.3	4.0	?	?
2.50	8.2	45.4	?	?	-0.1	4.1	?	?
2.55	8.4	116.2	0.892	0.77	-0.2	5.7	?	?
2.60	8.5	123.5	-0.614	-0.50	-0.3	8.4	sand to silty sand	20
2.65	8.7	6.1	1.097	17.87	-0.3	7.6	silty sand to sandy silt	18
2.70	8.9	36.3	1.278	3.34	-0.3	7.8	clay	22
2.75	9.0	24.0	1.229	5.11	-0.3	7.6	clay	26
2.80	9.2	19.4	1.337	6.88	-0.3	7.1	clay	26
2.85	9.4	38.6	2.362	6.12	-0.3	8.3	clay	27
2.90	9.5	25.7	1.447	5.63	-0.3	7.8	clay	31
2.95	9.7	33.5	0.886	2.64	-0.2	8.2	clayey silt to silty clay	12
3.00	9.8	18.1	0.159	0.88	-0.3	7.4	sandy silt to clayey silt	8
3.05	10.0	11.6	-0.478	-4.13	-0.3	7.3	?	?
3.10	10.2	12.5	-0.216	-1.74	-0.4	7.2	?	?
3.15	10.3	14.8	-0.036	-0.24	-0.4	7.4	?	?
3.20	10.5	1.0	0.056	5.66	-0.4	6.6	sensitive fine grained	3
3.25	10.7	0.7	0.030	4.44	-0.4	7.6	?	?
3.30	10.8	0.2	0.024	12.42	-0.4	7.7	?	?
3.35	11.0	0.8	0.226	28.74	-0.3	8.0	organic material	1
3.40	11.2	2.7	-0.034	-1.24	-0.4	8.8	?	?
3.45	11.3	4.3	-0.724	-14.69	-0.4	7.4	?	?
3.50	11.5	34.0	0.095	0.26	-0.3	7.2	?	?
3.55	11.6	29.7	-0.222	-0.75	-0.4	7.8	?	?
3.60	11.8	11.7	-0.221	-1.89	-0.4	7.3	sandy silt to clayey silt	9
3.65	12.0	28.8	1.385	4.80	-0.3	7.1	sandy silt to clayey silt	10
3.70	12.1	38.4	0.673	1.71	-0.3	10.0	sandy silt to clayey silt	15
3.75	12.3	49.8	0.713	1.44	-0.2	6.4	sandy silt to clayey silt	14
3.80	12.5	19.4	0.388	2.00	-0.3	7.4	sandy silt to clayey silt	10
3.85	12.6	13.2	0.133	1.01	-0.2	7.6	sandy silt to clayey silt	6
3.90	12.8	10.5	0.012	0.11	-0.3	7.6	clayey silt to silty clay	6
3.95	13.0	11.1	0.586	5.28	-0.2	7.3	clay	11
4.00	13.1	12.7	0.750	5.91	-0.2	7.7	clay	8
4.05	13.3	1.3	0.061	4.62	-0.2	8.4	clay	4
4.10	13.5	-0.8	-0.465	61.46	-0.3	8.3	?	?
4.15	13.6	-3.0	-0.787	26.00	-0.3	8.2	?	?
4.20	13.8	19.1	0.164	0.86	-0.3	7.8	sandy silt to clayey silt	8
4.25	13.9	22.9	0.642	2.80	-0.3	7.8	silt to silty clay	8
4.30	14.1	17.6	0.[illegible]	[illegible]	-0.3	[illegible]	y silt to silty clay	8
4.35	14.3	15.1	0.[illegible]	[illegible]	[illegible]	[illegible]	y silt to silty clay	7
4.40	14.4	[illegible]	0.102	[illegible]	[illegible]	[illegible]	clay	6
4.45	14.6	22.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10
[illegible]	[illegible]	11.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
4.55	14.9	6.8	0.371	5.45	-0.4	9.7	?	?
4.60	15.1	10.7	1.727	16.15	-0.2	5.8	clay	15
4.65	15.3	29.7	1.523	5.12	-0.2	8.6	sandy silt to clayey silt	23
4.70	15.4	137.9	1.220	0.88	-0.1	9.7	silty sand to sandy silt	30
4.75	15.6	117.5	1.763	1.50	-0.0	9.7	sand to silty sand	27
4.80	15.7	86.8	2.150	2.48	-0.0	10.3	sandy silt to clayey silt	30
4.85	15.9	30.8	1.575	5.11	-0.0	9.9	clayey silt to silty clay	22
4.90	16.1	18.4	0.586	3.18	0.2	10.0	silty clay to clay	13
4.95	16.2	12.7	0.311	2.44	-1.5	10.1	silty clay to clay	9
5.00	16.4	10.5	0.363	3.47	-1.2	10.3	clay	10
5.05	16.6	8.1	0.502	6.24	-0.5	10.2	clay	11
5.10	16.7	14.6	0.554	3.81	-2.9	10.6	?	?
5.15	16.9	11.7	2.706	23.22	-4.2	10.4	?	?
5.20	17.1	10.1	2.145	21.34	-2.1	10.6	?	?
5.25	17.2	47.6	2.370	4.98	0.1	9.9	clay	20
5.30	17.4	6.1	1.548	25.21	-0.1	8.6	clay	19
5.35	17.6	6.4	1.554	24.39	-0.1	8.3	?	?
5.40	17.7	17.6	0.851	4.82	-0.0	7.8	clay	22
5.45	17.9	43.7	0.708	1.62	-0.0	7.1	clayey silt to silty clay	13
5.50	18.0	18.8	0.722	3.84	-0.1	5.8	sandy silt to clayey silt	10
5.55	18.2	17.0	0.529	3.11	-0.1	5.7	clay	12
5.60	18.4	2.4	1.155	48.53	-0.1	5.7	?	?
5.65	18.5	-1.5	1.362	%-133.50	0.1	5.8	clay.	18
5.70	18.7	54.3	1.266	2.33	0.0	5.9	clay	15
5.75	18.9	7.4	0.450	6.09	0.1	5.6	clayey silt to silty clay	9
5.80	19.0	-2.9	-0.026	0.90	0.0	4.1	?	?
5.85	19.2	-1.0	0.857	-84.00	0.1	4.2	?	?
5.90	19.4	5.6	3.750	67.33	0.0	4.2	clay	27
5.95	19.5	73.6	2.558	3.21	0.0	3.7	clayey silt to silty clay	30
6.00	19.7	103.2	1.629	1.58	0.1	2.4	sandy silt to clayey silt	31
6.05	19.8	57.7	2.075	3.59	0.0	2.8	sandy silt to clayey silt	22
6.10	20.0	9.8	1.194	12.16	0.0	3.1	clayey silt to silty clay	19
6.15	20.2	51.2	0.468	0.91	0.1	3.4	silty clay to clay	16
6.20	20.3	12.0	1.046	8.75	-0.3	2.5	clayey silt to silty clay	15
6.25	20.5	28.3	1.418	5.01	-0.1	3.9	silty clay to clay	17
6.30	20.7	38.0	0.970	2.55	-0.4	3.7	silty sand to sandy silt	16
6.35	20.8	86.6	0.174	0.20	-0.0	4.7	sand to silty sand	19
6.40	21.0	115.7	0.441	0.38	-0.0	4.1	sand	22
6.45	21.2	147.7	-0.157	-0.11	-0.3	4.1	?	?
6.50	21.3	154.0	-0.472	-0.31	-0.3	5.4	sand	28
6.55	21.5	144.0	0.862	0.60	-0.3	5.3	sand	25
6.60	21.7	95.6	1.042	1.09	-0.5	3.3	sand to silty sand	24
6.65	21.8	57.3	1.173	2.05	-0.1	2.4	silty sand to sandy silt	22
6.70	22.0	52.3	0.548	1.05	-0.6	2.8	silty sand to sandy silt	20
6.75	22.1	76.7	0.375	0.49	-3.2	2.5	sand to silty sand	16
6.80	22.3	101.3	0.518	0.51	-0.2	1.7	sand to silty sand	23
6.85	22.5	116.2	0.743	0.64	-0.2	2.1	sand	22
6.90	22.6	128.8	0.744	0.60	-0.2	2.0	sand	25
6.95	22.8	120.7	0.803	0.66	-0.2	2.0	sand	27
7.00	23.0	115.6	0.853	0.80	-0.3	1.9	sand to silty sand	20

Soil interpretation reference: Robertson & Campanella-1983, based on 80% hydraulic efficiency and CS & Schmertmann data adj630

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
7.05	23.1	108.3	0.618	0.57	-0.3	2.1	sand to silty sand	26
7.10	23.3	105.0	0.543	0.52	-0.2	1.8	sand to silty sand	25
7.15	23.5	99.6	0.464	0.43	-0.3	2.1	sand to silty sand	24
7.20	23.6	93.6	0.474	0.51	-0.2	1.8	sand to silty sand	23
7.25	23.8	90.8	0.414	0.46	-0.3	1.3	sand to silty sand	22
7.30	23.9	93.0	0.405	0.44	-0.2	2.0	sand to silty sand	22
7.35	24.1	96.6	0.456	0.47	-0.2	2.0	sand to silty sand	24
7.40	24.3	106.7	0.482	0.45	-0.2	2.0	sand	21
7.45	24.4	116.0	0.504	0.43	-0.3	2.0	sand	21
7.50	24.6	111.4	0.449	0.40	-0.2	2.0	sand	22
7.55	24.8	110.9	0.404	0.36	-0.3	2.0	sand	21
7.60	24.9	107.8	0.414	0.38	-0.3	2.0	sand	20
7.65	25.1	97.5	0.386	0.40	-0.1	2.2	sand	19
7.70	25.3	96.5	0.405	0.45	-0.2	2.2	sand to silty sand	22
7.75	25.4	85.7	0.369	0.43	-0.2	2.2	sand to silty sand	21
7.80	25.6	86.9	0.323	0.37	-0.2	2.2	sand to silty sand	21
7.85	25.8	87.6	0.359	0.41	-0.3	2.2	sand to silty sand	21
7.90	25.9	83.6	0.404	0.48	-0.0	2.2	sand to silty sand	21
7.95	26.1	92.7	0.340	0.37	-0.3	2.2	sand to silty sand	22
8.00	26.2	104.4	0.350	0.33	-0.5	2.2	sand	19
8.05	26.4	106.4	0.324	0.30	-0.4	2.2	sand	20
8.10	26.6	105.1	0.293	0.28	-0.2	2.2	sand	20
8.15	26.7	97.1	0.249	0.26	-0.3	2.2	sand	18
8.20	26.9	86.9	0.276	0.32	-0.1	2.2	sand	17
8.25	27.1	82.6	0.241	0.29	-0.3	2.2	sand to silty sand	20
8.30	27.2	75.4	0.233	0.31	-0.0	2.2	sand to silty sand	18
8.35	27.4	72.4	0.197	0.27	0.0	2.2	sand to silty sand	18
8.40	27.6	72.9	0.179	0.25	0.3	2.2	sand to silty sand	17
8.45	27.7	72.4	0.154	0.21	0.7	2.2	sand to silty sand	18
8.50	27.9	77.0	0.202	0.26	0.6	2.2	sand to silty sand	18
8.55	28.1	74.4	0.261	0.35	-0.1	2.2	sand to silty sand	18
8.60	28.2	71.9	0.259	0.36	-0.5	2.2	sand to silty sand	18
8.65	28.4	75.1	0.285	0.38	-0.3	1.3	sand to silty sand	18
8.70	28.5	74.3	0.264	0.36	-1.6	1.9	sand to silty sand	18
8.75	28.7	74.8	0.264	0.35	-1.3	1.3	sand to silty sand	18
8.80	28.9	80.8	0.234	0.29	-3.5	1.9	sand to silty sand	19
8.85	29.0	80.2	0.463	0.58	-4.5	1.3	sand to silty sand	19
8.90	29.2	79.3	0.307	0.38	-4.7	1.3	sand to silty sand	20
8.95	29.4	85.1	0.307	0.36	-5.1	1.3	sand to silty sand	21
9.00	29.5	96.6	0.339	0.35	-5.3	1.9	sand	18
9.05	29.7	95.9	0.286	0.30	-7.3	1.3	sand to silty sand	22
9.10	29.9	79.9	0.413	0.52	-7.3	1.9	sand to silty sand	20
9.15	30.0	72.1	0.384	0.53	-7.3	1.9	sand to silty sand	18
9.20	30.2	70.1	0.721	1.03	-9.8	1.3	silty sand to sandy silt	22
9.25	30.4	80.0	0.738	0.93	-10.4	1.3	silty sand to sandy silt	23
9.30	30.5	76.3	0.736	0.97	-10.3	1.3	sand to silty sand	17
9.35	30.7	68.7	0.575	0.84	-9.7	1.3	sand to silty sand	17
9.40	30.8	67.1	0.567	0.85	-9.7	1.3	sand to silty sand	16
9.45	31.0	68.1	0.622	0.92	-9.7	1.3	sand to silty sand	20
9.50	31.2	68.5	0.553	0.81	-9.7	1.3	sand to silty sand	19

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N BPT
9.55	31.3	57.3	0.570	0.99	-11.2	1.9	silty sand to sandy silt	20
9.60	31.5	67.6	0.739	1.09	-11.5	1.9	sand to silty sand	17
9.65	31.7	64.5	0.662	0.78	-9.5	2.2	sand to silty sand	13
9.70	31.8	62.6	0.544	0.86	-9.6	2.0	sand to silty sand	13
9.75	32.0	75.4	0.551	0.73	-9.7	2.0	sand to silty sand	13
9.80	32.2	77.3	0.672	0.87	-9.6	2.0	sand to silty sand	18
9.85	32.3	77.1	0.504	0.65	-9.8	2.0	sand to silty sand	18
9.90	32.5	72.1	0.317	0.44	-10.1	2.0	sand to silty sand	17
9.95	32.6	63.3	0.285	0.45	-10.1	2.0	sand to silty sand	16
10.00	32.8	61.6	0.303	0.49	-10.1	2.0	sand to silty sand	15
10.05	33.0	63.2	0.391	0.62	-10.1	2.0	sand to silty sand	15
10.10	33.1	62.5	0.268	0.43	-10.1	2.0	sand to silty sand	15
10.15	33.3	60.8	0.292	0.48	-10.1	2.0	silty sand to sandy silt	17
10.20	33.5	32.3	0.658	2.04	-10.1	2.0	silty sand to sandy silt	12
10.25	33.6	20.2	0.554	2.74	-10.0	2.0	sandy silt to clayey silt	10
10.30	33.8	24.0	0.551	2.29	-9.7	2.4	sandy silt to clayey silt	12
10.35	34.0	50.3	0.500	0.98	-9.6	2.1	silty sand to sandy silt	13
10.40	34.1	48.6	0.904	1.87	-9.6	2.2	sandy silt to clayey silt	16
10.45	34.3	26.0	0.850	3.27	-9.2	2.2	sandy silt to clayey silt	14
10.50	34.4	31.9	0.701	2.20	-9.1	2.1	silty sand to sandy silt	13
10.55	34.6	63.2	0.392	0.62	-9.0	2.1	sand to silty sand	14
10.60	34.8	84.8	0.239	0.28	-8.8	2.1	sand to silty sand	16
10.65	34.9	73.9	0.218	0.29	-8.8	2.1	sand to silty sand	18
10.70	35.1	71.1	0.177	0.25	-8.5	2.1	sand to silty sand	17
10.75	35.3	62.4	0.153	0.25	-8.6	2.1	sand to silty sand	15
10.80	35.4	48.5	0.424	0.87	-8.6	2.1	silty sand to sandy silt	15
10.85	35.6	26.4	0.297	1.12	-8.5	2.1	silty sand to sandy silt	10
10.90	35.8	22.4	0.285	1.27	-8.5	2.1	silty sand to sandy silt	11
10.95	35.9	52.9	0.292	0.55	-8.4	2.1	silty sand to sandy silt	15
11.00	36.1	64.6	0.203	0.31	-8.5	2.2	sand to silty sand	15
11.05	36.3	67.2	0.267	0.40	-8.4	2.2	sand to silty sand	16
11.10	36.4	72.1	0.300	0.42	-8.5	2.2	sand to silty sand	17
11.15	36.6	73.4	0.313	0.43	-8.6	2.3	sand to silty sand	18
11.20	36.7	75.4	0.359	0.48	-8.6	2.3	sand to silty sand	18
11.25	36.9	79.7	0.307	0.39	-8.6	2.3	sand to silty sand	19
11.30	37.1	81.4	0.263	0.32	-8.7	2.3	sand to silty sand	19
11.35	37.2	82.2	0.509	0.62	-8.7	2.3	sand to silty sand	18
11.40	37.4	58.7	0.484	0.83	-8.8	2.4	silty sand to sandy silt	18
11.45	37.6	31.1	0.455	1.46	-8.8	2.4	silty sand to sandy silt	12
11.50	37.7	22.3	0.291	1.30	-8.7	2.4	sandy silt to clayey silt	8
11.55	37.9	12.6	0.407	3.23	-8.7	2.4	clayey silt to silty clay	7
11.60	38.1	11.8	0.396	3.35	-8.8	2.4	silty clay to clay	8
11.65	38.2	12.5	0.297	2.38	-8.6	2.5	clayey silt to silty clay	8
11.70	38.4	25.3	0.308	1.22	-8.4	2.7	silty sand to sandy silt	10
11.75	38.5	53.5	0.260	0.48	-8.3	2.7	?	?
11.80	38.7	75.3	?	?	-7.9	2.7	?	?
11.85	38.9	70.9	?	?	-8.0	2.7	?	?

Soil behavior reference: Robertson & Campanella 1983, based on 60% hammer efficiency and [illegible] data average

SOUNDING DATA IN FILE CPT-45 10-07-96 15:45

OPERATOR : BROWN LOCATION : CPT-2

CONE ID : 608 JOB No. : 96-33

Northwest Cone Exploration

DEPTH meters	DEPTH feet	TIME sec	DISSIPATION OF Pw psi AT INTERVAL 5 sec											
7.60	24.9	0.0	-0.3	-0.3	-0.3	-0.2	-0.4	-0.4	-0.3	-0.4	-0.2	-0.4	-0.3	-0.3
		60.0	-0.2	-0.3	-0.3	-0.2	-0.4	-0.4	-0.3	-0.3	-0.2	-0.4	-0.2	-0.2
		120.0	-0.4	-0.2	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3
		180.0	-0.3	-0.2	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.1	-0.3
		240.0	-0.2	-0.2	-0.2	-0.3	-0.2	-0.3	-0.2	-0.2	-0.2			
8.60	28.2	0.0	-0.6	-0.6	-0.6	-0.7	-0.7	-0.7	-0.6	-0.7	-0.7	-0.7	-0.6	-0.6
		60.0	-0.6	-0.6	-0.6	-0.7	-0.6	-0.6	-0.5	-0.6	-0.6	-0.5	-0.4	-0.5
		120.0	-0.5	-0.5	-0.6	-0.5	-0.6	-0.4	-0.5	-0.4	-0.5	-0.4	-0.4	-0.4
		180.0	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4						
9.60	31.5	0.0	-11.4	-11.5	-11.5	-11.5	-11.4	-11.3	-11.5	-11.4	-11.3	-11.3	-11.4	-11.4
		60.0	-11.3	-11.3	-11.3	-11.4	-11.3	-11.2	-11.2	-11.3	-11.3	-11.2	-11.3	-11.3
		120.0	-11.2	-11.4	-11.3	-11.1	-11.2	-11.2	-11.1	-11.1	-11.1	-11.2	-11.2	-11.2
		180.0	-11.1	-11.1	-11.1	-11.0	-9.6							
10.25	33.6	0.0	-10.0	-10.0	-9.9	-9.8	-10.0	-9.8	-9.9	-9.8	-9.8	-9.7	-9.9	-9.9
		60.0	-9.9	-10.0	-9.9	-9.8	-9.9	-9.8	-10.0	-9.8	-9.8	-10.0	-9.8	-9.9
		120.0	-9.9	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8	-9.9	-9.7	-9.9	-9.7	-9.8
		180.0	-9.9	-9.7	-9.7	-9.8	-9.9	-9.8	-9.9	-9.9	-9.7	-9.7	-9.7	-9.8
		240.0	-9.7	-9.7	-9.7	-9.7	-9.7	-9.7	-9.7	-9.7	-9.7	-9.7	-9.6	-9.7
		300.0	-9.7	-9.6	-9.7	-9.7	-9.7	-9.6	-9.7	-9.6	-9.5	-9.8		
11.85	38.9	0.0	-8.1	-8.0	-8.0	-8.1	-8.1	-8.0	-8.1	-8.0	-8.0	-8.0	-8.0	-8.0
		60.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-7.9	-8.0	-7.9	-8.0	-7.9	-7.8
		120.0	-7.9	-7.9	-7.9	-7.8	-7.9	-7.9	-7.9	-7.9	-7.7	-7.8	-7.8	-7.8
		180.0	-7.9	-7.7	-7.7	-7.8	-7.7	-7.8	-7.6	-7.7	-7.6	-7.6	-7.6	-7.7
		240.0	-7.5	-7.6	-7.5	-7.6	-7.5	-7.5	-7.5	-7.5	-7.5	-7.5	-7.5	-7.4
		300.0	-7.4	-7.4	-7.5	-7.3	-7.4	-7.3	-7.3	-7.3	-7.3	-7.3	-7.4	-7.3
		360.0	-7.3	-7.4	-7.4									

SOUNDING DATA IN FILE CPT-47 10-08-96 16:15

OPERATOR : BROWN LOCATION : CPT-3

CONE ID : 608 JOB NO. : 96-33

Northwest Cone Exploration

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
0.05	0.2	2.2	-0.025	-1.14	0.1	1.3	?	?
0.10	0.3	2.2	0.270	12.10	0.1	0.3	sandy silt to clayey silt	8
0.15	0.5	57.1	0.640	1.12	-0.1	0.0	silty sand to sandy silt	16
0.20	0.7	86.1	1.322	1.50	-0.0	0.0	sand to silty sand	33
0.25	0.8	268.3	3.191	1.19	-0.2	0.0	sand to silty sand	64
0.30	1.0	451.3	6.931	1.54	-0.1	0.1	sand to silty sand	90
0.35	1.1	412.6	7.432	1.80	0.0	0.0	sand	85
0.40	1.3	460.7	5.810	1.26	0.1	0.2	sand	76
0.45	1.5	314.6	4.458	1.42	0.1	0.8	sand	64
0.50	1.6	221.6	3.816	1.72	-0.1	0.4	sand	46
0.55	1.8	186.8	1.125	0.60	-0.1	0.5	sand to silty sand	47
0.60	2.0	175.2	4.002	2.28	-0.4	0.4	sand to silty sand	45
0.65	2.1	204.6	4.073	1.99	-0.2	0.3	silty sand to sandy silt	55
0.70	2.3	137.5	4.619	3.36	-0.0	0.2	silty sand to sandy silt	47
0.75	2.5	103.3	2.496	2.42	-0.2	0.3	sandy silt to clayey silt	42
0.80	2.6	86.7	1.796	2.03	-0.3	0.5	silty sand to sandy silt	28
0.85	2.8	72.4	1.330	1.84	-0.5	0.5	silty sand to sandy silt	24
0.90	3.0	60.0	1.037	1.73	-0.3	0.3	silty sand to sandy silt	19
0.95	3.1	50.7	0.790	1.56	-0.3	0.3	silty sand to sandy silt	16
1.00	3.3	42.8	0.598	1.40	-0.3	0.6	silty sand to sandy silt	14
1.05	3.4	37.7	0.464	1.23	-0.3	0.4	silty sand to sandy silt	12
1.10	3.6	31.9	0.391	1.23	-0.3	0.3	silty sand to sandy silt	10
1.15	3.8	27.0	0.262	0.97	-0.2	0.3	sandy silt to clayey silt	11
1.20	3.9	24.2	0.343	1.42	-0.2	0.5	sandy silt to clayey silt	9
1.25	4.1	21.1	0.219	1.04	-0.2	0.4	sandy silt to clayey silt	8
1.30	4.3	17.9	0.261	1.46	-0.1	0.2	sandy silt to clayey silt	7
1.35	4.4	16.5	0.191	1.16	-0.2	0.3	sandy silt to clayey silt	7
1.40	4.6	16.7	0.146	0.88	-0.2	0.2	sandy silt to clayey silt	7
1.45	4.8	18.7	0.155	0.83	-0.1	0.2	sandy silt to clayey silt	7
1.50	4.9	18.2	0.230	1.26	-0.1	0.2	sandy silt to clayey silt	7
1.55	5.1	17.3	0.304	1.76	-0.2	0.2	sandy silt to clayey silt	7
1.60	5.2	17.8	0.330	1.86	-0.2	0.2	clayey silt to silty clay	8
1.65	5.4	16.8	0.294	1.75	-0.2	0.2	clayey silt to silty clay	7
1.70	5.6	10.4	0.237	2.27	-0.2	0.2	clayey silt to silty clay	7
1.75	5.7	14.9	0.161	1.08	-0.1	0.2	sandy silt to clayey silt	6
1.80	5.9	20.3	0.181	0.89	-0.9	0.2	sandy silt to clayey silt	7
1.85	6.1	23.1	0.189	0.82	-0.5	0.2	sandy silt to clayey silt	9
1.90	6.2	24.8	0.242	0.98	-0.1	0.2	sandy silt to clayey silt	9
1.95	6.4	25.0	0.273	1.09	-0.1	0.2	sandy silt to clayey silt	10
2.00	6.6	25.6	0.280	1.09	0.0	0.2	sandy silt to clayey silt	10

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .15 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
2.05	6.7	27.5	0.300	1.09	-0.1	0.2	sandy silt to clayey silt	11
2.10	6.9	30.5	0.316	1.04	-0.2	0.4	sandy silt to clayey silt	11
2.15	7.1	26.7	0.336	1.26	-0.1	0.4	sandy silt to clayey silt	10
2.20	7.2	16.6	0.340	1.83	-0.1	0.4	sandy silt to clayey silt	8
2.25	7.4	20.2	0.292	1.44	-0.2	0.7	sandy silt to clayey silt	8
2.30	7.5	23.6	0.263	1.11	-1.5	0.7	sandy silt to clayey silt	9
2.35	7.7	23.1	0.250	1.08	-0.3	0.7	sandy silt to clayey silt	8
2.40	7.9	19.6	0.327	1.67	-0.1	0.7	sandy silt to clayey silt	7
2.45	8.0	13.7	0.280	2.04	-0.0	0.7	clayey silt to silty clay	7
2.50	8.2	12.3	0.233	1.90	0.2	0.7	clayey silt to silty clay	6
2.55	8.4	10.9	0.215	2.00	0.4	0.7	clayey silt to silty clay	5
2.60	8.5	9.8	0.178	1.80	0.4	0.7	clayey silt to silty clay	5
2.65	8.7	11.9	0.231	1.94	0.2	0.7	clayey silt to silty clay	5
2.70	8.9	7.4	0.210	2.83	0.5	0.7	silty clay to clay	5
2.75	9.0	4.3	0.127	2.94	0.2	0.7	clay	5
2.80	9.2	3.4	0.098	2.89	0.2	0.7	clay	4
2.85	9.4	3.7	0.104	2.82	0.3	0.7	clay	4
2.90	9.5	4.1	0.117	2.86	0.4	0.7	clay	4
2.95	9.7	3.6	0.102	2.86	0.3	0.7	clay	3
3.00	9.8	3.1	0.116	3.75	0.4	0.7	clay	3
3.05	10.0	3.8	0.162	4.32	0.5	0.7	clay	4
3.10	10.2	4.4	0.242	5.45	0.6	0.7	clay	5
3.15	10.3	8.0	0.304	3.82	0.6	0.7	silty clay to clay	6
3.20	10.5	15.3	0.343	2.25	0.5	0.9	clayey silt to silty clay	7
3.25	10.7	21.5	0.339	1.57	-0.4	0.9	clayey silt to silty clay	9
3.30	10.8	16.5	0.304	1.84	-1.9	1.0	clayey silt to silty clay	8
3.35	11.0	10.8	0.305	2.83	-1.6	1.0	clayey silt to silty clay	6
3.40	11.2	7.4	0.272	3.65	-1.6	1.0	clay	6
3.45	11.3	5.4	0.210	3.86	-1.4	1.0	clay	6
3.50	11.5	4.6	0.155	3.38	-1.3	1.0	clay	5
3.55	11.6	4.9	0.135	2.78	-1.3	1.0	clay	5
3.60	11.8	5.4	0.183	3.38	-1.2	1.0	clay	5
3.65	12.0	5.7	0.257	4.54	-1.2	1.0	clayey silt to silty clay	5
3.70	12.1	22.2	0.371	1.67	-1.2	1.0	sandy silt to clayey silt	8
3.75	12.3	38.6	0.333	0.86	-1.2	1.0	silty sand to sandy silt	11
3.80	12.5	45.4	0.334	0.74	-1.4	1.0	silty sand to sandy silt	13
3.85	12.6	35.2	0.305	0.87	-1.8	1.0	silty sand to sandy silt	11
3.90	12.8	21.5	0.307	1.41	-0.7	1.0	sandy silt to clayey silt	9
3.95	13.0	12.3	0.288	2.33	0.3	1.1	clayey silt to silty clay	7
4.00	13.1	7.5	0.250	3.29	0.2	1.1	clayey silt to silty clay	6
4.05	13.3	15.4	0.203	1.39	0.4	1.1	sandy silt to clayey silt	6
4.10	13.5	28.4	0.139	0.53	0.1	1.1	sandy silt to clayey silt	9
4.15	13.6	33.3	0.223	0.68	-0.1	1.1	silty sand to sandy silt	9
4.20	13.8	21.6	0.213	0.97	0.1	1.1	silty sand to sandy silt	8
4.25	13.9	11.7	0.164	1.43	-1.2	1.1	silty sand to sandy silt	7
4.30	14.1	11.1	0.165	1.47	-1.4	1.3	silty sand to sandy silt	5
4.35	14.3	9.5	0.156	1.61	-1.2	1.3	sandy silt to clayey silt	5
4.40	14.4	9.4	0.145	1.54	-1.7	1.3	clayey silt to silty clay	5
4.45	14.6	9.3	0.145	1.56	-1.8	1.3	clayey silt to silty clay	5
4.50	14.8	9.2	0.145	1.58	-1.8	1.3	silty clay to clay	5

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DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
4.55	14.9	8.3	0.161	1.94	-1.1	1.3	silty clay to clay	5
4.60	15.1	7.4	0.147	1.98	-1.0	1.3	silty clay to clay	5
4.65	15.3	6.3	0.135	2.15	-1.0	1.3	silty clay to clay	4
4.70	15.4	5.6	0.118	2.11	-0.9	1.3	silty clay to clay	4
4.75	15.6	5.4	0.119	2.19	-0.7	1.3	silty clay to clay	3
4.80	15.7	4.4	0.111	2.53	-0.6	1.3	clay	5
4.85	15.9	5.1	0.118	2.30	-0.6	1.3	clay	5
4.90	16.1	5.2	0.126	2.43	-0.6	1.3	clay	5
4.95	16.2	4.7	0.127	2.70	-0.6	1.5	clay	5
5.00	16.4	5.1	0.122	2.41	-0.4	1.5	clay	5
5.05	16.6	5.6	0.109	1.94	-0.3	1.5	silty clay to clay	4
5.10	16.7	5.8	0.107	1.85	-0.2	1.5	silty clay to clay	4
5.15	16.9	5.3	0.167	3.15	-0.2	1.5	clay	5
5.20	17.1	5.3	0.150	2.85	-0.2	1.6	clay	5
5.25	17.2	5.8	0.118	2.02	0.6	1.7	silty clay to clay	3
5.30	17.4	4.9	0.101	2.06	0.8	1.7	clay	5
5.35	17.6	4.5	0.156	3.48	0.8	1.7	clay	5
5.40	17.7	6.3	0.164	2.58	0.9	1.7	clay	6
5.45	17.9	6.8	0.289	4.25	1.1	1.7	clay	7
5.50	18.0	7.5	0.245	3.27	1.2	1.7	sandy silt to clayey silt	8
5.55	18.2	50.1	0.220	0.44	1.4	1.7	silty sand to sandy silt	11
5.60	18.4	46.9	0.315	0.67	0.8	1.7	silty sand to sandy silt	14
5.65	18.5	38.5	0.234	0.61	1.3	1.7	silty sand to sandy silt	14
5.70	18.7	44.5	0.151	0.34	1.7	1.7	silty sand to sandy silt	13
5.75	18.9	42.9	0.221	0.51	0.6	2.0	silty sand to sandy silt	12
5.80	19.0	29.3	0.522	1.75	1.4	2.0	sandy silt to clayey silt	12
5.85	19.2	19.3	0.576	2.98	1.3	2.0	clayey silt to silty clay	10
5.90	19.4	14.0	0.458	3.27	1.6	2.0	clayey silt to silty clay	8
5.95	19.5	16.8	0.264	1.58	1.7	1.8	clayey silt to silty clay	7
6.00	19.7	12.8	0.302	2.37	1.5	1.8	clayey silt to silty clay	7
6.05	19.8	14.5	0.247	1.71	1.4	1.8	clayey silt to silty clay	6
6.10	20.0	9.7	0.128	1.32	1.2	1.8	clayey silt to silty clay	5
6.15	20.2	7.8	0.230	2.93	1.4	1.9	silty clay to clay	5
6.20	20.3	7.2	0.261	3.62	1.6	1.8	silty clay to clay	6
6.25	20.5	11.9	0.297	2.49	2.0	1.8	clayey silt to silty clay	6
6.30	20.7	17.6	0.236	1.34	2.0	1.9	sandy silt to clayey silt	7
6.35	20.8	21.5	0.315	1.47	3.5	1.9	sandy silt to clayey silt	7
6.40	21.0	17.5	0.322	1.84	7.7	1.9	sandy silt to clayey silt	6
6.45	21.2	11.1	0.187	1.69	8.1	1.9	clayey silt to silty clay	6
6.50	21.3	7.0	0.127	1.82	7.3	2.0	clayey silt to silty clay	6
6.55	21.5	17.5	0.104	0.59	7.3	1.9	sandy silt to clayey silt	6
6.60	21.7	23.0	0.147	0.64	4.3	1.9	sandy silt to clayey silt	8
6.65	21.8	21.4	0.240	1.12	4.4	1.9	sandy silt to clayey silt	7
6.70	22.0	13.4	0.200	1.51	6.6	1.9	sandy silt to clayey silt	6
6.75	22.1	9.0	0.172	1.91	7.1	1.9	clayey silt to silty clay	5
6.80	22.3	7.3	0.118	1.61	7.2	1.9	clayey silt to silty clay	4
6.85	22.5	7.0	0.130	1.85	7.3	1.9	clayey silt to silty clay	4
6.90	22.6	7.7	0.127	1.66	7.4	1.9	silty clay to clay	5
6.95	22.8	7.7	0.288	3.72	7.4	1.9	clay	8
7.00	23.0	8.9	0.373	4.53	7.5	1.9	silty clay to clay	8

Soil interpretation reference: Robertson & Campanella 1983, based on FOR however 'I' (clay and '2' = drilling data coverage

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Fw psi	INC I deg	INTERPRETED SOIL TYPE	N SPT
7.05	23.1	14.5	0.237	1.64	4.7	1.9	clayey silt to silty clay	6
7.10	23.3	15.0	0.200	1.34	4.1	2.1	clayey silt to silty clay	7
7.15	23.5	11.6	0.195	1.68	4.2	2.2	clayey silt to silty clay	6
7.20	23.6	10.4	0.181	1.74	3.3	2.1	clayey silt to silty clay	5
7.25	23.8	7.3	0.134	1.82	3.3	2.1	clayey silt to silty clay	4
7.30	23.9	6.3	0.100	1.58	3.3	2.0	silty clay to clay	4
7.35	24.1	6.3	0.135	2.13	3.5	2.0	silty clay to clay	4
7.40	24.3	6.6	0.201	3.03	3.6	2.0	sandy silt to clayey silt	5
7.45	24.4	27.0	0.186	0.69	3.7	2.0	sandy silt to clayey silt	9
7.50	24.6	37.0	0.214	0.58	0.8	2.0	silty sand to sandy silt	11
7.55	24.8	40.1	0.244	0.61	0.7	2.0	silty sand to sandy silt	12
7.60	24.9	38.3	0.362	0.94	0.6	2.0	silty sand to sandy silt	12
7.65	25.1	38.9	0.408	1.05	0.8	2.4	silty sand to sandy silt	13
7.70	25.3	42.1	0.447	1.06	0.5	2.2	silty sand to sandy silt	15
7.75	25.4	58.7	0.415	0.71	-0.0	2.2	silty sand to sandy silt	16
7.80	25.6	52.4	0.317	0.60	0.6	2.2	silty sand to sandy silt	17
7.85	25.8	46.3	0.375	0.81	0.6	2.2	silty sand to sandy silt	16
7.90	25.9	49.0	0.444	0.91	0.3	2.1	silty sand to sandy silt	16
7.95	26.1	54.3	0.478	0.87	0.3	2.1	silty sand to sandy silt	17
8.00	26.2	53.1	0.589	1.11	0.7	2.1	silty sand to sandy silt	15
8.05	26.4	37.1	0.492	1.33	1.1	2.1	silty sand to sandy silt	14
8.10	26.6	37.5	0.287	0.76	1.1	2.1	silty sand to sandy silt	13
8.15	26.7	52.3	0.247	0.47	0.8	2.1	sand to silty sand	12
8.20	26.9	58.7	0.277	0.49	0.1	2.5	sand to silty sand	13
8.25	27.1	53.2	0.283	0.53	0.2	2.2	sand to silty sand	13
8.30	27.2	50.6	0.334	0.66	0.3	2.4	sand to silty sand	13
8.35	27.4	55.0	0.376	0.68	0.6	2.4	sand to silty sand	13
8.40	27.6	60.7	0.324	0.53	0.3	2.4	sand to silty sand	14
8.45	27.7	64.9	0.323	0.50	0.6	2.4	sand to silty sand	15
8.50	27.9	64.6	0.230	0.36	1.2	2.4	sand to silty sand	16
8.55	28.1	64.9	0.225	0.35	1.4	2.4	sand to silty sand	16
8.60	28.2	69.7	0.219	0.31	1.2	2.4	sand to silty sand	17
8.65	28.4	72.9	0.215	0.29	0.8	2.4	sand to silty sand	17
8.70	28.5	73.7	0.193	0.26	1.2	2.4	sand to silty sand	18
8.75	28.7	75.5	0.235	0.31	1.4	2.4	sand to silty sand	18
8.80	28.9	77.6	0.246	0.32	1.0	2.4	sand to silty sand	18
8.85	29.0	77.1	0.202	0.26	0.7	2.4	sand to silty sand	18
8.90	29.2	72.8	0.204	0.28	0.3	2.4	sand to silty sand	18
8.95	29.4	68.9	0.222	0.32	0.3	2.4	sand to silty sand	17
9.00	29.5	66.9	0.318	0.48	0.4	2.1	sand to silty sand	16
9.05	29.7	60.7	0.398	0.66	0.3	2.4	silty sand to sandy silt	13
9.10	29.8	48.2	0.313	0.65	0.5	2.4	silty sand to sandy silt	15
9.15	30.0	38.4	0.305	0.80	0.5	2.4	sandy silt to clayey silt	13
9.20	30.2	34.1	0.379	1.12	0.5	2.4	sandy silt to clayey silt	11
9.25	30.3	32.1	0.457	1.43	0.5	2.4	sandy silt to clayey silt	10
9.30	30.5	29.0	0.464	1.60	-0.2	2.4	sandy silt to clayey silt	9
9.35	30.7	23.2	0.[illegible]	2.[illegible]	-0.4	2.4	clayey silt to silty clay	7
9.40	30.8	19.7	0.[illegible]	[illegible]	-0.4	2.4	clayey silt to silty clay	5
9.45	31.0	22.3	0.[illegible]	[illegible]	-0.4	2.4	clayey silt to silty clay	6
9.50	31.2	18.2	0.[illegible]	[illegible]	-0.4	2.4	clayey silt to silty clay	5

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	PORE PR Pw psi	INC I deg	INTERPRETED SOIL TYPE		N SPT
9.55	31.3	11.5	0.287	2.50	-2.6	2.3	silty clay to clay		?
9.60	31.5	11.0	0.324	2.95	-2.7	2.3	silty clay to clay		?
9.65	31.7	12.3	0.296	2.40	-2.7	2.3		?	?
9.70	31.8	13.4	?	?	-2.7	2.5		?	?
9.75	32.0	44.9	?	?	-2.8	2.4		?	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .15 m sliding data average

SOUNDING DATA IN FILE CPT-47 10-08-96 16:15

OPERATOR : BROWN LOCATION : CPT-3

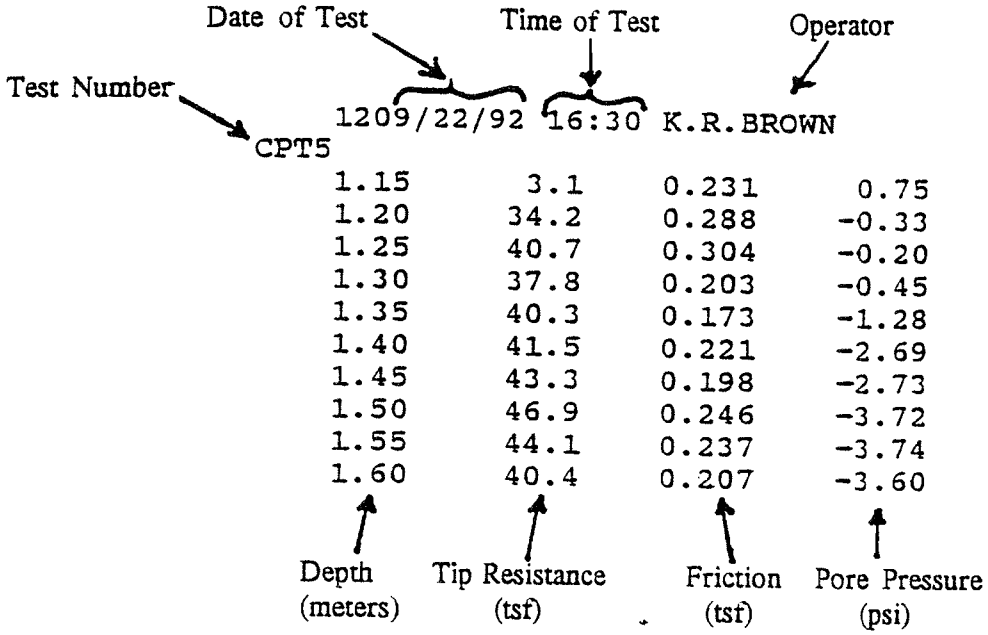
CONE ID : 608 JOB No. : 96-33

Northwest Cone Exploration

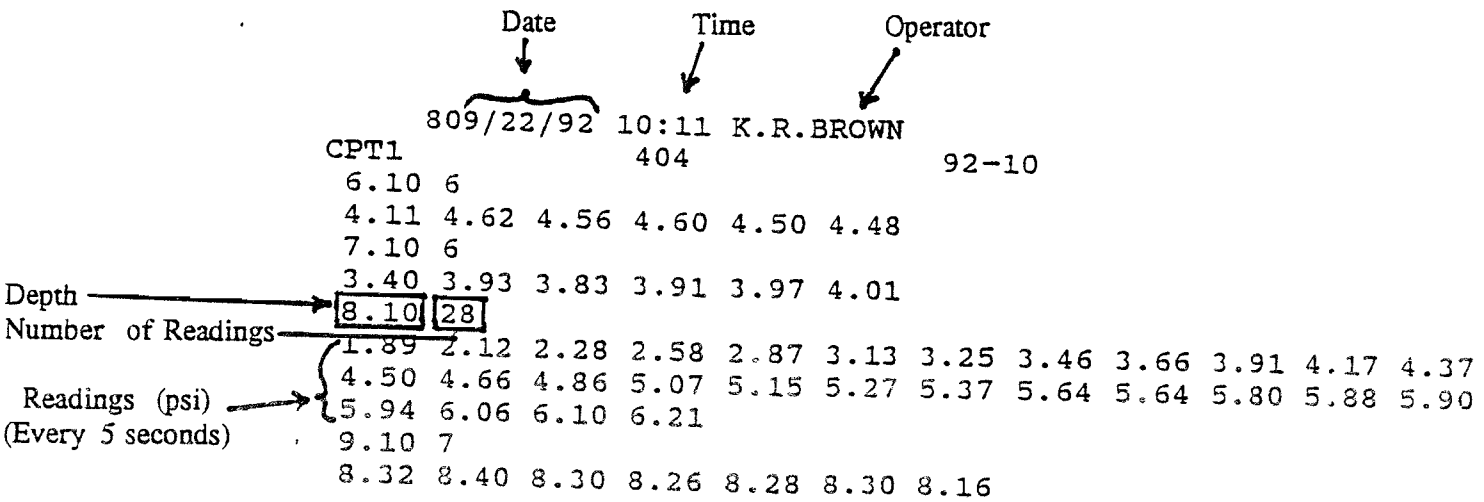
DEPTH meters	DEPTH feet	TIME sec	DISSIPATION OF Pw psi AT INTERVAL 5 sec											
5.70	18.7	0.0	1.7	1.7	1.5	1.6	1.4	1.4	1.4	1.4	1.3	1.3	1.2	1.3
		60.0	1.2	1.2	1.2	1.2	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2
		120.0	1.1	1.1	1.0	1.0	1.0	1.1	0.9	1.0	1.0	1.1	1.1	1.1
		180.0	1.0	1.0	1.2	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.1
		240.0	1.1	0.5										
7.60	24.9	0.0	0.5	0.5	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.6	0.6
		60.0	0.7	0.7	0.7	0.7	0.6	0.7	0.6	0.6	0.7	0.6	0.7	0.6
		120.0	0.6	0.7	0.6	0.6	0.5	0.5	0.6	0.7	0.7	0.6	0.6	0.6
		180.0	0.7	0.7										
8.15	26.7	0.0	1.3	1.1	1.3	1.0	1.2	1.1	1.1	1.1	1.0	1.1	1.1	1.0
		60.0	1.0	1.1	1.1	1.0	1.1	1.1	1.1	1.2	0.5			
9.20	30.2	0.0	0.5	0.5	0.5	0.6	0.6	0.5	0.7	0.6	0.6	0.7	0.5	0.7
		60.0	0.5	0.6	0.7	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7
		120.0	0.7	0.8	0.7	0.7	0.8	0.8	0.7	0.7	0.6	0.7	0.8	0.8
		180.0	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.8	0.8	0.9	0.7
		240.0	0.8	0.9	0.9	0.9	0.8	0.8	0.9	0.8	1.0	0.9	0.8	1.0
		300.0	0.8	0.9	0.9	0.9	1.0	1.0	0.9	0.9	1.0	0.9	1.0	1.0
		360.0	0.9	0.9	1.0	1.1	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1
		420.0	1.1	1.1	1.1	1.1	1.1	1.2	1.1	1.2	1.1	1.2	1.1	1.1
		480.0	1.2	1.1	1.2	1.1	1.2	1.3	1.2	1.2	1.3	1.1	1.3	1.3
		540.0	1.2	1.3	1.3	1.2	1.3	1.3	1.2	1.3	1.4	1.2	1.2	1.4
		600.0	1.3	1.3	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.2	1.5
		660.0	1.4	1.3	1.3	1.3	1.3	1.5	1.5	1.4	1.4	1.4	1.4	1.4
		720.0	1.4	1.5	1.5	1.5	1.5	1.4	1.6	1.5	1.5	1.5	1.5	1.5
		780.0	1.4	1.4	1.5	1.5	1.5	1.4	1.5	1.6	1.5	1.6	1.5	1.6
		840.0	1.7	1.5	1.6	1.7	1.5	1.5	1.7	1.6	1.6	1.5	1.5	1.6
		900.0	1.7	1.6	1.6	1.5	1.6	1.7	1.5	1.7	1.6	1.7	1.5	1.7
		960.0	1.5	1.6	1.7	1.6	1.6	1.6	1.7	1.7	1.3	1.7	1.4	1.6
		1020.0	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.7	1.6	1.7	1.6	1.6
		1080.0	1.6	1.6	1.7	1.9	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.7
		1140.0	1.7	1.7	1.7	1.6	1.6	1.6	1.9	1.6	1.9	1.6	1.6	1.6
		1200.0	1.6	1.9	1.9	1.6	1.6	1.6	1.9	1.9	1.9	1.9	1.9	1.6
		1260.0	1.9	1.6	1.6	1.6	1.9	1.9	1.7	1.9	1.6	1.8	1.8	1.9
		1320.0	1.6	1.9	1.6	1.9	1.9	1.6	1.9	2.0	1.9	1.9	1.9	1.6
		1380.0	1.9	2.0	2.0	1.9	1.9	1.9	2.0	1.9	1.6	2.0	1.9	1.9
		1440.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	1.9
		1500.0	2.0				1.9	1.9	2.0	1.9	2.0	1.9	1.9	1.9
		1560.0	1.9											

EXPLANATION OF CONE PENETROMETER DISK FILES

Penetrometer Sounding Files (CPT?.[illegible])



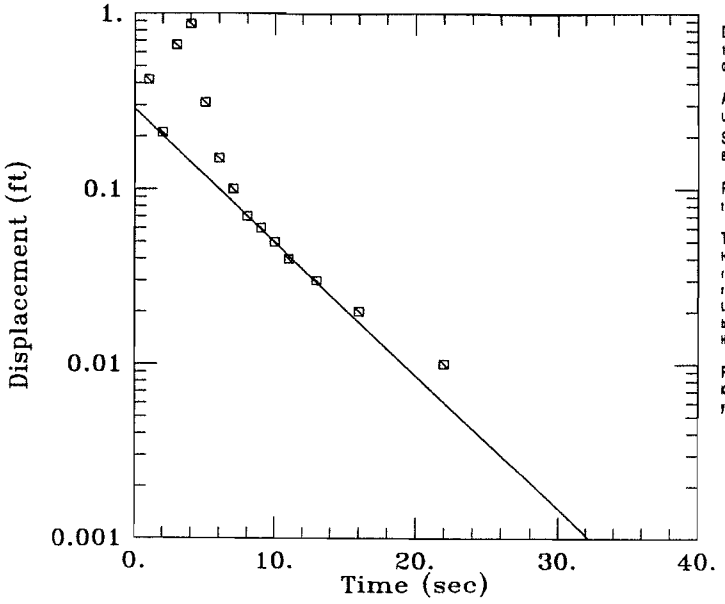
Pore Pressure Dissipation Files (CPT?P.[illegible])



APPENDIX G

Aquifer Test Data

Well MWA-1 Rising Head Slug Test 1



DATA SET:
11W.DAT
05/12/97

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

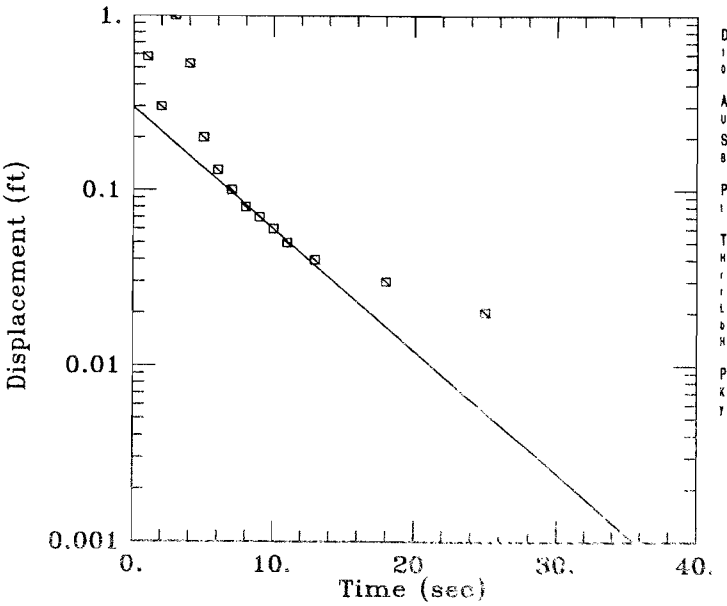
PROJECT DATA:
test date: April 22, 1997

TEST DATA:
H0 = 2.678 ft
rc = 0.0861 ft
rw = 0.25 ft
L = 10 ft
b = 15.91 ft
H = 15.91 ft

PARAMETER ESTIMATES:
K = 0.0002019 ft/sec
y0 = 0.2865 ft

AQTESOLV

Well MWA-1 Rising Head Slug Test 2



DATA SET:
12W.DAT
05/12/97

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

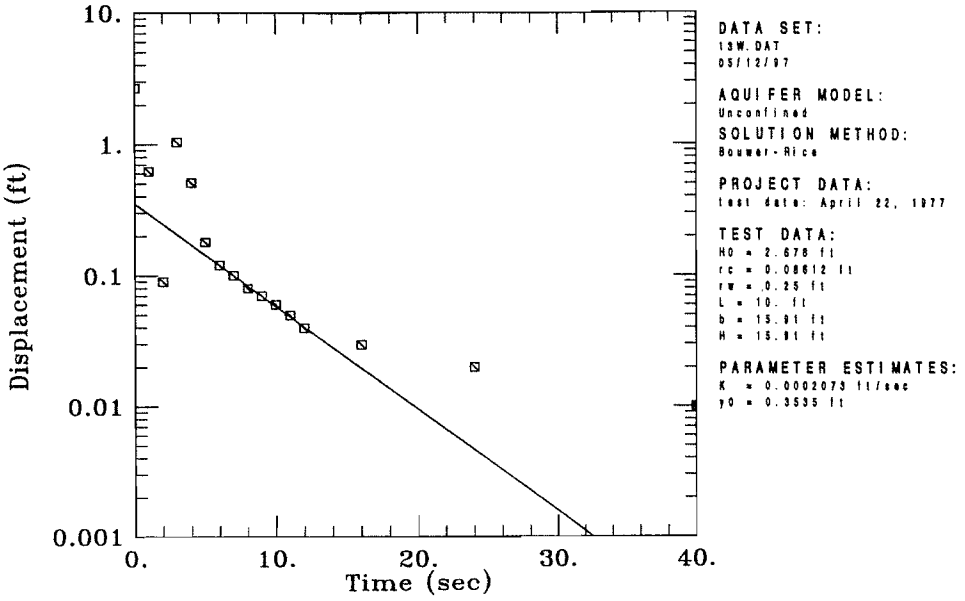
PROJECT DATA:
test date: April 22, 1997

TEST DATA:
H0 = 2.678 ft
rc = 0.08612 ft
rw = 0.25 ft
L = 10 ft
b = 15.91 ft
H = 15.91 ft

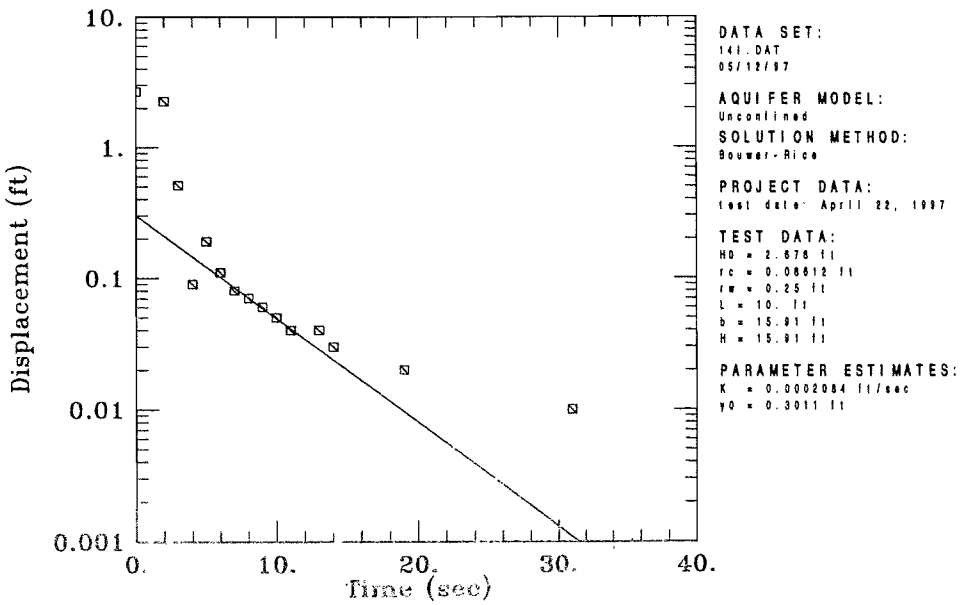
PARAMETER ESTIMATES:
K = 0.0001845 ft/sec
y0 = 0.299 ft

AQTESOLV

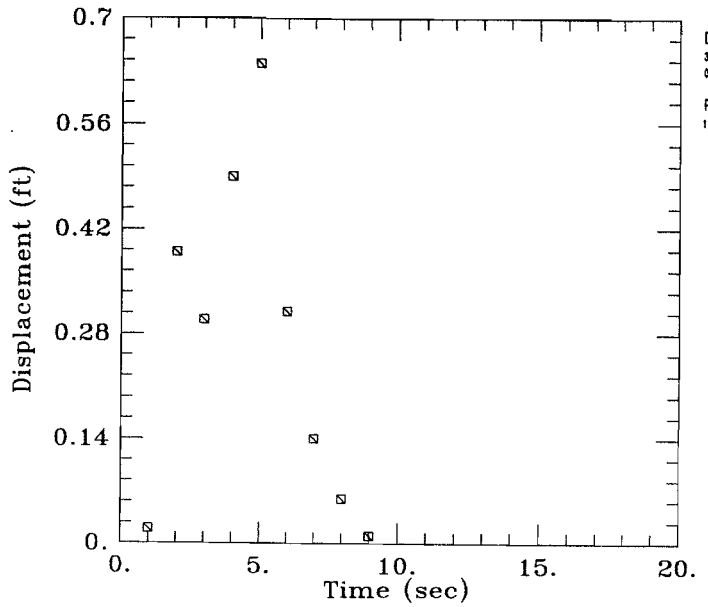
Well MWA-1 Rising Head Slug Test 3



Well MWA-1 Falling Head Slug Test 1



Well MWA-3 Rising Head Slug Test 1

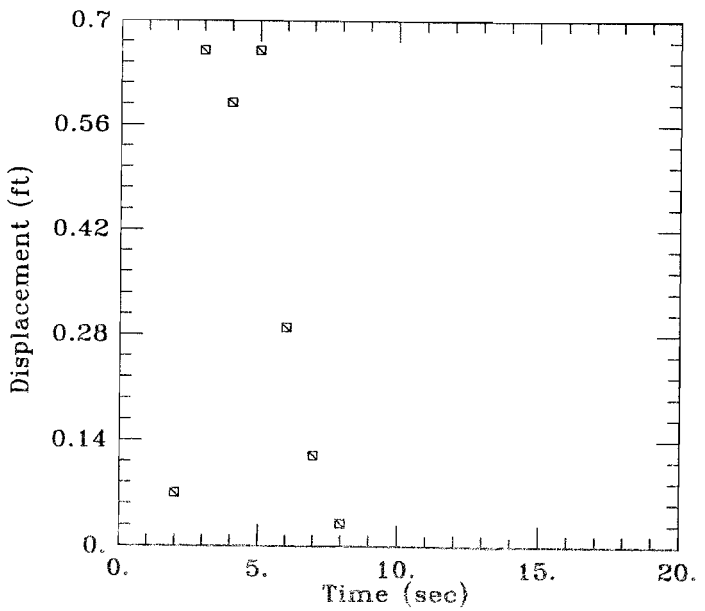


DATA SET:
34W.DAT
05/20/97

PROJECT DATA:
Test date: April 22, 1997

AQTESOLV

Well MWA-3 Rising Head Slug Test 2

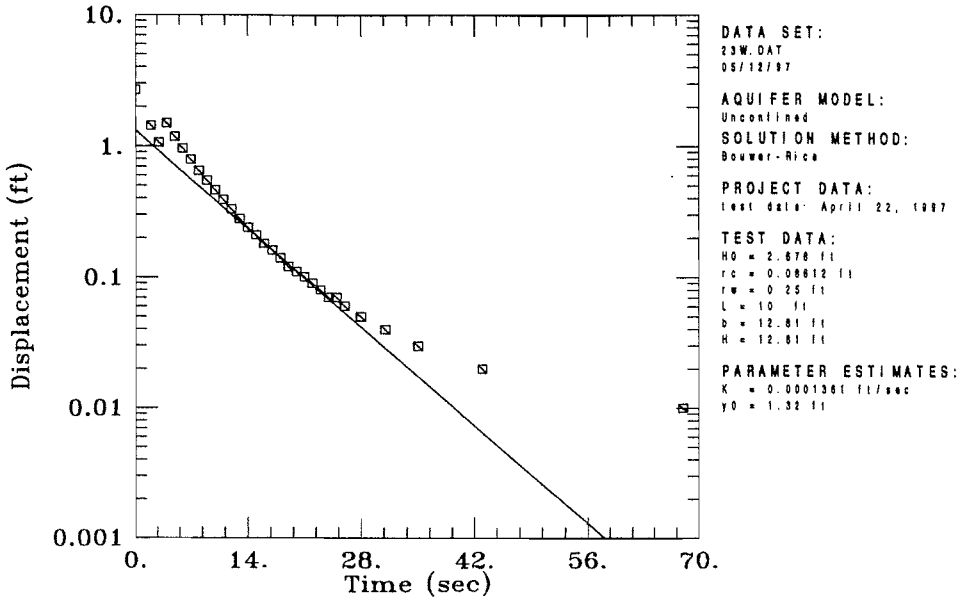


DATA SET:
36W.DAT
05/20/97

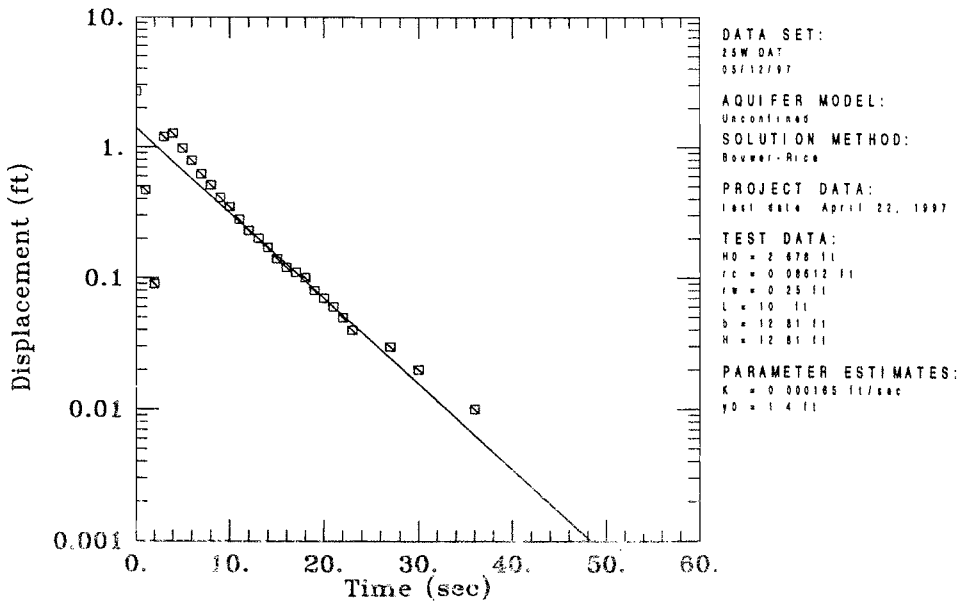
PROJECT DATA:
Test date: April 22, 1997

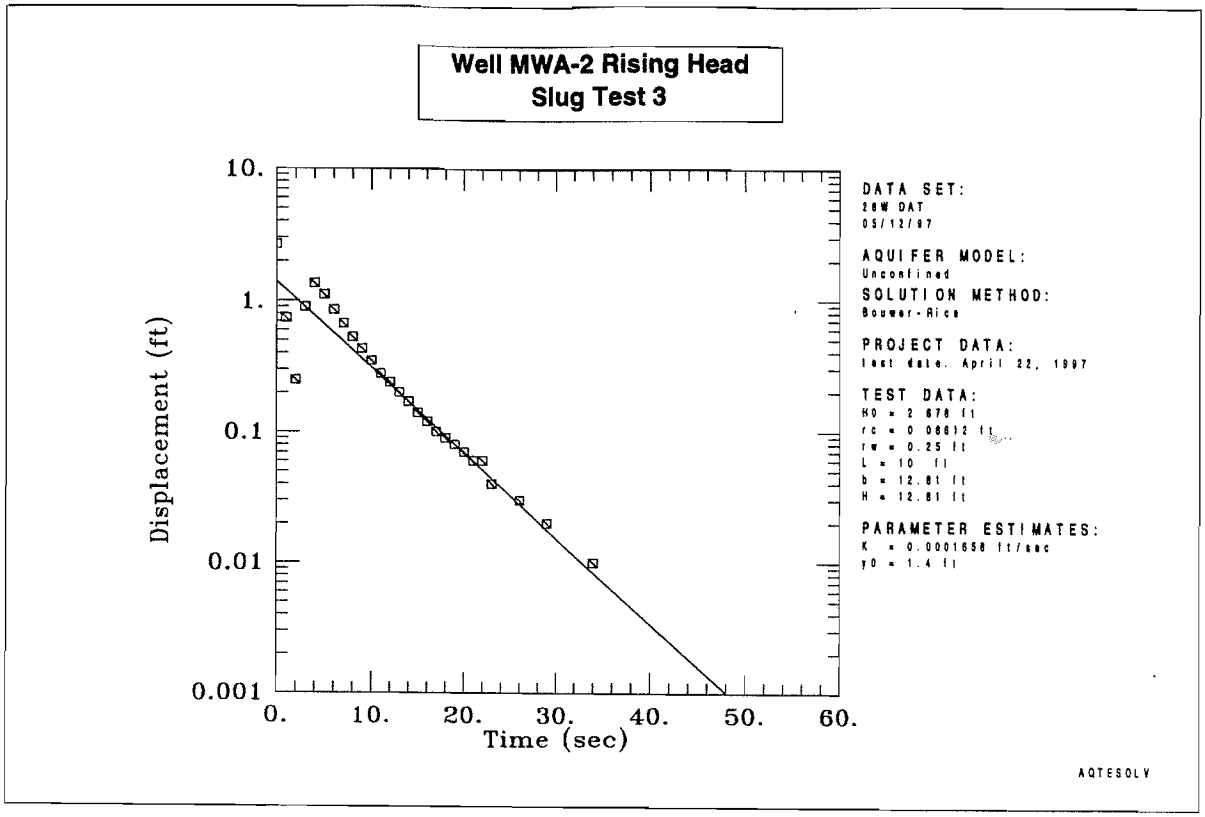
AQTESOLV

Well MWA-2 Rising Head Slug Test 1

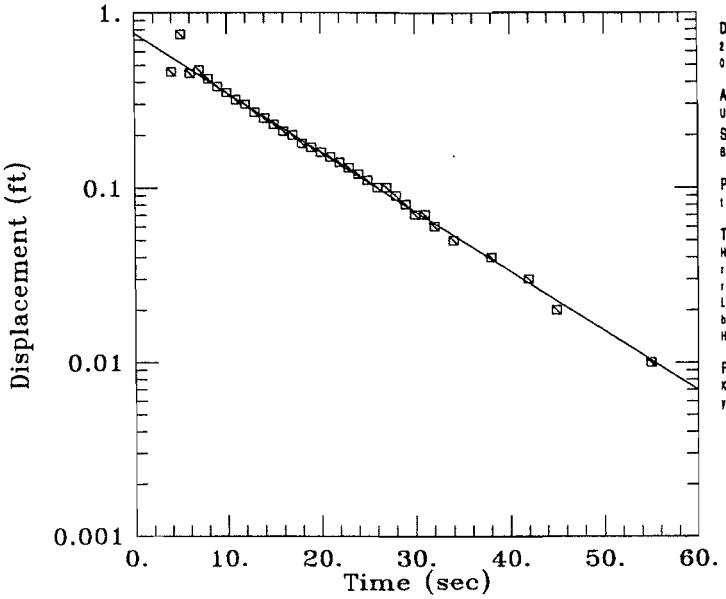


Well MWA-2 Rising Head Slug Test 2




Well MWA-2 Rising Head
Slug Test 3
Displacement (ft)
10.
1.
0.1
0.01
0.001
0.
10.
20.
30.
40.
50.
60.
Time (sec)
DATA SET:
28W.DAT
05/12/97
AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
PROJECT DATA:
Test date: April 22, 1997
TEST DATA:
H0 = 2.678 ft
rc = 0.08612 ft
rw = 0.25 ft
L = 10 ft
b = 12.81 ft
H = 12.81 ft
PARAMETER ESTIMATES:
K = 0.0001658 ft/sec
y0 = 1.4 ft
AQTESOLV

Well MWA-2 Falling Head Slug Test 1



DATA SET:
221.DAT
05/12/97

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

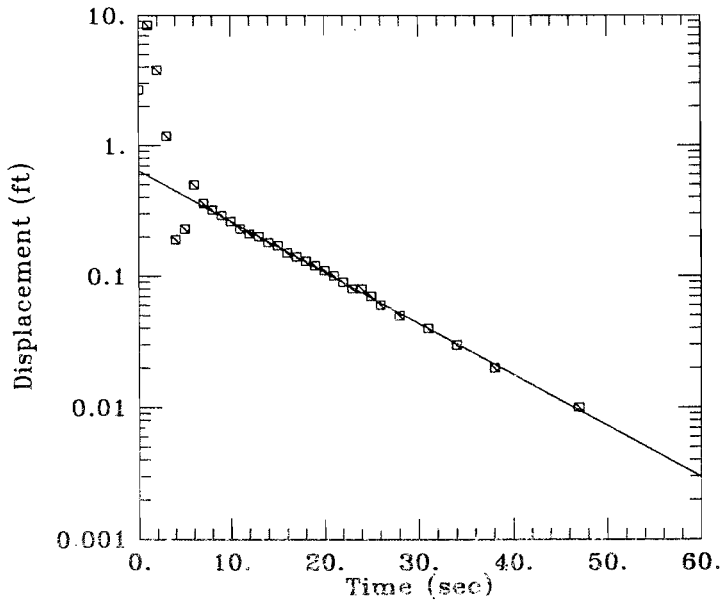
PROJECT DATA:
test date: April 22, 1997

TEST DATA:
H0 = 2.678 ft
rc = 0.08612 ft
rw = 0.25 ft
L = 10. ft
b = 12.81 ft
H = 12.81 ft

PARAMETER ESTIMATES:
K = 8.62E-05 ft/sec
y0 = 0.7636 ft

AQTESOLV

Well MWA-2 Falling Head Slug Test 2



DATA SET:
241.DAT
05/12/97

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

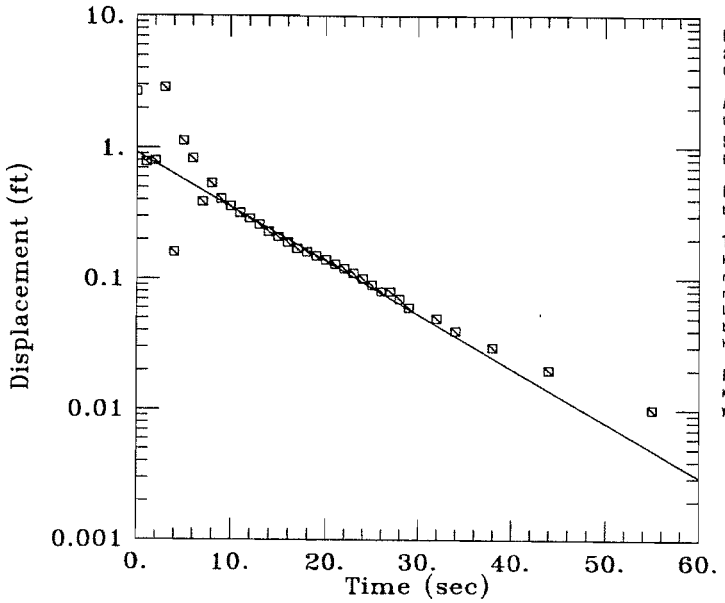
PROJECT DATA:
test date: April 22, 1997

TEST DATA:
H0 = 2.678 ft
rc = 0.08612 ft
rw = 0.25 ft
L = 10. ft
b = 12.81 ft
H = 12.81 ft

PARAMETER ESTIMATES:
K = 8.657E-05 ft/sec
y0 = 0.6401 ft

AQTESOLV

Well MWA-2 Falling Head Slug Test 3



DATA SET:
261.DAT
05/12/97

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

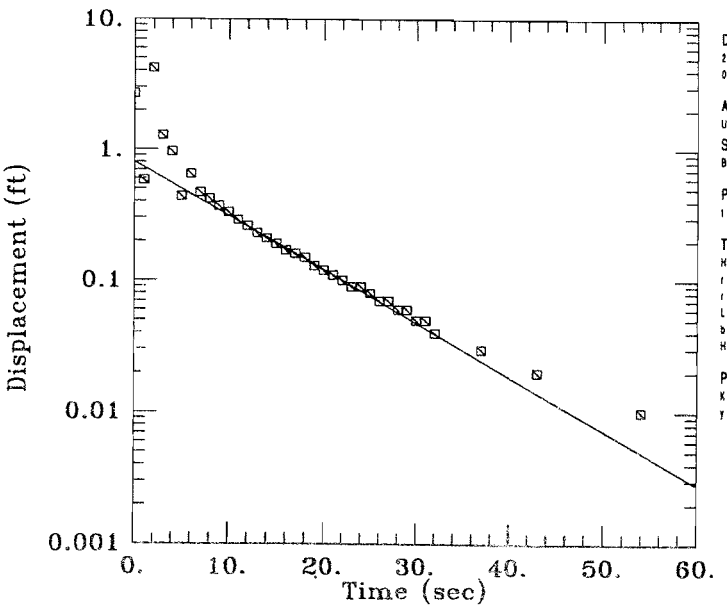
PROJECT DATA:
test date April 22, 1997

TEST DATA:
H0 = 2.670 ft
rc = 0.08612 ft
rw = 0.25 ft
L = 10. ft
b = 12.81 ft
H = 12.81 ft

PARAMETER ESTIMATES:
K = 0.0001048 ft/sec
y0 = 0.9255 ft

AQTESOLV

Well MWA-2 Falling Head Slug Test 4



DATA SET:
271.DAT
05/12/97

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

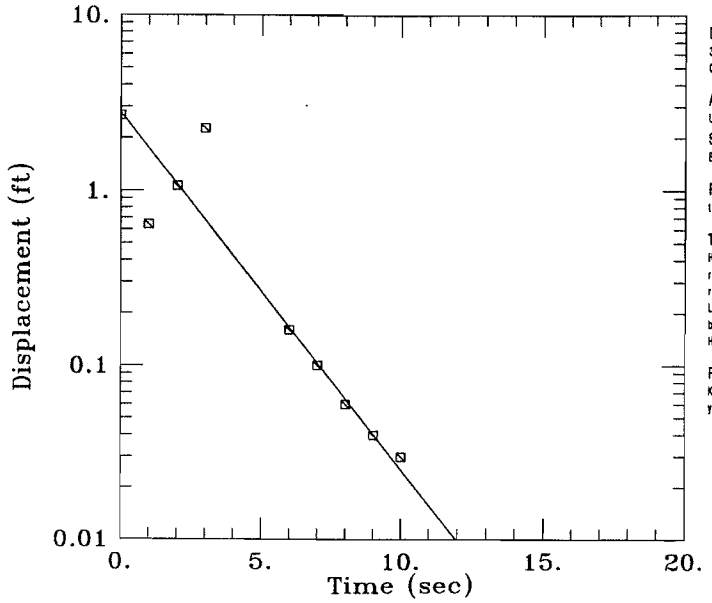
PROJECT DATA:
test date April 22, 1997

TEST DATA:
H0 = 2.678 ft
rc = 0.08612 ft
rw = 0.25 ft
L = 10. ft
b = 12.81 ft
H = 12.81 ft

PARAMETER ESTIMATES:
K = 0.0001036 ft/sec
y0 = 0.8 ft

AQTESOLV

Well MWA-3 Falling Head Slug Test 1



DATA SET:
31I.DAT
05/12/97

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

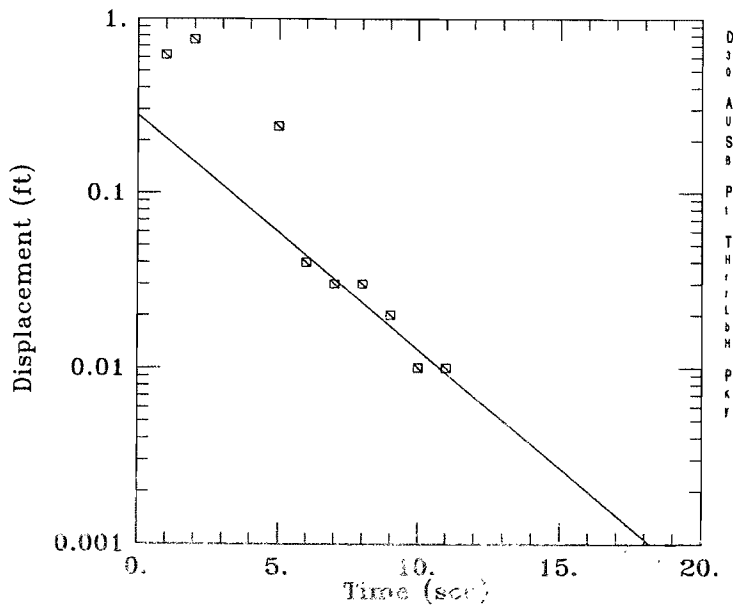
PROJECT DATA:
test date: April 22, 1997

TEST DATA:
H0 = 2.678 ft
rc = 0.08612 ft
rw = 0.25 ft
L = 10 ft
b = 11.31 ft
H = 11.31 ft

PARAMETER ESTIMATES:
K = 0.0005043 ft/sec
y0 = 2.779 ft

AQTESOLV

Well MWA-3 Falling Head Slug Test 2



DATA SET:
35I.DAT
05/12/97

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

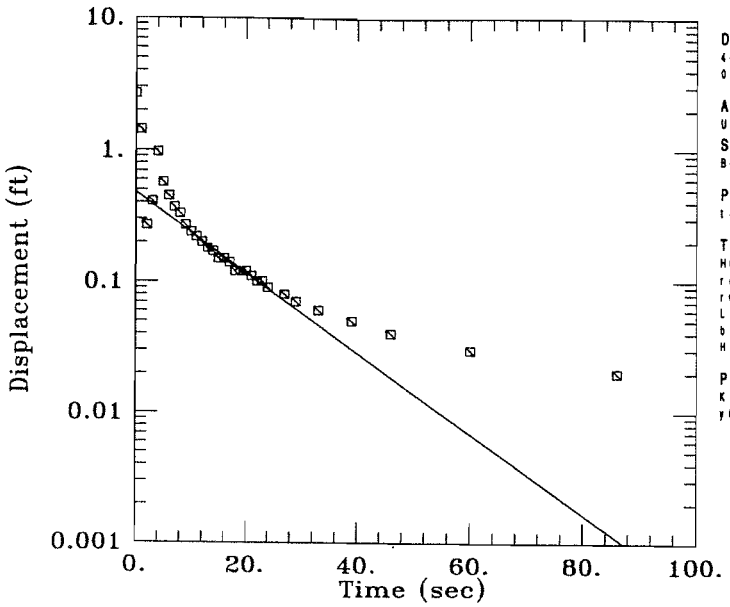
PROJECT DATA:
test date: April 22, 1997

TEST DATA:
H0 = 2.678 ft
rc = 0.08612 ft
rw = 0.25 ft
L = 10 ft
b = 11.31 ft
H = 11.31 ft

PARAMETER ESTIMATES:
K = 0.0003316 ft/sec
y0 = 0.28 ft

AQTESOLV

Well MWA-4 Rising Head Slug Test 1



DATA SET:
44W.DAT
05/12/97

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

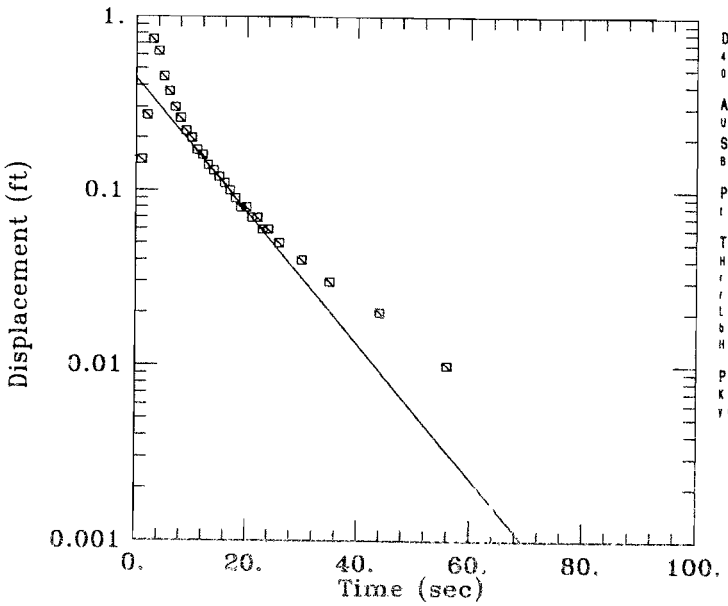
PROJECT DATA:
test date: April 22, 1997

TEST DATA:
H0 = 2.678 ft
rc = 0.08812 ft
rw = 0.25 ft
L = 10 ft
b = 11.56 ft
H = 11.56 ft

PARAMETER ESTIMATES:
K = 0.0002461 ft/sec
y0 = 0.48 ft

AQTESOLV

Well MWA-4 Rising Head Slug Test 2



DATA SET:
46W.DAT
05/12/97

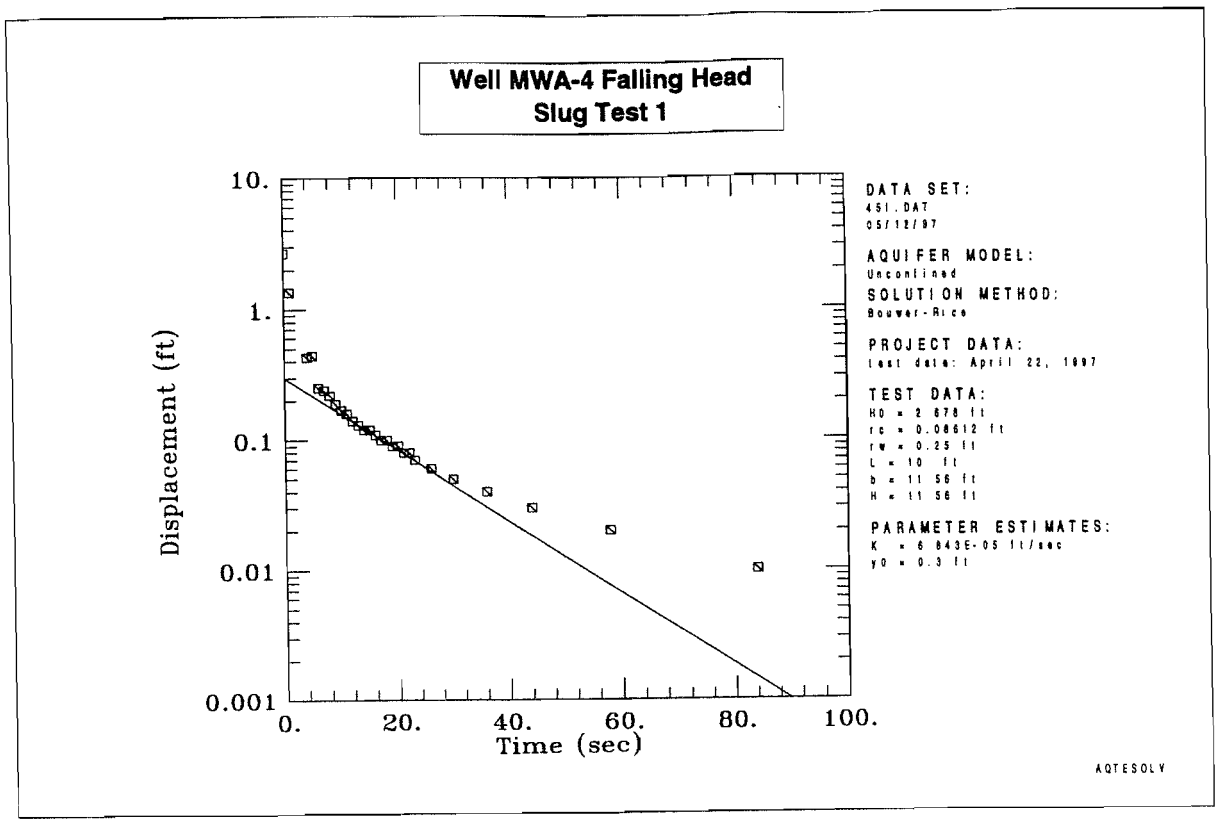
AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: April 22, 1997

TEST DATA:
H0 = 2.678 ft
rc = 0.08812 ft
rw = 0.25 ft
L = 10. ft
b = 11.56 ft
H = 11.56 ft

PARAMETER ESTIMATES:
K = 0.0003053 ft/sec
y0 = 0.4405 ft

AQTESOLV


Well MWA-4 Falling Head
Slug Test 1
Displacement (ft)
10.
1.
0.1
0.01
0.001
0.
20.
40.
60.
80.
100.
Time (sec)
DATA SET:
451.DAT
05/12/97
AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
PROJECT DATA:
Test date: April 22, 1997
TEST DATA:
H0 = 2.678 ft
rc = 0.08612 ft
rw = 0.25 ft
L = 10 ft
b = 11.56 ft
H = 11.56 ft
PARAMETER ESTIMATES:
K = 6.843E-05 ft/sec
y0 = 0.3 ft
AQTESOLV

Slug Test Data: Monitoring Well MWA-1
Elf Atochem
April 22, 1997

Rising Head Test 1			Rising Head Test 2			Rising Head Test 3			Falling Head Test 1		
Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)
0	14.71	0.00	0	14.72	0.00	0	14.72	0.00	0	14.72	0.00
1	14.29	0.42	1	14.14	0.58	1	14.10	0.62	1	14.75	0.03
2	14.50	0.21	2	14.42	0.30	2	14.63	0.09	2	16.98	2.26
3	14.05	0.66	3	13.72	1.00	3	13.68	1.04	3	15.23	0.51
4	13.84	0.87	4	14.19	0.53	4	14.21	0.51	4	14.81	0.09
5	14.40	0.31	5	14.52	0.20	5	14.54	0.18	5	14.91	0.19
6	14.56	0.15	6	14.59	0.13	6	14.60	0.12	6	14.83	0.11
7	14.61	0.10	7	14.62	0.10	7	14.62	0.10	7	14.80	0.08
8	14.64	0.07	8	14.64	0.08	8	14.64	0.08	8	14.79	0.07
9	14.65	0.06	9	14.65	0.07	9	14.65	0.07	9	14.78	0.06
10	14.66	0.05	10	14.66	0.06	10	14.66	0.06	10	14.77	0.05
11	14.67	0.04	11	14.67	0.05	11	14.67	0.05	11	14.76	0.04
12	14.67	0.04	12	14.67	0.05	12	14.68	0.04	14	14.75	0.03
13	14.68	0.03	13	14.68	0.04	16	14.69	0.03	19	14.74	0.02
16	14.69	0.02	18	14.69	0.03	24	14.70	0.02	31	14.73	0.01
22	14.70	0.01	25	14.70	0.02	40	14.71	0.01	63	14.72	0.00
37	14.71	0.00	45	14.71	0.01	104	14.72	0.00			

Slug Test Data: Monitoring Well MWA-2
Elf Atochem
April 22, 1997

Rising Head Test 1			Rising Head Test 2			Rising Head Test 3			Rising Head Test 4		
Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)
0	12.31	0.00	0	12.31	0.00	0	12.30	0.00	0	12.33	0.00
1	12.19	0.12	1	12.98	-0.67	1	11.83	0.47	1	11.59	0.74
2	10.38	1.93	2	10.87	1.44	2	12.21	0.09	2	12.08	0.25
3	10.87	1.44	3	11.25	1.06	3	11.10	1.20	3	11.43	0.90
4	10.47	1.84	4	10.81	1.50	4	11.03	1.27	4	10.98	1.35
5	10.73	1.58	5	11.13	1.18	5	11.32	0.98	5	11.22	1.11
6	10.94	1.37	6	11.35	0.96	6	11.51	0.79	6	11.48	0.85
7	11.10	1.21	7	11.52	0.79	7	11.68	0.62	7	11.66	0.67
8	11.24	1.07	8	11.66	0.65	8	11.79	0.51	8	11.80	0.53
9	11.36	0.95	9	11.76	0.55	9	11.89	0.41	9	11.90	0.43
10	11.45	0.86	10	11.85	0.46	10	11.95	0.35	10	11.98	0.35
11	11.55	0.76	11	11.92	0.39	11	12.02	0.28	11	12.05	0.28
12	11.63	0.68	12	11.98	0.33	12	12.07	0.23	12	12.09	0.24
13	11.70	0.61	13	12.03	0.28	13	12.10	0.20	13	12.13	0.20
14	11.76	0.55	14	12.07	0.24	14	12.13	0.17	14	12.16	0.17
15	11.82	0.49	15	12.10	0.21	15	12.16	0.14	15	12.19	0.14
16	11.86	0.45	16	12.13	0.18	16	12.18	0.12	16	12.21	0.12
17	11.90	0.41	17	12.15	0.16	17	12.19	0.11	17	12.23	0.10
18	11.94	0.37	18	12.17	0.14	18	12.20	0.10	18	12.24	0.09
19	11.97	0.34	19	12.19	0.12	19	12.22	0.08	19	12.25	0.08
20	12.01	0.30	20	12.20	0.11	20	12.23	0.07	20	12.26	0.07
21	12.03	0.28	21	12.21	0.10	21	12.24	0.06	21	12.27	0.06
22	12.06	0.25	22	12.22	0.09	22	12.25	0.05	22	12.27	0.06
23	12.08	0.23	23	12.23	0.08	23	12.26	0.04	23	12.29	0.04
24	12.10	0.21	24	12.24	0.07	27	12.27	0.03	26	12.30	0.03
25	12.11	0.20	25	12.24	0.07	30	12.28	0.02	29	12.31	0.02
26	12.13	0.18	26	12.25	0.06	36	12.29	0.01	34	12.32	0.01
27	12.14	0.17	27	12.25	0.06	51	12.30	0.00	48	12.33	0.00

Slug Test Data: Monitoring Well MWA-2
Elf Atochem
April 22, 1997

Rising Head Test 1			Rising Head Test 2			Rising Head Test 3			Rising Head Test 4		
Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)
28	12.15	0.16	28	12.26	0.05						
29	12.16	0.15	29	12.26	0.05						
30	12.17	0.14	30	12.26	0.05						
31	12.18	0.13	31	12.27	0.04						
32	12.19	0.12	35	12.28	0.03						
33	12.20	0.11	43	12.29	0.02						
34	12.21	0.10	68	12.30	0.01						
35	12.22	0.09									
36	12.22	0.09									
37	12.23	0.08									
38	12.23	0.08									
39	12.24	0.07									
42	12.25	0.06									
46	12.26	0.05									
51	12.27	0.04									
59	12.28	0.03									
75	12.29	0.02									
140	12.30	0.01									

Slug Test Data: Monitoring Well MWA-2
Elf Atochem
April 22, 1997

Falling Head Test 1			Falling Head Test 2			Falling Head Test 3			Falling Head Test 4		
Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)
0	12.32	0.00	0	12.32	0.00	0	12.34	0.00	0	12.34	0.00
1	9.12	-3.20	1	20.69	8.37	1	13.12	0.78	1	12.92	0.58
2	12.01	-0.31	2	16.11	3.79	2	13.14	0.80	2	16.54	4.20
3	12.17	-0.15	3	13.50	1.18	3	15.20	2.86	3	13.62	1.28
4	12.78	0.46	4	12.51	0.19	4	12.50	0.16	4	13.30	0.96
5	13.07	0.75	5	12.55	0.23	5	13.47	1.13	5	12.78	0.44
6	12.77	0.45	6	12.82	0.50	6	13.17	0.83	6	12.99	0.65
7	12.79	0.47	7	12.68	0.36	7	12.73	0.39	7	12.81	0.47
8	12.74	0.42	8	12.64	0.32	8	12.88	0.54	8	12.76	0.42
9	12.70	0.38	9	12.61	0.29	9	12.75	0.41	9	12.71	0.37
10	12.67	0.35	10	12.58	0.26	10	12.70	0.36	10	12.67	0.33
11	12.64	0.32	11	12.55	0.23	11	12.66	0.32	11	12.63	0.29
12	12.62	0.30	12	12.53	0.21	12	12.63	0.29	12	12.60	0.26
13	12.59	0.27	13	12.52	0.20	13	12.60	0.26	13	12.57	0.23
14	12.57	0.25	14	12.50	0.18	14	12.57	0.23	14	12.55	0.21
15	12.55	0.23	15	12.49	0.17	15	12.55	0.21	15	12.53	0.19
16	12.53	0.21	16	12.47	0.15	16	12.53	0.19	16	12.51	0.17
17	12.52	0.20	17	12.46	0.14	17	12.51	0.17	17	12.50	0.16
18	12.50	0.18	18	12.45	0.13	18	12.50	0.16	18	12.49	0.15
19	12.49	0.17	19	12.44	0.12	19	12.49	0.15	19	12.47	0.13
20	12.48	0.16	20	12.43	0.11	20	12.48	0.14	20	12.46	0.12
21	12.47	0.15	21	12.42	0.10	21	12.47	0.13	21	12.45	0.11
22	12.46	0.14	22	12.41	0.09	22	12.46	0.12	22	12.44	0.10
23	12.45	0.13	23	12.40	0.08	23	12.45	0.11	23	12.43	0.09
24	12.44	0.12	24	12.40	0.08	24	12.44	0.10	24	12.43	0.09
25	12.43	0.11	25	12.39	0.07	25	12.43	0.09	25	12.42	0.08
26	12.42	0.10	26	12.38	0.06	26	12.42	0.08	26	12.41	0.07
27	12.42	0.10	27	12.38	0.06	27	12.42	0.08	27	12.41	0.07

Slug Test Data: Monitoring Well MWA-2
Elf Atochem
April 22, 1997

Falling Head Test 1			Falling Head Test 2			Falling Head Test 3			Falling Head Test 4		
Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)
28	12.41	0.09	28	12.37	0.05	28	12.41	0.07	28	12.40	0.06
29	12.40	0.08	31	12.36	0.04	29	12.40	0.06	29	12.40	0.06
30	12.39	0.07	34	12.35	0.03	32	12.39	0.05	30	12.39	0.05
31	12.39	0.07	38	12.34	0.02	34	12.38	0.04	31	12.39	0.05
32	12.38	0.06	47	12.33	0.01	38	12.37	0.03	32	12.38	0.04
34	12.37	0.05	66	12.32	0.00	44	12.36	0.02	37	12.37	0.03
38	12.36	0.04				55	12.35	0.01	43	12.36	0.02
42	12.35	0.03				87	12.34	0.00	54	12.35	0.01
45	12.34	0.02							105	12.34	0.00
55	12.33	0.01									
66	12.32	0.00									

Slug Test Data: Monitoring Well MWA-3
Elf Atochem
April 22, 1997

Rising Head Test 1			Rising Head Test 2			Falling Head Test 1			Falling Head Test 2		
Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)
0	10.81	0.00	0	10.83	0.00	0	10.78	0.00	0	10.81	0.00
1	10.79	0.02	1	10.82	0.01	1	11.42	0.64	1	11.43	0.62
2	10.42	0.39	2	10.75	0.08	2	11.84	1.06	2	11.57	0.76
3	10.51	0.30	3	10.16	0.67	3	13.04	2.26	3	10.10	-0.71
4	10.32	0.49	4	10.23	0.60	4	10.77	-0.01	4	10.72	-0.09
5	10.17	0.64	5	10.16	0.67	5	10.45	-0.33	5	11.05	0.24
6	10.50	0.31	6	10.53	0.30	6	10.94	0.16	6	10.85	0.04
7	10.67	0.14	7	10.70	0.13	7	10.88	0.10	7	10.84	0.03
8	10.75	0.06	8	10.79	0.04	8	10.84	0.06	8	10.84	0.03
9	10.80	0.01	9	10.82	0.01	9	10.82	0.04	9	10.83	0.02
10	10.81	0.00	10	10.83	0.00	10	10.81	0.03	10	10.82	0.01
						24	10.80	0.02			

Slug Test Data: Monitoring Well MWA-4
Elf Atochem
April 22, 1997

Rising Head Test 1			Rising Head Test 2			Falling Head Test 1		
Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)	Elapsed Time (sec)	Transducer Depth (feet)	Head Change (feet)
0	14.90	0.00	0	14.88	0.00	0	14.90	0.00
1	13.46	1.44	1	14.73	0.15	1	16.25	1.35
2	14.63	0.27	2	14.61	0.27	2	12.30	-2.60
3	14.49	0.41	3	14.14	0.74	3	14.79	-0.11
4	13.93	0.97	4	14.25	0.63	4	15.33	0.43
5	14.33	0.57	5	14.43	0.45	5	15.34	0.44
6	14.45	0.45	6	14.51	0.37	6	15.15	0.25
7	14.53	0.37	7	14.58	0.30	7	15.14	0.24
8	14.57	0.33	8	14.62	0.26	8	15.12	0.22
9	14.63	0.27	9	14.66	0.22	9	15.09	0.19
10	14.66	0.24	10	14.68	0.20	10	15.07	0.17
11	14.68	0.22	11	14.71	0.17	11	15.06	0.16
12	14.70	0.20	12	14.72	0.16	12	15.04	0.14
13	14.72	0.18	13	14.74	0.14	13	15.03	0.13
14	14.73	0.17	14	14.75	0.13	14	15.02	0.12
15	14.75	0.15	15	14.76	0.12	15	15.02	0.12
16	14.75	0.15	16	14.77	0.11	16	15.01	0.11
17	14.76	0.14	17	14.78	0.10	17	15.00	0.10
18	14.78	0.12	18	14.79	0.09	18	15.00	0.10
19	14.78	0.12	19	14.80	0.08	19	14.99	0.09
20	14.78	0.12	20	14.80	0.08	20	14.99	0.09
21	14.79	0.11	21	14.81	0.07	21	14.98	0.08
22	14.80	0.10	22	14.81	0.07	22	14.98	0.08
23	14.80	0.10	23	14.82	0.06	23	14.97	0.07
24	14.81	0.09	26	14.83	0.05	26	14.96	0.06
27	14.82	0.08	30	14.84	0.04	30	14.95	0.05
29	14.83	0.07	35	14.85	0.03	36	14.94	0.04
33	14.84	0.06	44	14.86	0.02	44	14.93	0.03
39	14.85	0.05	56	14.87	0.01	58	14.92	0.02
46	14.86	0.04	85	14.88	0.00	84	14.91	0.01
60	14.87	0.03				140	14.90	0.00
86	14.88	0.02						

APPENDIX H

Soil and Groundwater Sampling Results

Elf Atochem Data Quality Review

This appendix includes the data validation reports associated with each data set generated during the Phase 2 investigation.

Analytical Methodology

The analytical parameters are shown in Appendix H.

Volatile organic compounds and pesticides were analyzed using USEPA methods 8240 and 8080 (Test Methods for Evaluating Solid Waste–SW846, 3rd Ed., Rev. 1 1992). The laboratory standard operating procedures detail analytical procedure and detection limits, calibration procedures and criteria, internal quality control checks and corrective action, data calculations and reporting units, documentation, and deliverable items. The laboratory quality control (QC) criteria have been detailed in the appended validation reports as further described below. The implementation of these specifications has provided data of known quality.

Data Validation

Data were validated independent of the laboratory. Individual data validation reports were prepared for each specific sample delivery group (SDG) and each specific chemical parameter. The laboratories group samples into SDGs; the samples in an SDG have common QC data, as they are run consecutively. The individual data validation reports presented in this appendix were organized per contents of the EPA functional guidelines for data review. Each section detailed analytical protocol deviations, if any. The subsections summarized the data that did not meet QC requirements, if any, with the following minimum information.

- Affected sample numbers
- Affected parameters
- Specific quantitative deviation from the QC requirements
- Criteria for the noted deviation
- Applicable data validation flags
- Data validation flag description, whether it was due to laboratory error (designated as "protocol" flag) or due to matrix, analytical, or instrument limitations ("advisory" flag).

The sample analyses were reviewed for QC data per EPA method guidelines and laboratory specific criteria to include checks for proper methodology, level of QC effort (frequency of runs), and for conformance to quantitative control limits. This resulted in sample-specific data validation flags as can be seen in reports.

Data validation flags (also known as data usability flags) for the specific SDGs were summarized in tables contained in the data reports. The protocol flags were entered into the

database and are shown with all reported analytical data in this report. These flags and their meanings are listed below:

- U — Concentration is less than the listed value (not detected).
- J or E — Estimated value is for qualitative use only.
- R — Data are restricted and may not be used.
- UJ — Concentration is less than the estimated detection limit; detection limit should be used qualitatively and may bias result to false negative.

Qualification of sample analyses for contamination observed in laboratory blank samples was also detailed in the data validation reports. These qualifications have also been incorporated into the data used in this report.

Data Assessment

Validated data has met project quality goals as described in the QAPP and the attached reports. Data are over 90 percent complete. Accuracy and precision values have been summarized and included in the project file along with data validation reports for data users as necessary.

Elf Atochem Soil Sampling Results

	Sample ID:	GA-SB01-0-0005		GA-SB01-0-0020		GA-SB01-0-0060		GA-SB02-0-0025		GA-SB02-0-0040		GA-SB02-0-0060		GA-SB03-0-0025		GA-SB03-0-0040		GA-SB03-0-0060		GA-SB03-0-0080		GA-SB03-0-0100	
	Station ID:	GA-SB01		GA-SB01		GA-SB01		GA-SB02		GA-SB02		GA-SB02		GA-SB03		GA-SB03		GA-SB03		GA-SB03		GA-SB03	
	Date Sampled:	10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96	
	Depth, feet bgs:	.5		2		6		2.5		4		6		2.5		4		6		8		10	
Pesticides	**Units**																						
4,4'-DDD	mg/Kg	4.6		1.2		.006		.54		.0041	U	.49	U	.35	U	.015		15					
4,4'-DDE	mg/Kg	12		5.1		.0041	U	.38		.0041	U	.49	U	.47		.018		6.3					
4,4'-DDT	mg/Kg	400	D	61	D	.32	D	16	DJ	.073	U	2.5		7.9		.65	D	1200	D				
Aldrin	mg/Kg	1.9	U	.19	U	.0021	U	.19	U	.0021	U	.25	U	.18	U	.0019	U	2.2	U				
Alpha-BHC	mg/Kg	1.9	U	.19	U	.0021	U	.19	U	.0021	U	.25	U	.18	U	.0019	U	2.2	U				
Beta-BHC	mg/Kg	1.9	U	.19	U	.0021	U	.19	U	.0021	U	.25	U	.18	U	.0019	U	2.2	U				
Chlordane (Total)	mg/Kg	3.7	U	.37	U	.0041	U	.36	U	.0041	U	.49	U	.35	U	.0036	U	4.3	U				
Delta-BHC	mg/Kg	1.9	U	.19	U	.0021	U	.19	U	.0021	U	.25	U	.18	U	.0019	U	2.2	U				
Dieldrin	mg/Kg	3.7	U	.37	U	.0041	U	.36	U	.0041	U	.49	U	.35	U	.0036	U	4.3	U				
Endosulfan I	mg/Kg	1.9	U	.19	U	.0021	U	.19	U	.0021	U	.25	U	.18	U	.0019	U	2.2	U				
Endosulfan II	mg/Kg	3.7	U	.37	U	.0041	U	.36	U	.0041	U	.49	U	.35	U	.0036	U	4.3	U				
Endosulfan Sulfate	mg/Kg	3.7	U	.37	U	.0041	U	.36	U	.0041	U	.49	U	.35	U	.0036	U	4.3	U				
Endrin	mg/Kg	3.7	U	.37	U	.0041	U	.36	U	.0041	U	.49	U	.35	U	.0036	U	4.3	U				
Endrin Aldehyde	mg/Kg	3.7	U	.37	U	.0041	U	.36	U	.0041	U	.49	U	.35	U	.0036	U	4.3	U				
Gamma-BHC	mg/Kg	1.9	U	.19	U	.0021	U	.19	U	.0021	U	.25	U	.18	U	.0019	U	2.2	U				
Heptachlor	mg/Kg	1.9	U	.19	U	.0021	U	.19	U	.0021	U	.25	U	.18	U	.0019	U	2.2	U				
Heptachlor Epoxide	mg/Kg	1.9	U	.19	U	.0021	U	.19	U	.0021	U	.25	U	.18	U	.0019	U	2.2	U				
Methoxychlor	mg/Kg	19	U	1.9	U	.021	U	1.9	U	.021	U	2.5	U	1.8	U	.019	U	22	U				
Toxaphene	mg/Kg	190	U	19	U	.21	U	19	U	.21	U	25	U	18	U	.19	U	220	U				
Total Organic Carbon																							
Total Organic Carbon	mg/Kg																						
Petroleum Hydrocarbons																							
Diesel - by 8015	mg/Kg																						
Volatile Organic																							
1,1,1,2-Tetrachloroethane	mg/Kg																						
1,1,1-Trichloroethane	mg/Kg																						
1,1,2,2-Tetrachloroethane	mg/Kg															47	U	180	U				
1,1,2-Trichloroethane	mg/Kg															47	U	180	U				
1,1-Dichloroethane	mg/Kg															47	U	180	U				
1,1-Dichloroethene	mg/Kg															47	U	180	U				
1,1-Dichloropropene	mg/Kg															47	U	180	U				
1,2,3-Trichlorobenzene	mg/Kg																						
1,2,3-Trichloropropane	mg/Kg																						
1,2,4-Trichlorobenzene	mg/Kg																						
1,2,4-Trimethylbenzene	mg/Kg																						
1,2-Dibromo-3-	mg/Kg																						
1,2-Dibromoethane	mg/Kg																						
1,2-Dichlorobenzene	mg/Kg																						
1,2-Dichloroethane	mg/Kg																						
1,2-Dichloroethene	mg/Kg															47	U	180	U				
1,2-Dichloropropane	mg/Kg															47	U	180	U				
1,3,5-Trimethylbenzene	mg/Kg															47	U	180	U				
1,3-Dichlorobenzene	mg/Kg																						
1,3-Dichloropropane	mg/Kg																						
1,4-Dichlorobenzene	mg/Kg																						
2,2-Dichloropropane	mg/Kg																						
2-Butanone (Mek)	mg/Kg																						
2-Chloroethyl Vinyl Ether	mg/Kg															93	U	360	U				
2-Chlorotoluene	mg/Kg																						
2-Hexanone	mg/Kg																						
4-Chlorotoluene	mg/Kg															93	U	360	U				
4-Methyl-2-Pentanone	mg/Kg																						
Acetone	mg/Kg															93	U	360	U				
Benzene	mg/Kg															93	UJ	1300	J				
																47	U	180	U				

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Elf Atochem Soil Sampling Results

	Sample ID:	GA-SB01-0-0005		GA-SB01-0-0020		GA-SB01-0-0060		GA-SB02-0-0025		GA-SB02-0-0040		GA-SB02-0-0060		GA-SB03-0-0025		GA-SB03-0-0040		GA-SB03-0-0060		GA-SB03-0-0080		GA-SB03-0-0100	
	Station ID:	GA-SB01		GA-SB01		GA-SB01		GA-SB02		GA-SB02		GA-SB02		GA-SB03		GA-SB03		GA-SB03		GA-SB03		GA-SB03	
	Date Sampled:	10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96	
	Depth, feet bgs:	.5		2		6		2.5		4		6		2.5		4		6		8		10	
Volatile Organic Compounds, con't																							
Bromobenzene	mg/Kg																						
Bromochloromethane	mg/Kg																						
Bromodichloromethane	mg/Kg																						
Bromoform	mg/Kg																			47	U	180	U
Bromomethane	mg/Kg																			47	U	180	U
Carbon Disulfide	mg/Kg																			93	U	360	U
Carbon Tetrachloride	mg/Kg																			47	U	180	U
Chlorobenzene	mg/Kg																			47	U	180	U
Chloroethane	mg/Kg																			1000		4500	
Chloroform	mg/Kg																			93	U	360	U
Chloromethane	mg/Kg																			47	U	180	U
Cis-1,2-Dichloroethene	mg/Kg																			93	U	360	U
Cis-1,3-Dichloropropene	mg/Kg																						
Dibromochloromethane	mg/Kg																			47	U	180	U
Dibromomethane	mg/Kg																			47	U	180	U
Dichlorodifluoromethane	mg/Kg																						
Ethylbenzene	mg/Kg																						
Hexachlorobutadiene	mg/Kg																			47	U	180	U
Iodomethane	mg/Kg																						
Isopropylbenzene	mg/Kg																						
Methyl Tert-Butyl Ether	mg/Kg																						
Methylene Chloride	mg/Kg																						
N-Butylbenzene	mg/Kg																			47	UJ	180	UJ
N-Propylbenzene	mg/Kg																						
Naphthalene	mg/Kg																						
O-Xylene	mg/Kg																						
P-Isopropyltoluene	mg/Kg																						
Sec-Butylbenzene	mg/Kg																						
Styrene	mg/Kg																						
Tert-Butylbenzene	mg/Kg																			47	U	180	U
Tetrachloroethene	mg/Kg																						
Toluene	mg/Kg																			47	U	180	U
Trans-1,2-Dichlorotethene	mg/Kg																			47	U	180	U
Trans-1,3-Dichloropropene	mg/Kg																						
Trichloroethene	mg/Kg																			47	U	180	U
Trichlorofluoromethane	mg/Kg																			47	U	180	U
Vinyl Acetate	mg/Kg																						
Vinyl Chloride	mg/Kg																						
Xylenes, Total	mg/Kg																			93	U	360	U
																				47	U	180	U

Qualifier Explanation:

U - Indicates the compound was analyzed for but not detected. The nember adjacent to the U qualifier indicates the reporting limit for that compound. The reporting limit can vary from sample to sample depending on dilut

J - Indicates an estimated value. A J qualifier is used by the lab when the presence of a compound is detected below the reporting limit. J qualifiers applied during data validation indicate failure to meet a method quality c

D - Indicates that the associated result was derived from a dilution.

B - The compound was detected in the associated method blank as well as in the sample.

Elf Atochem Soil Sampling Results

	Sample ID:	GA-SB04-0-0005		GA-SB04-0-0020		GA-SB04-0-0040		GA-SB04-0-0060		GA-SB05-0-0005		GA-SB05-0-0020		GA-SB05-0-0040		GA-SB05-0-0060		GA-SB06-0-0020		GA-SB07-0-0040		GA-MWA1-0-0140	
	Station ID:	GA-SB04		GA-SB04		GA-SB04		GA-SB04		GA-SB05		GA-SB05		GA-SB05		GA-SB05		GA-SB06		GA-SB07		GA-MWA1	
	Date Sampled:	10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/8/96		10/11/96		10/14/96		12/11/96	
	Depth, feet bgs:	.5		2		4		6		.5		2		4		6		2		4		14	
Pesticides	**Units**																						
4,4'-DDD	mg/Kg	37		.036		.52		.46	U	260	D	.0043	U	.0037	U	.39	U	.2	U	79		.15	U
4,4'-DDE	mg/Kg	12		.0039	U	.38	U	.46	U	33		.0043	U	.0037	U	.39	U	.2	U	43	U	.15	U
4,4'-DDT	mg/Kg	470	DJ	.14	D	3.4		11		12000	D	.081	U	.015	U	1.7	J	1.5		510		.15	U
Aldrin	mg/Kg	1.9	U	.002	U	.2	U	.24	U	2	U	.0022	U	.0019	U	.2	U	.1	U	22	U	.075	U
Alpha-BHC	mg/Kg	1.9	U	.002	U	.2	U	.24	U	2	U	.0022	U	.0019	U	.2	U	.1	U	22	U	.075	U
Beta-BHC	mg/Kg	1.9	U	.002	U	.2	U	.24	U	2	U	.0022	U	.0019	U	.2	U	.1	U	22	U	.075	U
Chlordane (Total)	mg/Kg	3.8	U	.0039	U	.38	U	.46	U	3.9	U	.0043	U	.0037	U	.39	U	.2	U	43	U	.15	U
Delta-BHC	mg/Kg	1.9	U	.002	U	.2	U	.24	U	2	U	.0022	U	.0019	U	.2	U	.1	U	22	U	.075	U
Dieldrin	mg/Kg	3.8	U	.0039	U	.38	U	.46	U	3.9	U	.0043	U	.0037	U	.39	U	.2	U	43	U	.15	U
Endosulfan I	mg/Kg	1.9	U	.002	U	.2	U	.24	U	2	U	.0035		.0019	U	.2	U	.1	U	22	U	.075	U
Endosulfan II	mg/Kg	3.8	U	.0039	U	.38	U	.46	U	3.9	U	.033		.0037	U	.39	U	.2	U	43	U	.15	U
Endosulfan Sulfate	mg/Kg	3.8	U	.0039	U	.38	U	.46	U	3.9	U	.0043	U	.0037	U	.39	U	.2	U	43	U	.15	U
Endrin	mg/Kg	3.8	U	.0039	U	.38	U	.46	U	3.9	U	.0043	U	.0037	U	.39	U	.2	U	43	U	.15	U
Endrin Aldehyde	mg/Kg	3.8	U	.0039	U	.38	U	.46	U	3.9	U	.0043	U	.0037	U	.39	U	.2	U	43	U	.15	U
Gamma-BHC	mg/Kg	1.9	U	.002	U	.2	U	.24	U	2	U	.0057		.007		.2	U	.1	U	22	U	.075	U
Heptachlor	mg/Kg	1.9	U	.002	U	.2	U	.24	U	2	U	.0022	U	.0019	U	.2	U	.1	U	22	U	.075	U
Heptachlor Epoxide	mg/Kg	1.9	U	.002	U	.2	U	.24	U	2	U	.0022	U	.0019	U	.2	U	.1	U	22	U	.075	U
Methoxychlor	mg/Kg	19	U	.02	U	2	U	2.4	U	20	U	.022	U	.019	U	2	U	1	U	220	U	.75	U
Toxaphene	mg/Kg	190	U	.2	U	20	U	24	U	200	U	.22	U	.19	U	20	U	10	U	2200	U	7.5	U
Total Organic Carbon																							
Total Organic Carbon	mg/Kg																						
Petroleum Hydrocarbons																							
Diesel - by 8015	mg/Kg																						
Volatile Organic																				270			
1,1,1,2-Tetrachloroethane	mg/Kg																						
1,1,1-Trichloroethane	mg/Kg																						
1,1,2,2-Tetrachloroethane	mg/Kg																					.007	U
1,1,2-Trichloroethane	mg/Kg																					.007	U
1,1-Dichloroethane	mg/Kg																					.007	U
1,1-Dichloroethene	mg/Kg																					.007	U
1,1-Dichloropropene	mg/Kg																					.007	U
1,2,3-Trichlorobenzene	mg/Kg																						
1,2,3-Trichloropropane	mg/Kg																						
1,2,4-Trichlorobenzene	mg/Kg																						
1,2,4-Trimethylbenzene	mg/Kg																						
1,2-Dibromo-3-	mg/Kg																						
1,2-Dibromoethane	mg/Kg																						
1,2-Dichlorobenzene	mg/Kg																						
1,2-Dichloroethane	mg/Kg																						
1,2-Dichloroethene	mg/Kg																					.007	U
1,2-Dichloropropane	mg/Kg																					.007	U
1,3,5-Trimethylbenzene	mg/Kg																					.007	U
1,3-Dichlorobenzene	mg/Kg																						
1,3-Dichloropropane	mg/Kg																						
1,4-Dichlorobenzene	mg/Kg																						
2,2-Dichloropropane	mg/Kg																						
2-Butanone (Mek)	mg/Kg																						
2-Chloroethyl Vinyl Ether	mg/Kg																					.015	U
2-Chlorotoluene	mg/Kg																						
2-Hexanone	mg/Kg																						
4-Chlorotoluene	mg/Kg																					.015	U
4-Methyl-2-Pentanone	mg/Kg																						
Acetone	mg/Kg																					.015	U
Benzene	mg/Kg																					.029	
																						.007	U

Elf Atochem Soil Sampling Results

	Sample ID:	GA-SB04-0-0005	GA-SB04-0-0020	GA-SB04-0-0040	GA-SB04-0-0060	GA-SB05-0-0005	GA-SB05-0-0020	GA-SB05-0-0040	GA-SB05-0-0060	GA-SB06-0-0020	GA-SB07-0-0040	GA-MWA1-0-0140	
	Station ID:	GA-SB04	GA-SB04	GA-SB04	GA-SB04	GA-SB05	GA-SB05	GA-SB05	GA-SB05	GA-SB06	GA-SB07	GA-MWA1	
	Date Sampled:	10/8/96	10/8/96	10/8/96	10/8/96	10/8/96	10/8/96	10/8/96	10/8/96	10/11/96	10/14/96	12/11/96	
	Depth, feet bgs:	.5	2	4	6	.5	2	4	6	2	4	14	
Volatile Organic Compounds, con't													
Bromobenzene	mg/Kg												
Bromochloromethane	mg/Kg												
Bromodichloromethane	mg/Kg												
Bromoform	mg/Kg											.007	U
Bromomethane	mg/Kg											.007	U
Carbon Disulfide	mg/Kg											.015	U
Carbon Tetrachloride	mg/Kg											.007	U
Chlorobenzene	mg/Kg											.007	U
Chloroethane	mg/Kg											.059	
Chloroform	mg/Kg											.015	U
Chloromethane	mg/Kg											.007	U
Cis-1,2-Dichloroethene	mg/Kg											.015	U
Cis-1,3-Dichloropropene	mg/Kg												
Dibromochloromethane	mg/Kg											.007	U
Dibromomethane	mg/Kg											.007	U
Dichlorodifluoromethane	mg/Kg												
Ethylbenzene	mg/Kg												
Hexachlorobutadiene	mg/Kg											.007	U
Iodomethane	mg/Kg												
Isopropylbenzene	mg/Kg												
Methyl Tert-Butyl Ether	mg/Kg												
Methylene Chloride	mg/Kg												
N-Butylbenzene	mg/Kg											.008	
N-Propylbenzene	mg/Kg												
Naphthalene	mg/Kg												
O-Xylene	mg/Kg												
P-Isopropyltoluene	mg/Kg												
Sec-Butylbenzene	mg/Kg												
Styrene	mg/Kg												
Tert-Butylbenzene	mg/Kg											.007	U
Tetrachloroethene	mg/Kg												
Toluene	mg/Kg											.007	U
Trans-1,2-Dichlorotethene	mg/Kg											.007	U
Trans-1,3-Dichloropropene	mg/Kg												
Trichloroethene	mg/Kg											.007	U
Trichlorofluoromethane	mg/Kg											.007	U
Vinyl Acetate	mg/Kg												
Vinyl Chloride	mg/Kg												
Xylenes, Total	mg/Kg											.015	U
												.007	U

Qualifier Explanation:

U - Indicates the compound was analion factors or percent moisture.

J - Indicates an estimated value. A J assurance criteria.

D - Indicates that the associated resul

B - The compound was detected in th

Elf Atochem Soil Sampling Results

	Sample ID:	GA-MWA1-0-0190		GA-MWA1-0-0260		GA-MWA2-0-0220	GA-MWA2-0-0240		GA-MWA2-0-0290		GA-MWA3-0-0220		GA-MWA3-0-0240		GA-MWA3-0-0275		GA-MWA4-0-0240		GA-MWA4-0-0278	
	Station ID:	GA-MWA1		GA-MWA1		GA-MWA2	GA-MWA2		GA-MWA2		GA-MWA3		GA-MWA3		GA-MWA3		GA-MWA4		GA-MWA4	
	Date Sampled:	12/11/96		12/11/96		12/11/96	12/11/96		12/11/96		12/11/96		12/11/96		12/11/96		12/11/96		12/11/96	
	Depth, feet bgs:	19		26		22	24		29		22		24		27.5		24		27.8	
Pesticides	**Units**																			
4,4'-DDD	mg/Kg	.14	U	.13	U		.13	U	.13	U	.13	U	.72		.13	U	41		1.1	
4,4'-DDE	mg/Kg	.14	U	.13	U		.13	U	.13	U	.13	U	.26	U	.13	U	5.4		.16	
4,4'-DDT	mg/Kg	.14	U	.13	U		.36		.55		.13	U	2.5		.64		79		2.6	
Aldrin	mg/Kg	.072	U	.069	U		.068	U	.068	U	.065	U	.13	U	.066	U	1.3	U	.069	U
Alpha-BHC	mg/Kg	.072	U	.069	U		.068	U	.068	U	.065	U	.13	U	.066	U	1.3	U	.069	U
Beta-BHC	mg/Kg	.072	U	.069	U		.068	U	.068	U	.065	U	.13	U	.066	U	1.3	U	.069	U
Chlordane (Total)	mg/Kg	.14	U	.13	U		.13	U	.13	U	.13	U	.26	U	.13	U	2.5	U	.13	U
Delta-BHC	mg/Kg	.072	U	.069	U		.068	U	.068	U	.065	U	.13	U	.066	U	1.3	U	.069	U
Dieldrin	mg/Kg	.14	U	.13	U		.13	U	.13	U	.13	U	.26	U	.13	U	2.5	U	.13	U
Endosulfan I	mg/Kg	.072	U	.069	U		.068	U	.068	U	.065	U	.13	U	.066	U	1.3	U	.069	U
Endosulfan II	mg/Kg	.14	U	.13	U		.13	U	.13	U	.13	U	.26	U	.13	U	2.5	U	.13	U
Endosulfan Sulfate	mg/Kg	.14	U	.13	U		.13	U	.13	U	.13	U	.26	U	.13	U	2.5	U	.13	U
Endrin	mg/Kg	.14	U	.13	U		.13	U	.13	U	.13	U	.26	U	.13	U	2.5	U	.13	U
Endrin Aldehyde	mg/Kg	.14	U	.13	U		.13	U	.13	U	.13	U	.26	U	.13	U	2.5	U	.13	U
Gamma-BHC	mg/Kg	.072	U	.069	U		.068	U	.068	U	.065	U	.13	U	.066	U	1.3	U	.069	U
Heptachlor	mg/Kg	.072	U	.069	U		.068	U	.068	U	.065	U	.13	U	.066	U	1.3	U	.069	U
Heptachlor Epoxide	mg/Kg	.072	U	.069	U		.068	U	.068	U	.065	U	.13	U	.066	U	1.3	U	.069	U
Methoxychlor	mg/Kg	.72	U	.69	U		.68	U	.68	U	.65	U	1.3	U	.66	U	13	U	.69	U
Toxaphene	mg/Kg	7.2	U	6.9	U		6.8	U	6.8	U	6.5	U	13	U	6.6	U	130	U	6.9	U
Total Organic Carbon																				
Total Organic Carbon	mg/Kg	1970				633							1530							
Petroleum Hydrocarbons																				
Diesel - by 8015	mg/Kg																			
Volatile Organic																				
1,1,1,2-Tetrachloroethane	mg/Kg																			
1,1,1-Trichloroethane	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
1,1,2,2-Tetrachloroethane	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
1,1,2-Trichloroethane	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
1,1-Dichloroethane	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
1,1-Dichloroethene	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
1,1-Dichloropropene	mg/Kg																			
1,2,3-Trichlorobenzene	mg/Kg																			
1,2,3-Trichloropropane	mg/Kg																			
1,2,4-Trichlorobenzene	mg/Kg																			
1,2,4-Trimethylbenzene	mg/Kg																			
1,2-Dibromo-3-	mg/Kg																			
1,2-Dibromoethane	mg/Kg																			
1,2-Dichlorobenzene	mg/Kg																			
1,2-Dichloroethane	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
1,2-Dichloroethene	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
1,2-Dichloropropane	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
1,3,5-Trimethylbenzene	mg/Kg																			
1,3-Dichlorobenzene	mg/Kg																			
1,3-Dichloropropane	mg/Kg																			
1,4-Dichlorobenzene	mg/Kg																			
2,2-Dichloropropane	mg/Kg																			
2-Butanone (Mek)	mg/Kg	.014	UJ	.014	U		.016		.013	UJ	.013	U	.013	U	.013	U	.013	U	.014	UJ
2-Chloroethyl Vinyl Ether	mg/Kg																			
2-Chlorotoluene	mg/Kg																			
2-Hexanone	mg/Kg	.014	UJ	.014	U		.013	U	.013	UJ	.013	U	.013	U	.013	U	.013	U	.014	UJ
4-Chlorotoluene	mg/Kg																			
4-Methyl-2-Pentanone	mg/Kg	.014	UJ	.014	U		.013	U	.013	UJ	.013	U	.013	U	.013	U	.013	U	.014	UJ
Acetone	mg/Kg	.056	J	.025			.075		.042	J	.1		.052		.051		.25		.12	D
Benzene	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ

Elf Atochem Soil Sampling Results

	Sample ID:	GA-MWA1-0-0190		GA-MWA1-0-0260		GA-MWA2-0-0220	GA-MWA2-0-0240		GA-MWA2-0-0290		GA-MWA3-0-0220		GA-MWA3-0-0240		GA-MWA3-0-0275		GA-MWA4-0-0240		GA-MWA4-0-0278	
	Station ID:	GA-MWA1		GA-MWA1		GA-MWA2	GA-MWA2		GA-MWA2		GA-MWA3		GA-MWA3		GA-MWA3		GA-MWA4		GA-MWA4	
	Date Sampled:	12/11/96		12/11/96		12/11/96	12/11/96		12/11/96		12/11/96		12/11/96		12/11/96		12/11/96		12/11/96	
	Depth, feet bgs:	19		26		22	24		29		22		24		27.5		24		27.8	
Volatile Organic Compounds, con't																				
Bromobenzene	mg/Kg																			
Bromochloromethane	mg/Kg																			
Bromodichloromethane	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Bromoform	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Bromomethane	mg/Kg	.014	UJ	.014	U		.013	U	.013	UJ	.013	U	.013	U	.013	U	.013	U	.014	UJ
Carbon Disulfide	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Carbon Tetrachloride	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Chlorobenzene	mg/Kg	.057	J	.007	U		.084		.13	J	.006	U	.007	U	.006	U	.01		.13	DJ
Chloroethane	mg/Kg	.014	UJ	.014	U		.013	U	.013	UJ	.013	U	.013	U	.013	U	.013	U	.014	UJ
Chloroform	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Chloromethane	mg/Kg	.014	UJ	.014	U		.013	U	.013	UJ	.013	U	.013	U	.013	U	.013	U	.014	UJ
Cis-1,2-Dichloroethene	mg/Kg																			
Cis-1,3-Dichloropropene	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Dibromochloromethane	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Dibromomethane	mg/Kg																			
Dichlorodifluoromethane	mg/Kg																			
Ethylbenzene	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Hexachlorobutadiene	mg/Kg																			
Iodomethane	mg/Kg																			
Isopropylbenzene	mg/Kg																			
Methyl Tert-Butyl Ether	mg/Kg																			
Methylene Chloride	mg/Kg	.036	J	.008			.007	U	.007	J	.043		.023		.01		.055		.02	J
N-Butylbenzene	mg/Kg																			
N-Propylbenzene	mg/Kg																			
Naphthalene	mg/Kg																			
O-Xylene	mg/Kg																			
P-Isopropyltoluene	mg/Kg																			
Sec-Butylbenzene	mg/Kg																			
Styrene	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Tert-Butylbenzene	mg/Kg																			
Tetrachloroethene	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Toluene	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Trans-1,2-Dichlorotethene	mg/Kg																			
Trans-1,3-Dichloropropene	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Trichloroethene	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ
Trichlorofluoromethane	mg/Kg																			
Vinyl Acetate	mg/Kg																			
Vinyl Chloride	mg/Kg	.014	UJ	.014	U		.013	U	.013	UJ	.013	U	.013	U	.013	U	.013	U	.014	UJ
Xylenes, Total	mg/Kg	.007	UJ	.007	U		.007	U	.007	UJ	.006	U	.007	U	.006	U	.006	U	.007	UJ

Qualifier Explanation:

U - Indicates the compound was anal

J - Indicates an estimated value. A J

D - Indicates that the associated resul

B - The compound was detected in th

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Elf Atochem Soil Sampling Results

	Sample ID:	GA-MWA4-0-0300		GA-SB08-0-0005		GA-SB08-0-0020		GA-SB08-0-0040		GA-SB08-0-0060		GA-SB09-0-0005		GA-SB09-0-0020		GA-SB09-0-0040		GA-SB09-0-0060		GA-SB10-0-0005		GA-SB10-0-0020	
	Station ID:	GA-MWA4		GA-SB08		GA-SB08		GA-SB08		GA-SB08		GA-SB09		GA-SB09		GA-SB09		GA-SB09		GA-SB10		GA-SB10	
	Date Sampled:	12/11/96		12/13/96		12/13/96		12/13/96		12/13/96		12/13/96		12/13/96		12/13/96		12/13/96		12/13/96		12/13/96	
	Depth, feet bgs:	30		.5		2		4		6		.5		2		4		6		.5		2	
Pesticides	**Units**																						
4,4'-DDD	mg/Kg	.13	U	1.2	U	.12	U	.12	U	.11	U	11	U	13	U	2.4	U	.11	U	1.1	U	2.3	U
4,4'-DDE	mg/Kg	.13	U	1.2	U	.12	U	.12	U	.11	U	12		13	U	2.4	U	.11	U	1.1	U	2.3	U
4,4'-DDT	mg/Kg	.59		12		.66		.42		.22		310		130		21		.2		12		38	
Aldrin	mg/Kg	.067	U	.59	U	.063	U	.064	U	.059	U	5.5	U	6.5	U	1.2	U	.055	U	.56	U	1.2	U
Alpha-BHC	mg/Kg	.067	U	.59	U	.063	U	.064	U	.059	U	5.5	U	6.5	U	1.2	U	.055	U	.56	U	1.2	U
Beta-BHC	mg/Kg	.067	U	.59	U	.063	U	.064	U	.059	U	5.5	U	6.5	U	1.2	U	.055	U	.56	U	1.2	U
Chlordane (Total)	mg/Kg	.13	U	1.2	U	.12	U	.12	U	.11	U	11	U	13	U	2.4	U	.11	U	1.1	U	2.3	U
Delta-BHC	mg/Kg	.067	U	.59	U	.063	U	.064	U	.059	U	5.5	U	6.5	U	1.2	U	.055	U	.56	U	1.2	U
Dieldrin	mg/Kg	.13	U	1.2	U	.12	U	.12	U	.11	U	11	U	13	U	2.4	U	.11	U	1.1	U	2.3	U
Endosulfan I	mg/Kg	.067	U	.59	U	.063	U	.064	U	.059	U	5.5	U	6.5	U	1.2	U	.055	U	.56	U	1.2	U
Endosulfan II	mg/Kg	.13	U	1.2	U	.12	U	.12	U	.11	U	11	U	13	U	2.4	U	.11	U	1.1	U	2.3	U
Endosulfan Sulfate	mg/Kg	.13	U	1.2	U	.12	U	.12	U	.11	U	11	U	13	U	2.4	U	.11	U	1.1	U	2.3	U
Endrin	mg/Kg	.13	U	1.2	U	.12	U	.12	U	.11	U	11	U	13	U	2.4	U	.11	U	1.1	U	2.3	U
Endrin Aldehyde	mg/Kg	.13	U	1.2	U	.12	U	.12	U	.11	U	11	U	13	U	2.4	U	.11	U	1.1	U	2.3	U
Gamma-BHC	mg/Kg	.067	U	.59	U	.063	U	.064	U	.059	U	5.5	U	6.5	U	1.2	U	.055	U	.56	U	1.2	U
Heptachlor	mg/Kg	.067	U	.59	U	.063	U	.064	U	.059	U	5.5	U	6.5	U	1.2	U	.055	U	.56	U	1.2	U
Heptachlor Epoxide	mg/Kg	.067	U	.59	U	.063	U	.064	U	.059	U	5.5	U	6.5	U	1.2	U	.055	U	.56	U	1.2	U
Methoxychlor	mg/Kg	.67	U	5.9	U	.63	U	.64	U	.59	U	55	U	65	U	12	U	.55	U	5.6	U	12	U
Toxaphene	mg/Kg	6.7	U	59	U	6.3	U	6.4	U	5.9	U	550	U	650	U	120	U	5.5	U	56	U	120	U
Total Organic Carbon																							
Total Organic Carbon	mg/Kg	1330																					
Petroleum Hydrocarbons																							
Diesel - by 8015	mg/Kg																						
Volatile Organic																							
1,1,1,2-Tetrachloroethane	mg/Kg																						
1,1,1-Trichloroethane	mg/Kg	.82	UR																				
1,1,2,2-Tetrachloroethane	mg/Kg	.82	UR																				
1,1,2-Trichloroethane	mg/Kg	.82	UR																				
1,1-Dichloroethane	mg/Kg	.82	UR																				
1,1-Dichloroethene	mg/Kg	.82	UR																				
1,1-Dichloropropene	mg/Kg																						
1,2,3-Trichlorobenzene	mg/Kg																						
1,2,3-Trichloropropane	mg/Kg																						
1,2,4-Trichlorobenzene	mg/Kg																						
1,2,4-Trimethylbenzene	mg/Kg																						
1,2-Dibromo-3-	mg/Kg																						
1,2-Dibromoethane	mg/Kg																						
1,2-Dichlorobenzene	mg/Kg																						
1,2-Dichloroethane	mg/Kg	.82	UR																				
1,2-Dichloroethene	mg/Kg	.82	UR																				
1,2-Dichloropropane	mg/Kg	.82	UR																				
1,3,5-Trimethylbenzene	mg/Kg																						
1,3-Dichlorobenzene	mg/Kg																						
1,3-Dichloropropane	mg/Kg																						
1,4-Dichlorobenzene	mg/Kg																						
2,2-Dichloropropane	mg/Kg																						
2-Butanone (Mek)	mg/Kg	1.6	UR																				
2-Chloroethyl Vinyl Ether	mg/Kg																						
2-Chlorotoluene	mg/Kg																						
2-Hexanone	mg/Kg	1.6	UR																				
4-Chlorotoluene	mg/Kg																						
4-Methyl-2-Pentanone	mg/Kg	1.6	UR																				
Acetone	mg/Kg	1.6	UR																				
Benzene	mg/Kg	.82	UR																				

Elf Atochem Soil Sampling Results

	Sample ID:	GA-MWA4-0-0300		GA-SB08-0-0005	GA-SB08-C-0020	GA-SB08-0-0040	GA-SB08-0-0060	GA-SB09-0-0005	GA-SB09-0-0020	GA-SB09-0-0040	GA-SB09-0-0060	GA-SB10-0-0005	GA-SB10-0-0020
	Station ID:	GA-MWA4		GA-SB08	GA-SB08	GA-SB08	GA-SB08	GA-SB09	GA-SB09	GA-SB09	GA-SB09	GA-SB10	GA-SB10
	Date Sampled:	12/11/96		12/13/96	12/13/96	12/13/96	12/13/96	12/13/96	12/13/96	12/13/96	12/13/96	12/13/96	12/13/96
	Depth, feet bgs:	30		.5	2	4	6	.5	2	4	6	.5	2
Volatile Organic Compounds, con't													
Bromobenzene	mg/Kg												
Bromochloromethane	mg/Kg												
Bromodichloromethane	mg/Kg	.82	UR										
Bromoform	mg/Kg	.82	UR										
Bromomethane	mg/Kg	1.6	UR										
Carbon Disulfide	mg/Kg	.82	UR										
Carbon Tetrachloride	mg/Kg	.82	UR										
Chlorobenzene	mg/Kg	4.3	J										
Chloroethane	mg/Kg	1.6	UR										
Chloroform	mg/Kg	.82	UR										
Chloromethane	mg/Kg	1.6	UR										
Cis-1,2-Dichloroethene	mg/Kg												
Cis-1,3-Dichloropropene	mg/Kg	.82	UR										
Dibromochloromethane	mg/Kg	.82	UR										
Dibromomethane	mg/Kg												
Dichlorodifluoromethane	mg/Kg												
Ethylbenzene	mg/Kg	.82	UR										
Hexachlorobutadiene	mg/Kg												
Iodomethane	mg/Kg												
Isopropylbenzene	mg/Kg												
Methyl Tert-Butyl Ether	mg/Kg												
Methylene Chloride	mg/Kg	.82	UR										
N-Butylbenzene	mg/Kg												
N-Propylbenzene	mg/Kg												
Naphthalene	mg/Kg												
O-Xylene	mg/Kg												
P-Isopropyltoluene	mg/Kg												
Sec-Butylbenzene	mg/Kg												
Styrene	mg/Kg	.82	UR										
Tert-Butylbenzene	mg/Kg												
Tetrachloroethene	mg/Kg	.82	UR										
Toluene	mg/Kg	.82	UR										
Trans-1,2-Dichlorotethene	mg/Kg												
Trans-1,3-Dichloropropene	mg/Kg	.82	UR										
Trichloroethene	mg/Kg	.82	UR										
Trichlorofluoromethane	mg/Kg												
Vinyl Acetate	mg/Kg												
Vinyl Chloride	mg/Kg	1.6	UR										
Xylenes, Total	mg/Kg	.82	UR										

Qualifier Explanation:

U - Indicates the compound was anal

J - Indicates an estimated value. A J

D - Indicates that the associated resul

B - The compound was detected in th

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Elf Atochem Soil Sampling Results

	Sample ID:	GA-SB10-0-0040		GA-SB10-0-0060		GA-SB11-0-0005		GA-SB11-0-0020		GA-SB11-0-0040		GA-SB11-0-0060		RP-SB16-0-0050		RP-SB16-0-0150		RP-SB16-0-0200		RP-SB17-0-0100		RP-SB17-0-0150	
	Station ID:	GA-SB10		GA-SB10		GA-SB11		GA-SB11		GA-SB11		GA-SB11		RP-SB16		RP-SB16		RP-SB16		RP-SB17		RP-SB17	
	Date Sampled:	12/13/96		12/13/96		12/13/96		12/13/96		12/13/96		12/13/96		10/10/96		10/10/96		10/10/96		10/9/96		10/9/96	
	Depth, feet bgs:	4		6		.5		2		4		6		5		15		20		10		15	
Pesticides	**Units**																						
4,4'-DDD	mg/Kg	1.2	U	2.4	U	11	U	.13	U	.13	U	.13	U	21	U	1.9	U	410	U	190	U	200	U
4,4'-DDE	mg/Kg	3.7		7.5		11	U	.13	U	.13	U	.13	U	21	U	1.9	U	410	U	190	U	200	U
4,4'-DDT	mg/Kg	12		26		96		.47		.49		.13	U	360		24		13000		5100		2100	
Aldrin	mg/Kg	.61	U	1.3	U	5.5	U	.065	U	.067	U	.068	U	11	U	.98	U	210	U	99	U	110	U
Alpha-BHC	mg/Kg	.61	U	1.3	U	5.5	U	.065	U	.067	U	.068	U	11	U	.98	U	210	U	99	U	110	U
Beta-BHC	mg/Kg	.61	U	1.3	U	5.5	U	.065	U	.067	U	.068	U	11	U	.98	U	210	U	99	U	110	U
Chlordane (Total)	mg/Kg	1.2	U	2.4	U	11	U	.13	U	.13	U	.13	U	21	U	1.9	U	410	U	190	U	200	U
Delta-BHC	mg/Kg	.61	U	1.3	U	5.5	U	.065	U	.067	U	.068	U	11	U	.98	U	210	U	99	U	110	U
Dieldrin	mg/Kg	1.2	U	2.4	U	11	U	.13	U	.13	U	.13	U	21	U	1.9	U	410	U	190	U	200	U
Endosulfan I	mg/Kg	.61	U	1.3	U	5.5	U	.065	U	.067	U	.068	U	11	U	.98	U	210	U	99	U	110	U
Endosulfan II	mg/Kg	1.2	U	2.4	U	11	U	.13	U	.13	U	.13	U	21	U	1.9	U	410	U	190	U	200	U
Endosulfan Sulfate	mg/Kg	1.2	U	2.4	U	11	U	.13	U	.13	U	.13	U	21	U	1.9	U	410	U	190	U	200	U
Endrin	mg/Kg	1.2	U	2.4	U	11	U	.13	U	.13	U	.13	U	21	U	1.9	U	410	U	190	U	200	U
Endrin Aldehyde	mg/Kg	1.2	U	2.4	U	11	U	.13	U	.13	U	.13	U	21	U	1.9	U	410	U	190	U	200	U
Gamma-BHC	mg/Kg	.61	U	1.3	U	5.5	U	.065	U	.067	U	.068	U	11	U	.98	U	210	U	99	U	110	U
Heptachlor	mg/Kg	.61	U	1.3	U	5.5	U	.065	U	.067	U	.068	U	11	U	.98	U	210	U	99	U	110	U
Heptachlor Epoxide	mg/Kg	.61	U	1.3	U	5.5	U	.065	U	.067	U	.068	U	11	U	.98	U	210	U	99	U	110	U
Methoxychlor	mg/Kg	6.1	U	13	U	55	U	.65	U	.67	U	.68	U	110	U	9.8	U	2100	U	990	U	1100	U
Toxaphene	mg/Kg	61	U	130	U	550	U	6.5	U	6.7	U	6.8	U	1100	U	98	U	21000	U	9900	U	11000	U
Total Organic Carbon																							
Total Organic Carbon	mg/Kg																						
Petroleum Hydrocarbons																							
Diesel - by 8015	mg/Kg																						
Volatile Organic																							
1,1,1,2-Tetrachloroethane	mg/Kg																						
1,1,1-Trichloroethane	mg/Kg																						
1,1,2,2-Tetrachloroethane	mg/Kg															.014	U					.031	U
1,1,2-Trichloroethane	mg/Kg															.014	U					.031	U
1,1-Dichloroethane	mg/Kg															.014	U					.031	U
1,1-Dichloroethene	mg/Kg															.014	U					.031	U
1,1-Dichloropropene	mg/Kg															.014	U					.031	U
1,2,3-Trichlorobenzene	mg/Kg																						
1,2,3-Trichloropropane	mg/Kg																						
1,2,4-Trichlorobenzene	mg/Kg																						
1,2,4-Trimethylbenzene	mg/Kg																						
1,2-Dibromo-3-	mg/Kg																						
1,2-Dibromoethane	mg/Kg																						
1,2-Dichlorobenzene	mg/Kg																						
1,2-Dichloroethane	mg/Kg																						
1,2-Dichloroethene	mg/Kg															.014	U					.031	U
1,2-Dichloropropane	mg/Kg															.014	U					.031	U
1,3,5-Trimethylbenzene	mg/Kg															.014	U					.031	U
1,3-Dichlorobenzene	mg/Kg																						
1,3-Dichloropropane	mg/Kg																						
1,4-Dichlorobenzene	mg/Kg																						
2,2-Dichloropropane	mg/Kg																						
2-Butanone (Mek)	mg/Kg																						
2-Chloroethyl Vinyl Ether	mg/Kg															.029	U					.062	U
2-Chlorotoluene	mg/Kg																						
2-Hexanone	mg/Kg															.029	U					.062	U
4-Chlorotoluene	mg/Kg																						
4-Methyl-2-Pentanone	mg/Kg															.029	U					.062	U
Acetone	mg/Kg															.03	UJ					.062	UJ
Benzene	mg/Kg															.014	U					.031	U

Elf Atochem Soil Sampling Results

	Sample ID:	GA-SB10-0-0040		GA-SB10-0-0060		GA-SB11-0-0005		GA-SB11-0-0020		GA-SB11-0-0040		GA-SB11-0-0060		RP-SB16-0-0050		RP-SB16-0-0150		RP-SB16-0-0200		RP-SB17-0-0100		RP-SB17-0-0150	
	Station ID:	GA-SB10		GA-SB10		GA-SB11		GA-SB11		GA-SB11		GA-SB11		RF-SB16		RP-SB16		RP-SB16		RP-SB17		RP-SB17	
	Date Sampled:	12/13/96		12/13/96		12/13/96		12/13/96		12/13/96		12/13/96		10/10/96		10/10/96		10/10/96		10/9/96		10/9/96	
	Depth, feet bgs:	4		6		5		2		4		6		5		15		20		10		15	
Volatile Organic Compounds, con't																							
Bromobenzene	mg/Kg																						
Bromochloromethane	mg/Kg																						
Bromodichloromethane	mg/Kg															.014	U					.031	U
Bromoform	mg/Kg															.014	U					.031	U
Bromomethane	mg/Kg															.029	U					.062	U
Carbon Disulfide	mg/Kg															.014	U					.031	U
Carbon Tetrachloride	mg/Kg															.014	U					.031	U
Chlorobenzene	mg/Kg															.49						.64	
Chloroethane	mg/Kg															.029	U					.062	U
Chloroform	mg/Kg															.014	U					.12	
Chloromethane	mg/Kg															.029	U					.062	U
Cis-1,2-Dichloroethene	mg/Kg															.014	U					.031	U
Cis-1,3-Dichloropropene	mg/Kg															.014	U					.031	U
Dibromochloromethane	mg/Kg																						
Dibromomethane	mg/Kg															.014	U					.031	UJ
Dichlorodifluoromethane	mg/Kg															.014	UJ					.031	UJ
Ethylbenzene	mg/Kg																						
Hexachlorobutadiene	mg/Kg															.014	U					.031	U
Iodomethane	mg/Kg																						
Isopropylbenzene	mg/Kg																						
Methyl Tert-Butyl Ether	mg/Kg																						
Methylene Chloride	mg/Kg																						
N-Butylbenzene	mg/Kg															.014	UJ					.031	UJ
N-Propylbenzene	mg/Kg																						
Naphthalene	mg/Kg																						
O-Xylene	mg/Kg																						
P-Isopropyltoluene	mg/Kg																						
Sec-Butylbenzene	mg/Kg																						
Styrene	mg/Kg															.014	U					.031	U
Tert-Butylbenzene	mg/Kg																						
Tetrachloroethene	mg/Kg															.014	U					.067	
Toluene	mg/Kg															.014	U					.031	U
Trans-1,2-Dichlorotethene	mg/Kg																						
Trans-1,3-Dichloropropene	mg/Kg															.014	U					.031	U
Trichloroethene	mg/Kg															.014	U					.031	U
Trichlorofluoromethane	mg/Kg															.029	U					.062	U
Vinyl Acetate	mg/Kg															.014	U					.031	U
Vinyl Chloride	mg/Kg																						
Xylenes, Total	mg/Kg																						

Qualifier Explanation:

U - Indicates the compound was anal

J - Indicates an estimated value. A J

D - Indicates that the associated resul

B - The compound was detected in th

Elf Atochem Soil Sampling Results

	Sample ID:	RP-SB17-0-0200		RP-SB18-0-0100		RP-SB18-0-0200		RP-SB18-0-0250		RP-SB19-0-0150		RP-SB19-0-0250		RP-SB20-0-0150		RP-SB20-0-0200		RP-SB21-0-0050		RP-SB21-0-0185		RP-SB22-0-0050	
	Station ID:	RP-SB17		RP-SB18		RP-SB18		RP-SB18		RP-SB19		RP-SB19		RP-SB20		RP-SB20		RP-SB21		RP-SB21		RP-SB22	
	Date Sampled:	10/9/96		10/9/96		10/9/96		10/9/96		10/10/96		10/10/96		10/10/96		10/10/96		10/10/96		10/10/96		10/11/96	
	Depth, feet bgs:	20		10		20		25		15		25		15		20		5		18.5		5	
Pesticides	**Units**																						
4,4'-DDD	mg/Kg	390	U	690	D	.36	U	.63		.37	U	.044	U	.74	U	.36	U	390	U	800	U	.25	U
4,4'-DDE	mg/Kg	390	U	83		.36	U	.27		.37	U	.044	U	.74	U	.36	U	390	U	800	U	.25	U
4,4'-DDT	mg/Kg	11000		21000	D	5.8		140	D	1.8		.37		3.9		2.5		9200		20000		1.4	
Aldrin	mg/Kg	200	U	2.7	U	.19	U	.019	U	.19	U	.023	U	.38	U	.19	U	200	U	410	U	.13	U
Alpha-BHC	mg/Kg	200	U	2.7	U	.19	U	.019	U	.19	U	.023	U	.38	U	.19	U	200	U	410	U	.13	U
Beta-BHC	mg/Kg	200	U	2.7	U	.19	U	.019	U	.19	U	.023	U	.38	U	.19	U	200	U	410	U	.13	U
Chlordane (Total)	mg/Kg	390	U	5.1	U	.36	U	.037	U	.37	U	.044	U	.74	U	.36	U	390	U	800	U	.25	U
Delta-BHC	mg/Kg	200	U	2.7	U	.19	U	.019	U	.19	U	.023	U	.38	U	.19	U	200	U	410	U	.13	U
Dieldrin	mg/Kg	390	U	5.1	U	.36	U	.037	U	.37	U	.044	U	.74	U	.36	U	390	U	800	U	.25	U
Endosulfan I	mg/Kg	200	U	2.7	U	.19	U	.019	U	.19	U	.023	U	.38	U	.19	U	200	U	410	U	.13	U
Endosulfan II	mg/Kg	390	U	5.1	U	.36	U	.037	U	.37	U	.044	U	.74	U	.36	U	390	U	800	U	.25	U
Endosulfan Sulfate	mg/Kg	390	U	5.1	U	.36	U	.037	U	.37	U	.044	U	.74	U	.36	U	390	U	800	U	.25	U
Endrin	mg/Kg	390	U	5.1	U	.36	U	.037	U	.37	U	.044	U	.74	U	.36	U	390	U	800	U	.25	U
Endrin Aldehyde	mg/Kg	390	U	5.1	U	.36	U	.037	U	.37	U	.044	U	.74	U	.36	U	390	U	800	U	.25	U
Gamma-BHC	mg/Kg	200	U	2.7	U	.19	U	.019	U	.19	U	.023	U	.38	U	.19	U	200	U	410	U	.13	U
Heptachlor	mg/Kg	200	U	2.7	U	.19	U	.019	U	.19	U	.023	U	.38	U	.19	U	200	U	410	U	.13	U
Heptachlor Epoxide	mg/Kg	200	U	2.7	U	.19	U	.019	U	.19	U	.023	U	.38	U	.19	U	200	U	410	U	.13	U
Methoxychlor	mg/Kg	2000	U	27	U	1.9	U	.19	U	1.9	U	.23	U	3.8	U	1.9	U	2000	U	4100	U	1.3	U
Toxaphene	mg/Kg	20000	U	270	U	19	U	1.9	U	19	U	2.3	U	38	U	19	U	20000	U	41000	U	13	U
Total Organic Carbon																							
Total Organic Carbon	mg/Kg																						
Petroleum Hydrocarbons																							
Diesel - by 8015	mg/Kg																						
Volatile Organic																							
1,1,1,2-Tetrachloroethane	mg/Kg																						
1,1,1-Trichloroethane	mg/Kg	.03	U	2000	U	.69	U	1.4	U			.007	UJ			.005	U			.03	UJ		
1,1,2,2-Tetrachloroethane	mg/Kg	.03	U	2000	U	.69	U	1.4	U			.007	UJ			.005	U			.03	UJ		
1,1,2-Trichloroethane	mg/Kg	.03	U	2000	U	.69	U	1.4	U			.007	UJ			.005	U			.03	UJ		
1,1-Dichloroethane	mg/Kg	.03	U	2000	U	.69	U	1.4	U			.007	UJ			.005	U			.03	UJ		
1,1-Dichloroethene	mg/Kg	.03	U	2000	U	.69	U	1.4	U			.007	UJ			.005	U			.03	UJ		
1,1-Dichloropropene	mg/Kg											.007	UJ			.005	U			.03	UJ		
1,2,3-Trichlorobenzene	mg/Kg																						
1,2,3-Trichloropropane	mg/Kg																						
1,2,4-Trichlorobenzene	mg/Kg																						
1,2,4-Trimethylbenzene	mg/Kg																						
1,2-Dibromo-3-	mg/Kg																						
1,2-Dibromoethane	mg/Kg																						
1,2-Dichlorobenzene	mg/Kg																						
1,2-Dichloroethane	mg/Kg	.03	U	2000	U	.69	U	1.4	U			.007	UJ			.005	U			.03	UJ		
1,2-Dichloroethene	mg/Kg	.03	U	2000	U	.69	U	1.4	U			.007	UJ			.005	U			.03	UJ		
1,2-Dichloropropane	mg/Kg	.03	U	2000	U	.69	U	1.4	U			.007	UJ			.005	U			.03	UJ		
1,3,5-Trimethylbenzene	mg/Kg																						
1,3-Dichlorobenzene	mg/Kg																						
1,3-Dichloropropane	mg/Kg																						
1,4-Dichlorobenzene	mg/Kg																						
2,2-Dichloropropane	mg/Kg																						
2-Butanone (Mek)	mg/Kg	.06	U	3900	U	1.4	U	2.8	U			.013	UJ			.011	U			.06	UJ		
2-Chloroethyl Vinyl Ether	mg/Kg																						
2-Chlorotoluene	mg/Kg																						
2-Hexanone	mg/Kg	.06	U	3900	U	1.4	U	2.8	U			.013	UJ			.011	U			.06	UJ		
4-Chlorotoluene	mg/Kg																						
4-Methyl-2-Pentanone	mg/Kg	.06	U	3900	U	1.4	U	2.8	U			.013	UJ			.011	U			.06	UJ		
Acetone	mg/Kg	.024	UJ	5200	UJ	1.4	UJ	2.9	UJ			.04	J			.011	UJ			.06	UJ		
Benzene	mg/Kg	.03	U	2000	U	.69	U	1.4	U			.007	UJ			.005	U			.03	UJ		

Elf Atochem Soil Sampling Results

	Sample ID:	RP-SB17-0-0200		RP-SB18-0-0100		RP-SB18-0-0200		RP-SB18-0-0250		RP-SB19-0-0150	RP-SB19-0-0250		RP-SB20-0-0150	RP-SB20-0-0200		RP-SB21-0-0050	RP-SB21-0-0185		RP-SB22-0-0050
	Station ID:	RP-SB17		RP-SB18		RP-SB18		RP-SB18		RP-SB19	RP-SB19		RP-SB20	RP-SB20		RP-SB21	RP-SB21		RP-SB22
	Date Sampled:	10/9/96		10/9/96		10/9/96		10/9/96		10/10/96	10/10/96		10/10/96	10/10/96		10/10/96	10/10/96		10/11/96
	Depth, feet bgs:	20		10		20		25		15	25		15	20		5	18.5		5
Volatile Organic Compounds, con't																			
Bromobenzene	mg/Kg																		
Bromochloromethane	mg/Kg																		
Bromodichloromethane	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Bromoform	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Bromomethane	mg/Kg	.06	U	3900	U	1.4	U	2.8	U		.013	UJ		.011	U		.06	UJ	
Carbon Disulfide	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Carbon Tetrachloride	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Chlorobenzene	mg/Kg	3.1	U	43000		6.5		42			.081	J		.078			7.2	DJ	
Chloroethane	mg/Kg	.06	U	3900	U	1.4	U	2.8	U		.013	UJ		.011	U		.06	UJ	
Chloroform	mg/Kg	.35		2000	U	.69	U	1.4	U		.007	UJ		.005	U		.29	J	
Chloromethane	mg/Kg	.06	U	3900	U	1.4	U	2.8	U		.013	UJ		.011	U		.06	UJ	
Cis-1,2-Dichloroethene	mg/Kg																		
Cis-1,3-Dichloropropene	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Dibromochloromethane	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Dibromomethane	mg/Kg																		
Dichlorodifluoromethane	mg/Kg																		
Ethylbenzene	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Hexachlorobutadiene	mg/Kg																		
Iodomethane	mg/Kg																		
Isopropylbenzene	mg/Kg																		
Methyl Tert-Butyl Ether	mg/Kg																		
Methylene Chloride	mg/Kg	.03	UJ	2000	UJ	.69	UJ	1.4	UJ		.007	UJ		.005	UJ		.03	UJ	
N-Butylbenzene	mg/Kg																		
N-Propylbenzene	mg/Kg																		
Naphthalene	mg/Kg																		
O-Xylene	mg/Kg																		
P-Isopropyltoluene	mg/Kg																		
Sec-Butylbenzene	mg/Kg																		
Styrene	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Tert-Butylbenzene	mg/Kg																		
Tetrachloroethene	mg/Kg	.31		2000	U	.69	U	1.4	U		.007	UJ		.005	U		.27	UJ	
Toluene	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Trans-1,2-Dichlorotethene	mg/Kg																		
Trans-1,3-Dichloropropene	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Trichloroethene	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	
Trichlorofluoromethane	mg/Kg																		
Vinyl Acetate	mg/Kg																		
Vinyl Chloride	mg/Kg	.06	U	3900	U	1.4	U	2.8	U		.013	UJ		.011	U		.06	UJ	
Xylenes, Total	mg/Kg	.03	U	2000	U	.69	U	1.4	U		.007	UJ		.005	U		.03	UJ	

Qualifier Explanation:

U - Indicates the compound was anal

J - Indicates an estimated value. A J

D - Indicates that the associated resul

B - The compound was detected in th

Elf Atochem Soil Sampling Results

	Sample ID:	RP-SB23-0-0050		RP-SB25-0-0020		RP-SB26-0-0100		RP-SB27-0-0020		RP-SB27-0-0200		RP-SB28-0-0100		RP-SB28-0-0200		RP-SB29-0-0050		RP-SB30-0-0050		RP-SB31-0-0050		RP-SB31-0-0140	
	Station ID:	RP-SB23		RP-SB25		RP-SB26		RP-SB27		RP-SB27		RP-SB28		RP-SB28		RP-SB29		RP-SB30		RP-SB31		RP-SB31	
	Date Sampled:	10/11/96		12/12/96		12/12/96		12/12/96		12/12/96		12/12/96		12/12/96		12/12/96		12/12/96		12/12/96		12/12/96	
	Depth, feet bgs:	5		2		10		2		20		10		20		5		5		5		14	
Pesticides	**Units**																						
4,4'-DDD	mg/Kg	.18	U	55	U	1.1	U	1.1	U	1.4	U	.11	U	.7	U	.1	U	.71	U	570	U	110	U
4,4'-DDE	mg/Kg	.18	U	55	U	1.1	U	1.1	U	1.4	U	.15		.7	U	.1	U	.71	U	570	U	110	U
4,4'-DDT	mg/Kg	1.5		1300	B	9		11		7.9		1.3		9.1		.54	U	8.7	B	19000	B	750	
Aldrin	mg/Kg	.093	U	28	U	.55	U	.54	U	.73	U	.057	U	.36	U	.054	U	.36	U	290	U	56	U
Alpha-BHC	mg/Kg	.093	U	28	U	.55	U	.54	U	.73	U	.057	U	.36	U	.054	U	.36	U	290	U	56	U
Beta-BHC	mg/Kg	.093	U	28	U	.55	U	.54	U	.73	U	.057	U	.36	U	.054	U	.36	U	290	U	56	U
Chlordane (Total)	mg/Kg	.18	U	55	U	1.1	U	1.1	U	1.4	U	.11	U	.7	U	.1	U	.71	U	570	U	110	U
Delta-BHC	mg/Kg	.093	U	28	U	.55	U	.54	U	.73	U	.057	U	.36	U	.054	U	.36	U	290	U	56	U
Dieldrin	mg/Kg	.18	U	55	U	1.1	U	1.1	U	1.4	U	.11	U	.7	U	.1	U	.71	U	570	U	110	U
Endosulfan I	mg/Kg	.093	U	28	U	.55	U	.54	U	.73	U	.057	U	.36	U	.054	U	.36	U	290	U	56	U
Endosulfan II	mg/Kg	.18	U	55	U	1.1	U	1.1	U	1.4	U	.11	U	.7	U	.1	U	.71	U	570	U	110	U
Endosulfan Sulfate	mg/Kg	.18	U	55	U	1.1	U	1.1	U	1.4	U	.11	U	.7	U	.1	U	.71	U	570	U	110	U
Endrin	mg/Kg	.18	U	55	U	1.1	U	1.1	U	1.4	U	.11	U	.7	U	.1	U	.71	U	570	U	110	U
Endrin Aldehyde	mg/Kg	.18	U	55	U	1.1	U	1.1	U	1.4	U	.11	U	.7	U	.1	U	.71	U	570	U	110	U
Gamma-BHC	mg/Kg	.093	U	28	U	.55	U	.54	U	.73	U	.057	U	.36	U	.054	U	.36	U	290	U	56	U
Heptachlor	mg/Kg	.093	U	28	U	.55	U	.54	U	.73	U	.057	U	.36	U	.054	U	.36	U	290	U	56	U
Heptachlor Epoxide	mg/Kg	.093	U	28	U	.55	U	.54	U	.73	U	.057	U	.36	U	.054	U	.36	U	290	U	56	U
Methoxychlor	mg/Kg	.93	U	280	U	5.5	U	5.4	U	7.3	U	.57	U	3.6	U	.54	U	3.6	U	2900	U	560	U
Toxaphene	mg/Kg	9.3	U	2800	U	55	U	54	U	73	U	5.7	U	36	U	5.4	U	36	U	29000	U	5600	U
Total Organic Carbon																							
Total Organic Carbon	mg/Kg																						
Petroleum Hydrocarbons																							
Diesel - by 8015	mg/Kg																						
Volatile Organic																							
1,1,1,2-Tetrachloroethane	mg/Kg																						
1,1,1-Trichloroethane	mg/Kg																						
1,1,2,2-Tetrachloroethane	mg/Kg																						
1,1,2-Trichloroethane	mg/Kg																						
1,1-Dichloroethane	mg/Kg																						
1,1-Dichloroethene	mg/Kg																						
1,1-Dichloropropene	mg/Kg																						
1,2,3-Trichlorobenzene	mg/Kg																						
1,2,3-Trichloropropane	mg/Kg																						
1,2,4-Trichlorobenzene	mg/Kg																						
1,2,4-Trimethylbenzene	mg/Kg																						
1,2-Dibromo-3-	mg/Kg																						
1,2-Dibromoethane	mg/Kg																						
1,2-Dichlorobenzene	mg/Kg																						
1,2-Dichloroethane	mg/Kg																						
1,2-Dichloroethene	mg/Kg																						
1,2-Dichloropropane	mg/Kg																						
1,3,5-Trimethylbenzene	mg/Kg																						
1,3-Dichlorobenzene	mg/Kg																						
1,3-Dichloropropane	mg/Kg																						
1,4-Dichlorobenzene	mg/Kg																						
2,2-Dichloropropane	mg/Kg																						
2-Butanone (Mek)	mg/Kg																						
2-Chloroethyl Vinyl Ether	mg/Kg																						
2-Chlorotoluene	mg/Kg																						
2-Hexanone	mg/Kg																						
4-Chlorotoluene	mg/Kg																						
4-Methyl-2-Pentanone	mg/Kg																						
Acetone	mg/Kg																						
Benzene	mg/Kg																						

Elf Atochem Soil Sampling Results

	Sample ID:	RP-SB23-0-0050	RP-SB25-0-0020	RP-SB26-0-0100	RP-SB27-0-0020	RP-SB27-0-0200	RP-SB28-0-0100	RP-SB28-0-0200	RP-SB29-0-0050	RP-SB30-0-0050	RP-SB31-0-0050	RP-SB31-0-0140
	Station ID:	RP-SB23	RP-SB25	RP-SB26	RP-SB27	RP-SB27	RP-SB28	RP-SB28	RP-SB29	RP-SB30	RP-SB31	RP-SB31
	Date Sampled:	10/11/96	12/12/96	12/12/96	12/12/96	12/12/96	12/12/96	12/12/96	12/12/96	12/12/96	12/12/96	12/12/96
	Depth, feet bgs:	5	2	10	2	20	10	20	5	5	5	14
Volatile Organic Compounds, con't												
Bromobenzene	mg/Kg											
Bromochloromethane	mg/Kg											
Bromodichloromethane	mg/Kg											
Bromoform	mg/Kg											
Bromomethane	mg/Kg											
Carbon Disulfide	mg/Kg											
Carbon Tetrachloride	mg/Kg											
Chlorobenzene	mg/Kg											
Chloroethane	mg/Kg											
Chloroform	mg/Kg											
Chloromethane	mg/Kg											
Cis-1,2-Dichloroethene	mg/Kg											
Cis-1,3-Dichloropropene	mg/Kg											
Dibromochloromethane	mg/Kg											
Dibromomethane	mg/Kg											
Dichlorodifluoromethane	mg/Kg											
Ethylbenzene	mg/Kg											
Hexachlorobutadiene	mg/Kg											
Iodomethane	mg/Kg											
Isopropylbenzene	mg/Kg											
Methyl Tert-Butyl Ether	mg/Kg											
Methylene Chloride	mg/Kg											
N-Butylbenzene	mg/Kg											
N-Propylbenzene	mg/Kg											
Naphthalene	mg/Kg											
O-Xylene	mg/Kg											
P-Isopropyltoluene	mg/Kg											
Sec-Butylbenzene	mg/Kg											
Styrene	mg/Kg											
Tert-Butylbenzene	mg/Kg											
Tetrachloroethene	mg/Kg											
Toluene	mg/Kg											
Trans-1,2-Dichlorotethene	mg/Kg											
Trans-1,3-Dichloropropene	mg/Kg											
Trichloroethene	mg/Kg											
Trichlorofluoromethane	mg/Kg											
Vinyl Acetate	mg/Kg											
Vinyl Chloride	mg/Kg											
Xylenes, Total	mg/Kg											

Qualifier Explanation:

U - Indicates the compound was anal

J - Indicates an estimated value. A J

D - Indicates that the associated resul

B - The compound was detected in th

Elf Atochem Soil Sampling Results

	Sample ID:	RP-SB32-0-0180		RP-SB33-0-0020		RP-SB33-0-0200		RP-SB34-0-0100		RP-SB37-0-0100		RP-SB37-0-0200	
	Station ID:	RP-SB32		RP-SB33		RP-SB33		RP-SB34		RP-SB37		RP-SB37	
	Date Sampled:	12/12/96		12/13/96		12/13/96		12/13/96		12/13/96		12/13/96	
	Depth, feet bgs:	18		2		20		10		10		20	
Pesticides	**Units**												
4,4'-DDD	mg/Kg	.12	U	1200	U	.14	U	5.3	U	.11	U	.3	
4,4'-DDE	mg/Kg	.12	U	1200	U	.14	U	5.3	U	.11	U	.14	
4,4'-DDT	mg/Kg	1.1	U	31000	B	3.1	U	62		1.7	U	2.8	U
Aldrin	mg/Kg	.061	U	590	U	.071	U	2.7	U	.057	U	.07	U
Alpha-BHC	mg/Kg	.061	U	590	U	.071	U	2.7	U	.057	U	.07	U
Beta-BHC	mg/Kg	.061	U	590	U	.071	U	2.7	U	.057	U	.07	U
Chlordane (Total)	mg/Kg	.12	U	1200	U	.14	U	5.3	U	.11	U	.14	U
Delta-BHC	mg/Kg	.061	U	590	U	.071	U	2.7	U	.057	U	.07	U
Dieldrin	mg/Kg	.12	U	1200	U	.14	U	5.3	U	.11	U	.14	U
Endosulfan I	mg/Kg	.061	U	590	U	.071	U	2.7	U	.057	U	.07	U
Endosulfan II	mg/Kg	.12	U	1200	U	.14	U	5.3	U	.11	U	.14	U
Endosulfan Sulfate	mg/Kg	.12	U	1200	U	.14	U	5.3	U	.11	U	.14	U
Endrin	mg/Kg	.12	U	1200	U	.14	U	5.3	U	.11	U	.14	U
Endrin Aldehyde	mg/Kg	.12	U	1200	U	.14	U	5.3	U	.11	U	.14	U
Gamma-BHC	mg/Kg	.061	U	590	U	.071	U	2.7	U	.057	U	.07	U
Heptachlor	mg/Kg	.061	U	590	U	.071	U	2.7	U	.057	U	.07	U
Heptachlor Epoxide	mg/Kg	.061	U	590	U	.071	U	2.7	U	.057	U	.07	U
Methoxychlor	mg/Kg	.61	U	5900	U	.71	U	27	U	.57	U	.7	U
Toxaphene	mg/Kg	6.1	U	59000	U	7.1	U	270	U	5.7	U	7	U
Total Organic Carbon													
Total Organic Carbon	mg/Kg												
Petroleum Hydrocarbons													
Diesel - by 8015	mg/Kg												
Volatile Organic													
1,1,1,2-Tetrachloroethane	mg/Kg												
1,1,1-Trichloroethane	mg/Kg												
1,1,2,2-Tetrachloroethane	mg/Kg												
1,1,2-Trichloroethane	mg/Kg												
1,1-Dichloroethane	mg/Kg												
1,1-Dichloroethene	mg/Kg												
1,1-Dichloropropene	mg/Kg												
1,2,3-Trichlorobenzene	mg/Kg												
1,2,3-Trichloropropane	mg/Kg												
1,2,4-Trichlorobenzene	mg/Kg												
1,2,4-Trimethylbenzene	mg/Kg												
1,2-Dibromo-3-	mg/Kg												
1,2-Dibromoethane	mg/Kg												
1,2-Dichlorobenzene	mg/Kg												
1,2-Dichloroethane	mg/Kg												
1,2-Dichloroethene	mg/Kg												
1,2-Dichloropropane	mg/Kg												
1,3,5-Trimethylbenzene	mg/Kg												
1,3-Dichlorobenzene	mg/Kg												
1,3-Dichloropropane	mg/Kg												
1,4-Dichlorobenzene	mg/Kg												
2,2-Dichloropropane	mg/Kg												
2-Butanone (Mek)	mg/Kg												
2-Chloroethyl Vinyl Ether	mg/Kg												
2-Chlorotoluene	mg/Kg												
2-Hexanone	mg/Kg												
4-Chlorotoluene	mg/Kg												
4-Methyl-2-Pentanone	mg/Kg												
Acetone	mg/Kg												
Benzene	mg/Kg												

Elf Atochem Soil Sampling Results

	Sample ID:	RP-SB32-0-0180	RP-SB33-0-0020	RP-SB33-0-0200	RP-SB34-0-0100	RP-SB37-0-0100	RP-SB37-0-0200
	Station ID:	RP-SB32	RP-SB33	RP-SB33	RP-SB34	RP-SB37	RP-SB37
	Date Sampled:	12/12/96	12/13/96	12/13/96	12/13/96	12/13/96	12/13/96
	Depth, feet bgs:	18	2	20	10	10	20
Volatile Organic Compounds, con't							
Bromobenzene	mg/Kg						
Bromochloromethane	mg/Kg						
Bromodichloromethane	mg/Kg						
Bromoform	mg/Kg						
Bromomethane	mg/Kg						
Carbon Disulfide	mg/Kg						
Carbon Tetrachloride	mg/Kg						
Chlorobenzene	mg/Kg						
Chloroethane	mg/Kg						
Chloroform	mg/Kg						
Chloromethane	mg/Kg						
Cis-1,2-Dichloroethene	mg/Kg						
Cis-1,3-Dichloropropene	mg/Kg						
Dibromochloromethane	mg/Kg						
Dibromomethane	mg/Kg						
Dichlorodifluoromethane	mg/Kg						
Ethylbenzene	mg/Kg						
Hexachlorobutadiene	mg/Kg						
Iodomethane	mg/Kg						
Isopropylbenzene	mg/Kg						
Methyl Tert-Butyl Ether	mg/Kg						
Methylene Chloride	mg/Kg						
N-Butylbenzene	mg/Kg						
N-Propylbenzene	mg/Kg						
Naphthalene	mg/Kg						
O-Xylene	mg/Kg						
P-Isopropyltoluene	mg/Kg						
Sec-Butylbenzene	mg/Kg						
Styrene	mg/Kg						
Tert-Butylbenzene	mg/Kg						
Tetrachloroethene	mg/Kg						
Toluene	mg/Kg						
Trans-1,2-Dichlorotethene	mg/Kg						
Trans-1,3-Dichloropropene	mg/Kg						
Trichloroethene	mg/Kg						
Trichlorofluoromethane	mg/Kg						
Vinyl Acetate	mg/Kg						
Vinyl Chloride	mg/Kg						
Xylenes, Total	mg/Kg						

Qualifier Explanation:

U - Indicates the compound was anal

J - Indicates an estimated value. A J

D Indicates that the associated resul

B - The compound was detected in th

Elf Atochem Groundwater Results

	Sample ID:	GA-GW5		GA-GW6		GA-GW7		GA-GW8		GA-GW9		GA-GW10		GA-GW11		GA-GW12-1-1196		GA-GW13-1-1196		GA-GW14-1-1196		GA-GW15-1-1196		GA-GW15-4	
	Station ID:	GA-GW05		GA-GW06		GA-GW07		GA-GW08		GA-GW09		GA-GW10		GA-GW11		GA-GW12		GA-GW13		GA-GW14		GA-GW15		NA	
	Date	10/7/96		10/8/96		10/8/96		10/8/96		10/9/96		10/9/96		10/9/96		11/21/96		11/21/96		11/21/96		11/22/96		11/22/96	
Pesticides	**Units**																								
Heptachlor Epoxide	mg/L																								
Endosulfan Sulfate	mg/L																								
Aldrin	mg/L																								
Alpha-BHC	mg/L																								
Beta-BHC	mg/L																								
Delta-BHC	mg/L																								
Endosulfan II	mg/L																								
4,4'-DDT	mg/L																								
Chlordane (Total)	mg/L																								
Gamma-BHC	mg/L																								
Dieldrin	mg/L																								
Endrin	mg/L																								
Methoxychlor	mg/L																								
4,4'-DDD	mg/L																								
4,4'-DDE	mg/L																								
Endrin Aldehyde	mg/L																								
Heptachlor	mg/L																								
Toxaphene	mg/L																								
Endosulfan I	mg/L																								
Petroleum Hydrocarbons																									
Diesel - by 8015	mg/L																								
Volatile Organic Compounds																									
Ethylbenzene	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
Styrene	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
Cis-1,3-Dichloropropene	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
Trans-1,3-Dichloropropene	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
N-Propylbenzene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
N-Butylbenzene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
4-Chlorotoluene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
1,4-Dichlorobenzene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
1,2-Dibromoethane	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
1,2-Dichloroethane	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Vinyl Acetate	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
4-Methyl-2-Pentanone	mg/L	.01	UJ	.01	U	.01	U	.01	U	.01	U	.01	U	.5	U	.01	U	.2	U	1	U	.1	U	.006	U
1,3,5-Trimethylbenzene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Bromobenzene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Toluene	mg/L	.005	UJ	.008		.005	U	.005	U	.005	U	.005	U	.25	U	.093		.02	U	.1	U	.01	U	.0006	U
Chlorobenzene	mg/L	7.6	D	34		.005	U	.96	D	.027		.005	U	6		.047		1.8		32		5.3		.0006	U
2-Chloroethyl Vinyl Ether	mg/L															.01	U	.2	U	1	U	.1	U	.006	U
1,2,4-Trichlorobenzene	mg/L															.0025	U	.05	U	.25	U	.025	U	.0015	U
Dibromochloromethane	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Tetrachloroethene	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.0019		.03		.1	U	.01	U	.0006	U
Xylenes, Total	mg/L	.01	J	.1		.005	U	.006		.007		.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
Sec-Butylbenzene	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
1,3-Dichloropropane	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Cis-1,2-Dichloroethene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Trans-1,2-Dichlorotethene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Methyl Tert-Butyl Ether	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
1,2-Dichloroethene	mg/L															.001	U	.049		.1	U	.01	U	.0006	U
1,3-Dichlorobenzene	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
1,1,1,2-Tetrachloroethane	mg/L																								
1,1,1-Trichloroethane	mg/L	.006	J	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
1,1,2,2-Tetrachloroethane	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
1,1,2-Trichloroethane	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.0054		.02	U	.1	U	.01	U	.0006	U
1,1-Dichloroethane	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
	mg/L									.005	U	.007		.25	U	.033		.02	U	.1	U	.01	U	.0006	U

Elf Atochem Groundwater Results

	Sample ID:	GA-GW5		GA-GW6		GA-GW7		GA-GW8		GA-GW9		GA-GW10		GA-GW11		GA-GW12-1-1196		GA-GW13-1-1196		GA-GW14-1-1196		GA-GW15-1-1196		GA-GW15-4	
	Station ID:	GA-GW05		GA-GW06		GA-GW07		GA-GW08		GA-GW09		GA-GW10		GA-GW11		GA-GW12		GA-GW13		GA-GW14		GA-GW15		NA	
	Date	10/7/96		10/8/96		10/8/96		10/8/96		10/9/96		10/9/96		10/9/96		11/21/96		11/21/96		11/21/96		11/22/96		11/22/96	
Volatile Organic Compounds, con't																									
1,1-Dichloroethene	mg/L	.002	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.016		.02	U	.1	U	.01	U	.0006	U
1,1-Dichloropropene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
1,2,3-Trichlorobenzene	mg/L															.0025	U	.05	U	.25	U	.025	U	.0015	U
1,2,3-Trichloropropane	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
1,2,4-Trimethylbenzene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
1,2-Dibromo-3-Chloropropane	mg/L															.01	U	.2	U	1	U	.1	U	.006	U
1,2-Dichlorobenzene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
1,2-Dichloropropane	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
2,2-Dichloropropane	mg/L															.0025	U	.05	U	.25	U	.025	U	.0015	U
2-Butanone (Mek)	mg/L	.01	UJ	.074		.01	U	.01	U	.01	U	.01	U	.5	U	.01	U	.2	U	1	U	.1	U	.006	U
2-Chlorotoluene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
2-Hexanone	mg/L	.01	UJ	.01	U	.01	U	.01	U	.01	U	.01	U	.5	U	.01	U	.2	U	1	U	.1	U	.006	U
Acetone	mg/L	.46	U	.057	B	.01	U	.074	U	.011	U	.034	U	.5	U	.025	U	.5	U	2.5	U	.25	U	.015	U
Benzene	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
Bromochloromethane	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Bromodichloromethane	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
Bromoform	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.005	U	.1	U	.5	U	.05	U	.003	U
Bromomethane	mg/L	.01	UJ	.01	U	.01	U	.01	U	.01	U	.01	U	.5	U	.01	U	.2	U	1	U	.1	U	.006	U
Carbon Disulfide	mg/L	.005	J	.006		.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
Carbon Tetrachloride	mg/L	.005	UJ	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.01	U	.0006	U
Chloroethane	mg/L	.11	J	.01	U	.01	U	.01	U	.01	U	.01	U	.5	U	.001	U	.02	U	.1	U	.01	U	.0006	U
Chloroform	mg/L	.078	J	.11		.005	U	.013		.005	U	.005	U	.25	U	.001	U	.02	U	.1	U	.014		.0006	U
Chloromethane	mg/L	.01	UJ	.01	U	.01	U	.01	U	.01	U	.01	U	.5	U	.01	U	.2	U	1	U	.1	U	.006	U
Dibromomethane	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Dichlorodifluoromethane	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Hexachlorobutadiene	mg/L															.01	U	.2	U	1	U	.1	U	.006	U
Iodomethane	mg/L															.01	U	.2	U	1	U	.1	U	.006	U
Isopropylbenzene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Methylene Chloride	mg/L	.005	J	.005	U	.005	U	.005	U	.005	U	.005	U	.25	U	.025	UJB	.51	JB	1	U	.1	U	.013	UJB
Naphthalene	mg/L															.01	U	.2	U	1	U	.1	U	.006	U
O-Xylene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
P-Isopropyltoluene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Tert-Butylbenzene	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Trichloroethene	mg/L	.005	UJ	.005	U	.005	U	.005	U	.006		.005	U	.25	U	.0011		.035		.1	U	.01	U	.0006	U
Trichlorofluoromethane	mg/L															.001	U	.02	U	.1	U	.01	U	.0006	U
Vinyl Chloride	mg/L	.01	UJ	.01	U	.01	U	.01	U	.01	U	.01	U	.5	U	.001	U	.02	U	.1	U	.01	U	.0006	U

Qualifier Explanation:

U - Indicates the compound was analyzed for but not detected. The nember adjacent to the U qualifier indicates the reporting limit for that compound. The reporting limit can vary from sample to sample depenc

J - Indicates an estimated value. A J qualifier is used by the lab when the presence of a compound is detected below the reporting limit. J qualifiers applied during data validation indicate failure to meet a meth

D - Indicates that the associated result was derived from a dilution.

B - The compound was detected in the associated method blank as well as in the sample.

Elf Atochem Groundwater Results

	Sample ID:	GA-GW16-1-1196		GA-GW17-1-1196		GA-GW18-1-1196		GA-MW99-2-0397		GA-MWA1-1-0297		GA-MWA1-1-0397		GA-MWA2-1-0297		GA-MWA2-1-0397		GA-MWA3-3		GA-MWA3-4	
	Station ID:	GA-GW16		GA-GW17		GA-GW18		GA-MWA4		GA-MWA1		GA-MWA1		GA-MWA2		GA-MWA2		NA		NA	
	Date	11/22/96		11/22/96		11/22/96		3/12/97		1/2/97		3/12/97		3/12/97		3/12/97		12/11/96		12/11/96	
Pesticides	**Units**																				
Heptachlor Epoxide	mg/L							.00005	UJ	.00025	U	.00005	UJ	.00005	U	.00005	UJ	.00005	U		
Endosulfan Sulfate	mg/L							.0001	UJ	.0005	U	.0001	UJ	.0001	U	.0001	UJ	.0001	U		
Aldrin	mg/L							.00005	UJ	.00025	U	.00005	UJ	.00005	U	.00005	UJ	.00005	U		
Alpha-BHC	mg/L							.00005	UJ	.00025	U	.00005	UJ	.00005	U	.00005	U	.00005	U		
Beta-BHC	mg/L							.00005	UJ	.00025	U	.00005	UJ	.00005	U	.00005	U	.00005	U		
Delta-BHC	mg/L							.00005	UJ	.00025	U	.00005	UJ	.00005	U	.00005	UJ	.00005	U		
Endosulfan II	mg/L							.0001	UJ	.0005	U	.0001	UJ	.0001	U	.0001	UJ	.0001	U		
4,4'-DDT	mg/L							.0001	UJ	.0005	U	.0001	UJ	.00012		.0001	UJ	.0001	U		
Chlordane (Total)	mg/L							.0001	UJ	.0005	U	.0001	UJ	.0001	U	.0001	U	.0001	U		
Gamma-BHC	mg/L							.00005	UJ	.00025	U	.00005	UJ	.00005	U	.00005	UJ	.00005	U		
Dieldrin	mg/L							.0001	UJ	.0005	U	.0001	UJ	.0001	U	.0001	UJ	.0001	U		
Endrin	mg/L							.0001	UJ	.0005	U	.0001	UJ	.0001	U	.0001	UJ	.0001	U		
Methoxychlor	mg/L							.0005	UJ	.0025	U	.0005	UJ	.0005	U	.0005	U	.0005	U		
4,4'-DDD	mg/L							.0061	DJ	.0005	U	.0001	UJ	.0001	U	.0001	UJ	.0001	U		
4,4'-DDE	mg/L							.00015	J	.0005	U	.0001	UJ	.0001	U	.0001	UJ	.0001	U		
Endrin Aldehyde	mg/L							.0001	UJ	.0005	U	.0001	UJ	.0001	U	.0001	UJ	.0001	U		
Heptachlor	mg/L							.00005	UJ	.00025	U	.00005	UJ	.00005	U	.00005	UJ	.00005	U		
Toxaphene	mg/L							.001	UJ	.005	U	.001	UJ	.001	U	.001	U	.001	U		
Endosulfan I	mg/L							.00005	UJ	.00025	U	.00005	UJ	.00005	U	.00005	UJ	.00005	U		
Petroleum Hydrocarbons																					
Diesel - by 8015	mg/L									2.5	U			.5	U						
Volatile Organic Compounds																					
Ethylbenzene	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
Styrene	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
Cis-1,3-Dichloropropene	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
Trans-1,3-Dichloropropene	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
N-Propylbenzene	mg/L	.1	U	.01	U	.04	U														
N-Butylbenzene	mg/L	.1	U	.01	U	.04	U														
4-Chlorotoluene	mg/L	.1	U	.01	U	.04	U														
1,4-Dichlorobenzene	mg/L	.1	U	.01	U	.04	U														
1,2-Dibromoethane	mg/L	.1	U	.01	U	.04	U														
1,2-Dichloroethane	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
Vinyl Acetate	mg/L	1	U	.1	U	.4	U	.05	U	.4	U	1	U	.01	U	.01	U			.01	U
4-Methyl-2-Pentanone	mg/L	1	U	.1	U	.4	U														
1,3,5-Trimethylbenzene	mg/L	.1	U	.01	U	.04	U														
Bromobenzene	mg/L	.1	U	.01	U	.04	U														
Toluene	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
Chlorobenzene	mg/L	19		4.5		6.6		.98		4.3		16		.005	U	.007				.005	U
2-Chloroethyl Vinyl Ether	mg/L	1	U	.1	U	.4	U														
1,2,4-Trichlorobenzene	mg/L	.25	U	.025	U	.1	U														
Dibromochloromethane	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
Tetrachloroethene	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.059	D	.058				.005	U
Xylenes, Total	mg/L	.1	U	.01	U	.055		.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
Sec-Butylbenzene	mg/L	.1	U	.01	U	.04	U														
1,3-Dichloropropane	mg/L	.1	U	.01	U	.04	U														
Cis-1,2-Dichloroethene	mg/L	.1	U	.01	U	.04	U														
Trans-1,2-Dichloroethene	mg/L	.1	U	.01	U	.04	U														
Methyl Tert-Butyl Ether	mg/L																				
1,2-Dichloroethene	mg/L																				
1,3-Dichlorobenzene	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
1,1,1,2-Tetrachloroethane	mg/L	.1	U	.01	U	.04	U														
1,1,1-Trichloroethane	mg/L	.1	U	.01	U	.04	U														
1,1,2,2-Tetrachloroethane	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
1,1,2-Trichloroethane	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U
1,1-Dichloroethane	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U			.005	U

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Elf Atochem Groundwater Results

	Sample ID:	GA-GW16-1-1196		GA-GW17-1-1196		GA-GW18-1-1196		GA-MW99-2-0397		GA-MWA1-1-0297		GA-MWA1-1-0397		GA-MWA2-1-0297		GA-MWA2-1-0397		GA-MWA3-3	GA-MWA3-4	
	Station ID:	GA-GW16		GA-GW17		GA-GW18		GA-MWA4		GA-MWA1		GA-MWA1		GA-MWA2		GA-MWA2		NA	NA	
	Date	11/22/96		11/22/96		11/22/96		3/12/97		1/2/97		3/12/97		1/2/97		3/12/97		12/11/96	12/11/96	
Volatile Organic Compounds, con't																				
1,1-Dichloroethene	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U		.005	U
1,1-Dichloropropene	mg/L	.1	U	.01	U	.04	U													
1,2,3-Trichlorobenzene	mg/L	.25	U	.025	U	.1	U													
1,2,3-Trichloropropane	mg/L	.1	U	.01	U	.04	U													
1,2,4-Trimethylbenzene	mg/L	.1	U	.01	U	.04	U													
1,2-Dibromo-3-Chloropropane	mg/L	1	U	.1	U	.4	U													
1,2-Dichlorobenzene	mg/L	.1	U	.01	U	.04	U													
1,2-Dichloropropane	mg/L	.1	U	.01	U	.04	U													
2,2-Dichloropropane	mg/L	.25	U	.025	U	.1	U	.025	U	.2	U	.5	U	.005	U	.005	U		.005	U
2-Butanone (Mek)	mg/L	1	U	.1	U	.4	U	.05	U	.4	U	1	U	.01	U	.01	U		.01	U
2-Chlorotoluene	mg/L	.1	U	.01	U	.04	U													
2-Hexanone	mg/L	1	U	.1	U	.4	U	.05	U	.4	UR	1	U	.01	UR	.01	U		.01	U
Acetone	mg/L	2.5	U	.25	U	1	U	.05	U	.69		1	U	.01	U	.01	U		.01	U
Benzene	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U		.005	U
Bromochloromethane	mg/L	.1	U	.01	U	.04	U													
Bromodichloromethane	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U		.005	U
Bromoform	mg/L	.5	U	.05	U	.2	U	.025	U	.2	U	.5	U	.005	U	.005	U		.005	U
Bromomethane	mg/L	1	U	.1	U	.4	U	.05	U	.4	U	1	U	.01	U	.01	U		.01	U
Carbon Disulfide	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.005	U	.005	U		.005	U
Carbon Tetrachloride	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.12	D	.04			.005	U
Chloroethane	mg/L	.1	U	.01	U	.04	U	.05	U	.4	U	1	U	.01	U	.01	U		.01	U
Chloroform	mg/L	.84		.012		.04	U	.025	U	.2	U	.5	U	.6	D	.28	E		.005	U
Chloromethane	mg/L	1	U	.1	U	.4	U	.05	U	.4	U	1	U	.01	U	.01	U		.01	U
Dibromomethane	mg/L	.1	U	.01	U	.04	U													
Dichlorodifluoromethane	mg/L	.1	U	.01	U	.04	U													
Hexachlorobutadiene	mg/L	1	U	.1	U	.4	U													
Iodomethane	mg/L	1	U	.1	U	.4	U													
Isopropylbenzene	mg/L	.1	U	.01	U	.04	U													
Methylene Chloride	mg/L	1	U	.1	U	.4	U	.025	U	.2	U	.5	U	.005	U	.005	U		.005	U
Naphthalene	mg/L	1	U	.1	U	.4	U													
O-Xylene	mg/L	.1	U	.01	U	.04	U													
P-Isopropyltoluene	mg/L	.1	U	.01	U	.04	U													
Tert-Butylbenzene	mg/L	.1	U	.01	U	.04	U													
Trichloroethene	mg/L	.1	U	.01	U	.04	U	.025	U	.2	U	.5	U	.006		.005			.005	U
Trichlorofluoromethane	mg/L	.1	U	.01	U	.04	U	.05	U	.4	U	1	U	.01	U	.01	U		.01	U
Vinyl Chloride	mg/L	.1	U	.01	U	.04	U													

Qualifier Explanation:

U - Indicates the compound was analyzeding on dilution factors or percent moisture.

J - Indicates an estimated value. A J quabd quality assurance criteria.

D - Indicates that the associated result wc

B - The compound was detected in the as

Elf Atochem Groundwater Results

	Sample ID:	GA-MWA3-1-0297		GA-MWA3-2-0297		GA-MWA3-1-0397		GA-MWA4-3-0297		GA-MWA4-1-0297		GA-MWA4-3-02975		GA-TB1		GA-MWA4-1-0397		GA-MWA4-3-0397	
	Station ID:	GA-MWA3		GA-MWA3		GA-MWA3		GA-MWA4		GA-MWA4		GA-MWA4		NA		GA-MWA4		GA-MWA4	
	Date	1/2/97		1/2/97		3/12/97		12/11/96		1/2/97		1/2/97		1/2/97		3/12/97		3/12/97	
Pesticides	**Units**																		
Heptachlor Epoxide	mg/L	.00005	U	.00005	U	.00005	UJ	.00005	UJ	.00025	U								
Endosulfan Sulfate	mg/L	.0001	U	.0001	U	.0001	UJ	.0001	UJ	.0005	U					.00005	UJ	.00005	UJ
Aldrin	mg/L	.00005	U	.00005	U	.00005	UJ	.00005	UJ	.00025	U					.0001	UJ	.0001	UJ
Alpha-BHC	mg/L	.00005	U	.00005	U	.00005	UJ	.00005	UJ	.00025	U					.00005	UJ	.00005	UJ
Beta-BHC	mg/L	.00005	U	.00005	U	.00005	U	.00005	UJ	.00025	U					.00005	UJ	.00005	UJ
Delta-BHC	mg/L	.00005	U	.00005	U	.00005	UJ	.00005	UJ	.00025	U					.00014	J	.00005	U
Endosulfan II	mg/L	.0001	U	.0001	U	.0001	UJ	.0001	UJ	.00075						.00005	UJ	.00005	UJ
4,4'-DDT	mg/L	.00033		.00033		.00026	J	.0001	UJ	.0012						.0001	UJ	.0001	UJ
Chlordane (Total)	mg/L	.0001	U	.0001	U	.0001	U	.0001	UJ	.0005	U					.0001	UJ	.0001	UJ
Gamma-BHC	mg/L	.000089		.000092		.00005	UJ	.00005	UJ	.0006						.0001	UJ	.0001	U
Dieldrin	mg/L	.0001	U	.0001	U	.0001	UJ	.0001	UJ	.0005	U					.00014	J	.00005	UJ
Endrin	mg/L	.0001	U	.0001	U	.0001	UJ	.0001	UJ	.0005	U					.0001	UJ	.0001	UJ
Methoxychlor	mg/L	.0005	U	.0005	U	.0005	U	.0005	UJ	.0025	UJ					.0001	UJ	.0001	UJ
4,4'-DDD	mg/L	.0001	U	.0001	U	.0001	UJ	.0001	UJ	.0068						.0005	UJ	.0005	U
4,4'-DDE	mg/L	.0001	U	.0001	U	.0001	UJ	.0001	UJ	.0005	U					.006	DJ	.0001	UJ
Endrin Aldehyde	mg/L	.0001	U	.0001	U	.0001	UJ	.0001	UJ	.0005	U					.00013	J	.0001	UJ
Heptachlor	mg/L	.00005	U	.00005	U	.00005	UJ	.00005	UJ	.00025	U					.0001	UJ	.0001	UJ
Toxaphene	mg/L	.001	U	.001	U	.001	U	.001	UJ	.005	U					.00005	UJ	.00005	UJ
Endosulfan I	mg/L	.00005	U	.00005	U	.00005	UJ	.00005	UJ	.00025	U					.001	UJ	.001	U
Petroleum Hydrocarbons																.00005	UJ	.00005	UJ
Diesel - by 8015	mg/L	.5	U	.5	U					.5	U	.5	U						
Volatile Organic Compounds																			
Ethylbenzene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Styrene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Cis-1,3-Dichloropropene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Trans-1,3-Dichloropropene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
N-Propylbenzene	mg/L																		
N-Butylbenzene	mg/L																		
4-Chlorotoluene	mg/L																		
1,4-Dichlorobenzene	mg/L																		
1,2-Dibromoethane	mg/L																		
1,2-Dichloroethane	mg/L																		
Vinyl Acetate	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
4-Methyl-2-Pentanone	mg/L	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.05	U	.01	U
1,3,5-Trimethylbenzene	mg/L																		
Bromobenzene	mg/L																		
Toluene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Chlorobenzene	mg/L	.005	U	.005	U	.005	U	.005	U	.075		.005	U	.005	U	.96		.005	U
2-Chloroethyl Vinyl Ether	mg/L																		
1,2,4-Trichlorobenzene	mg/L																		
Dibromochloromethane	mg/L																		
Tetrachloroethene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Xylenes, Total	mg/L	.013		.014		.014		.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Sec-Butylbenzene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
1,3-Dichloropropane	mg/L																		
Cis-1,2-Dichloroethene	mg/L																		
Trans-1,2-Dichlorotethene	mg/L																		
Methyl Tert-Butyl Ether	mg/L																		
1,2-Dichloroethene	mg/L																		
1,3-Dichlorobenzene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
1,1,1,2-Tetrachloroethane	mg/L																		
1,2-Dichloroethane	mg/L																		
1,1,2,2-Tetrachloroethane	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
1,1,2-Trichloroethane	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
1,1-Dichloroethane	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U

Elf Atochem Groundwater Results

	Sample ID:	GA-MWA3-1-0297		GA-MWA3-2-0297		GA-MWA3-1-0397		GA-MWA4-3-0297		GA-MWA4-1-0297		GA-MWA4-3-02975		GA-TB1		GA-MWA4-1-0397		GA-MWA4-3-0397	
	Station ID:	GA-MWA3		GA-MWA3		GA-MWA3		GA-MWA4		GA-MWA4		GA-MWA4		NA		GA-MWA4		GA-MWA4	
	Date	1/2/97		1/2/97		3/12/97		12/11/96		1/2/97		1/2/97		1/2/97		3/12/97		3/12/97	
Volatile Organic Compounds, con't																			
1,1-Dichloroethene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
1,1-Dichloropropene	mg/L																		
1,2,3-Trichlorobenzene	mg/L																		
1,2,3-Trichloropropane	mg/L																		
1,2,4-Trimethylbenzene	mg/L																		
1,2-Dibromo-3-Chloropropane	mg/L																		
1,2-Dichlorobenzene	mg/L																		
1,2-Dichloropropane	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
2,2-Dichloropropane	mg/L																		
2-Butanone (Mek)	mg/L	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.05	U	.01	U
2-Chlorotoluene	mg/L																		
2-Hexanone	mg/L	.01	UR	.01	UR	.01	U	.01	U	.01	UR	.01	UR	.01	UR	.05	U	.01	U
Acetone	mg/L	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.05	U	.01	U
Benzene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Bromochloromethane	mg/L																		
Bromodichloromethane	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Bromoform	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Bromomethane	mg/L	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.05	U	.01	U
Carbon Disulfide	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Carbon Tetrachloride	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Chloroethane	mg/L	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.05	U	.01	U
Chloroform	mg/L	.01		.01		.022		.015		.009		.005	U	.005	U	.025	U	.005	U
Chloromethane	mg/L	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.05	U	.01	U
Dibromomethane	mg/L																		
Dichlorodifluoromethane	mg/L																		
Hexachlorobutadiene	mg/L																		
Iodomethane	mg/L																		
Isopropylbenzene	mg/L																		
Methylene Chloride	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Naphthalene	mg/L																		
O-Xylene	mg/L																		
P-Isopropyltoluene	mg/L																		
Tert-Butylbenzene	mg/L																		
Trichloroethene	mg/L	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.005	U	.025	U	.005	U
Trichlorofluoromethane	mg/L																		
Vinyl Chloride	mg/L	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.01	U	.05	U	.01	U

Qualifier Explanation:

U - Indicates the compound was analyzed

J - Indicates an estimated value. A J qual

D - Indicates that the associated result wa

B - The compound was detected in the as

Elf Atochem Groundwater Results

	Sample ID:	GA-MWA4-4-0397	
	Station ID:	GA-MWA4	
	Date	3/12/97	
Pesticides	**Units**		
Heptachlor Epoxide	mg/L		
Endosulfan Sulfate	mg/L		
Aldrin	mg/L		
Alpha-BHC	mg/L		
Beta-BHC	mg/L		
Delta-BHC	mg/L		
Endosulfan II	mg/L		
4,4'-DDT	mg/L		
Chlordane (Total)	mg/L		
Gamma-BHC	mg/L		
Dieldrin	mg/L		
Endrin	mg/L		
Methoxychlor	mg/L		
4,4'-DDD	mg/L		
4,4'-DDE	mg/L		
Endrin Aldehyde	mg/L		
Heptachlor	mg/L		
Toxaphene	mg/L		
Endosulfan I	mg/L		
Petroleum Hydrocarbons			
Diesel - by 8015	mg/L		
Volatile Organic Compounds			
Ethylbenzene	mg/L	.005	U
Styrene	mg/L	.005	U
Cis-1,3-Dichloropropene	mg/L	.005	U
Trans-1,3-Dichloropropene	mg/L	.005	U
N-Propylbenzene	mg/L		
N-Butylbenzene	mg/L		
4-Chlorotoluene	mg/L		
1,4-Dichlorobenzene	mg/L		
1,2-Dibromoethane	mg/L		
1,2-Dichloroethane	mg/L	.005	U
Vinyl Acetate	mg/L		
4-Methyl-2-Pentanone	mg/L	.01	U
1,3,5-Trimethylbenzene	mg/L		
Bromobenzene	mg/L		
Toluene	mg/L	.005	U
Chlorobenzene	mg/L	.005	U
2-Chloroethyl Vinyl Ether	mg/L		
1,2,4-Trichlorobenzene	mg/L		
Dibromochloromethane	mg/L	.005	U
Tetrachloroethene	mg/L	.005	U
Xylenes, Total	mg/L	.005	U
Sec-Butylbenzene	mg/L		
1,3-Dichloropropane	mg/L		
Cis-1,2-Dichloroethene	mg/L		
Trans-1,2-Dichlorotethene	mg/L		
Methyl Tert-Butyl Ether	mg/L		
1,2-Dichloroethene	mg/L	.005	U
1,3-Dichlorobenzene	mg/L		
1,1,1,2-Tetrachloroethane	mg/L		
1,1,1-Trichloroethane	mg/L	.005	U
1,1,2,2-Tetrachloroethane	mg/L	.005	U
1,1,2-Trichloroethane	mg/L	.005	U
1,1-Dichloroethane	mg/L	.005	U

Elf Atochem Groundwater Results

	Sample ID:	GA-MWA4-4-0397	
	Station ID:	GA-MWA4	
	Date	3/12/97	
Volatile Organic Compounds, con't			
1,1-Dichloroethene	mg/L	.005	U
1,1-Dichloropropene	mg/L		
1,2,3-Trichlorobenzene	mg/L		
1,2,3-Trichloropropane	mg/L		
1,2,4-Trimethylbenzene	mg/L		
1,2-Dibromo-3-Chloropropane	mg/L		
1,2-Dichlorobenzene	mg/L		
1,2-Dichloropropane	mg/L	.005	U
2,2-Dichloropropane	mg/L		
2-Butanone (Mek)	mg/L	.01	U
2-Chlorotoluene	mg/L		
2-Hexanone	mg/L	.01	U
Acetone	mg/L	.01	U
Benzene	mg/L	.005	U
Bromochloromethane	mg/L		
Bromodichloromethane	mg/L	.005	U
Bromoform	mg/L	.005	U
Bromomethane	mg/L	.01	U
Carbon Disulfide	mg/L	.005	U
Carbon Tetrachloride	mg/L	.005	U
Chloroethane	mg/L	.01	U
Chloroform	mg/L	.005	U
Chloromethane	mg/L	.01	U
Dibromomethane	mg/L		
Dichlorodifluoromethane	mg/L		
Hexachlorobutadiene	mg/L		
Iodomethane	mg/L		
Iscpropylbenzene	mg/L		
Methylene Chloride	mg/L	.005	U
Naphthalene	mg/L		
O-Xylene	mg/L		
P-Isopropyltoluene	mg/L		
Tert-Butylbenzene	mg/L		
Trichloroethene	mg/L	.005	U
Trichlorofluoromethane	mg/L		
Vinyl Chloride	mg/L	.01	U

Qualifier Explanation:

U - Indicates the compound was analyzec
J - Indicates an estimated value. A J qual
D - Indicates that the associated result wc
B - The compound was detected in the as

APPENDIX I

Data Validation Reports

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RD099

Parameters: Volatiles

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Matrix
GA-MWA1-1	Site Sample	Water
GA-MWA2-1	Site Sample	Water
GA-MWA2-1DL	Dilution of Site Sample	Water
GA-MWA3-1	Site Sample	Water
GA-MWA3-1MS	Matrix Spike	Water
GA-MWA3-1MSD	Matrix Spike Duplicate	Water
GA-MWA4-1	Site Sample	Water
GA-MW99-2	Site Sample	Water
GA-MWA4-3	Site Sample	Water
GA-MWA4-4	Site Sample	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8240B (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8240 requirements and as detailed in the following text.

This review follows EPA Functional Guidelines for Organic Data Review (Revised, February 1994) modified for Method 8240 requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified EPA protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section IV.

Field Duplicates are summarized in Section XI.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Holding time requirements were met. All original samples were analyzed within 14 days of collection.

II. GC/MS Instrument Performance Check

Instrument performance was checked at the beginning of each 12 hour period during which analysis is performed. All ion abundance requirements were met for BFB as listed below:

m/z	ION ABUNDANCE CRITERIA
50	15.0 - 40.0% of m/z 95
75	30.0 - 60.0% of m/z 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of m/z 95
173	Less than 2.0% of m/z 174
174	>50% of m/z 95
175	5.0 - 9.0% of m/z 174
176	95.0 - 101.0% of m/z 174
177	5.0 - 9.0% of m/z 176

III. Initial Calibration

An initial five-point calibration was performed using the required concentrations at the beginning of the analytical sequence.

Percent relative standard deviations (%RSD) were less than or equal to 30% for all calibration check compounds (CCC).

All non-calibration check compounds had %RSDs less than or equal to 30%.

Average relative response factors (RRF) for all volatile system performance check compounds (SPCC) were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-system performance check compounds had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform).

IV. Continuing Calibration

Continuing calibration was performed at the beginning of each 12-hour analysis period following the instrument performance check.

The percent difference (%D) between the initial calibration RRF and the continuing calibration RRF were within ±25.0% for all CCCs.

All non-CCCs have percent differences (%D) less than 25%:

All of the SPCC continuing calibration RRF values were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-SPCCs had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform).

V. Blanks

Method blank analyses were performed at the required frequencies. No volatile contaminants were reported above the reporting limits.

VI. System Monitoring Compounds

Three system monitoring compounds were added to all samples and blanks.

All surrogate recoveries were within the QC limits listed below.

	SOIL	WATER
Toluene-d8	81-117	88-110
Bromofluorobenzene	74-121	86-115
1,2-Dichloroethane-d4	70-121	76-114

VII. Matrix Spike/Matrix Spike Duplicates

One matrix spike/matrix spike duplicate pair was analyzed for this SDG.

All percent recoveries and relative percent differences were within the QC limits listed on Form 3A.

VIII. Laboratory Control Sample (LCS)

No LCS analysis is required for this method.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard retention times were within ±30 seconds of the retention times of the associated 12-hour calibration standard. All internal standard area counts were within -50 percent to 100 percent of the associated 12-hour calibration standard.

XI. Target Compound Identifications

No raw data review was conducted for this SDG.

XII. Compound Quantitation and CRQLs

No raw data review was conducted for this SDG.

Due to levels of target analytes, samples GA-MWA1-1, GA-MWA2-1 and GA-MW99-2 were analyzed on a diluted basis. In order to report target analytes within calibration range, sample GA-MWA2-1 was reanalyzed on a diluted basis. The reporting limits have been adjusted accordingly.

The form I lists the dilution factor for samples GA-MWA1-1, GA-MWA2-1DL, GA-MWA4-1, and GA-MW99-2, as 1.0 however, the case narrative states that this sample was diluted. The reporting limits for these samples have also been adjusted according to a different dilution factor. The laboratory has been requested to issue a dilution factor table for this project.

XIII. Tentatively Identified Compounds (TICs)

TICs reports were not required for this SDG.

XIV. System Performance

No raw data review was conducted for this SDG, QC data at large indicates acceptable performance.

XV. Overall Assessment of Data

All data were found to be acceptable per specifications as noted above under introduction/summary. Validation flags of an advisory nature are summarized at the end of this report.

XV. Field Duplicates

No field duplicates have been identified for this SDG.

ELF Atochem Volatiles - Data Qualification Summary - SDG RD099

No data has been qualified for this SDG.

ELF Atochem Volatiles - Blanks Data Qualification Summary - SDG RD099

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC256

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Matrix
RC256012	Site Sample	Soil
RC256009	Site Sample	Soil
RC256001	Site Sample	Soil
RC256013	Site Sample	Soil
RC256004DL	Site Sample	Soil
RC256007	Site Sample	Soil
RC256012DL	Site Sample	Soil
RC256001DL	Site Sample	Soil
RC256001MS	Matrix Spike	Soil
RC256001MSD	Matrix Spike Duplicate	Soil
RC256011	Site Sample	Soil
RC256016	Site Sample	Soil
RC256002	Site Sample	Soil
RC256007DL	Site Sample	Soil
RC256016DL	Site Sample	Soil
RC256011DL2	Site Sample	Soil
RC256004	Site Sample	Soil
RC256002DL	Site Sample	Soil
RC256004RE	Site Sample	Soil

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required.

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviation (%RSD) were within ±15%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15%.

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks with the following exceptions:

Blank	Compound	Concentration (ppm)	Associated Samples
PSB11016	4,4'-DDT	23	RC256001DL RC256002 RC256002DL RC256004 RC256004DL RC256007 RC256007DL RC256011 RC256011DL RC256011DL2 RC256012DL RC256016 RC256016DL RC256001MS RC256001MSD

Samples are qualified as non-detects if the sample result is less than five-times the blank concentration.

No data has been qualified for this SDG.

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below.

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

Surrogates: Surrogate recoveries could not be determined for samples RC256001, RC256001MS, RC256001MSD, RC256002, RC256009, RC256011, RC256013, and RC256016 due to the required dilution.

The surrogate recoveries for sample RC256004DL were outside laboratory control limits; however, the initial analysis displayed acceptable surrogate recoveries. Therefore, corrective action was not necessary.

The surrogate recovery for Tetrachloro-m-xylene (TCX) in sample RC256007 was outside laboratory control limits. However, the surrogate recovery could not be properly determined due to matrix interference; therefore, no corrective action was taken.

b. Laboratory Control Sample

Laboratory control sample included in this batch showed percent recoveries within laboratory control limits.

c. Matrix Spike

The spike recoveries for the MS/MSD could not be determined due to the required dilution. The laboratory control sample associated with the analytical sequence had acceptable percent recoveries and was included in the data package. No corrective action was recommended.

d. Duplicates

Observations are as noted above.

V. Sample Result Verification

Raw data [illegible]

VI. Overall Assessment

Data flags are summarized at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG.

ELF Atochem Pesticides Data Qualification Summary - SDG RC256

No data has been qualified for this SDG.

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RC256

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC256

Parameters: Volatiles

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Matrix
03-0-0100	Site Sample	Soil
18-0-0250	Site Sample	Soil
18-0-0200	Site Sample	Soil
18-0-0100	Site Sample	Soil
03-0-0080	Site Sample	Soil

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8240B (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8240 requirements and as detailed in the following text.

This review follows EPA Functional Guidelines for Organic Data Review (Revised, February 1994) modified for Method 8240 requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified EPA protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section IV.

Field Duplicates are summarized in Section XI.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Collection dates were not provided for this SDGs. Samples were analyzed within 14 days of laboratory receipt as required..

II. GC/MS Instrument Performance Check

Instrument performance was checked at the beginning of each 12 hour period during which analysis is performed. All ion abundance requirements were met for BFB as listed below:

m/z	ION ABUNDANCE CRITERIA
50	15.0 - 40.0% of m/z 95
75	30.0 - 60.0% of m/z 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of m/z 95
173	Less than 2.0% of m/z 174
174	>50% of m/z 95
175	5.0 - 9.0% of m/z 174
176	95.0 - 101.0% of m/z 174
177	5.0 - 9.0% of m/z 176

III. Initial Calibration

An initial five-point calibration was performed using the required concentrations at the beginning of the analytical sequence.

Percent relative standard deviations (%RSD) were less than or equal to 30% for all calibration check compounds (CCC).

The following non-calibration check compounds had %RSDs greater than 30%:

Calibration Date/Time	Analyte	%RSD	Associated Samples	Flag	A or P
10/21/96 14:20-19:03	Methylene Chloride	32.4	All samples in this SDG	J(detects)/UJ(non-detects)	A

Average relative response factors (RRF) for all volatile system performance check compounds (SPCC) were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-system performance check compounds had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform).

IV. Continuing Calibration

Continuing calibration was performed at the beginning of each 12-hour analysis period following the instrument performance check.

The percent difference (%D) between the initial calibration RRF and the continuing calibration RRF were within ±25.0% for all CCCs.

The following non-CCCs have percent differences (%D) greater than 25%:

Calibration Date/Time	Analyte	%D	Associated Samples	Flag	A or P
10/22/96 12:33	Acetone Methylene Chloride	65.5 52.2	03-0-0100 18-0-0250 18-0-0200 18-0-0100 03-0-0080	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A

All of the SPCC continuing calibration RRF values were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-SPCCs had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform).

V. Blanks

Method blank analyses were performed at the required frequencies. Initially no volatile contaminants were reported above the reporting limits. However, the laboratory was asked to calculate acetone and methylene chloride concentrations detected below the reporting limits as these were expected to be present.

Following is a list of blank results and associated samples.

Blank	Compound	Concentration (µg/Kg)	Associated Samples
J1021M01-BLK	Acetone	350J	none
J1022M01-BLK	Acetone	400J	03-0-0080 03-0-0100 18-0-0100 18-0-0200 18-0-0250

Sample	Analyte	Reported Concentration	Modified Final Concentration
18-0-0100	Acetone	5200000	5200000U
18-0-0250	Acetone	2900	2900U

VI. System Monitoring Compounds

Three system monitoring compounds were added to all samples and blanks.

All surrogate recoveries were within the QC limits listed below.

	SOIL	WATER
Toluene-d8	81-117	88-110
Bromofluorobenzene	74-121	86-115
1,2-Dichloroethane-d4	70-121	76-114

VII. Matrix Spike/Matrix Spike Duplicates

An MS/MSD pair was analyzed at the frequency of one per every 20 samples.

All percent recoveries were within the QC limits specified on CLP Form III VOA-2.

Matrix spike data will be evaluated on a project-wide basis.

VIII. Laboratory Control Sample (LCS)

No LCS analysis is required for this method.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard retention times were within ±30 seconds of the retention times of the associated 12-hour calibration standard. All internal standard area counts were within -50 percent to 100 percent of the associated 12-hour calibration standard.

XI. Target Compound Identifications

No raw data review was conducted for this SDG.

XII. Compound Quantitation and CRQLs

No raw data review was conducted for this SDG.

Due to the levels of target analytes the samples in this SDG were analyzed by medium level protocol. In order to report target analytes within calibration range, samples 03-0-0100, 18-0-0250, 18-0-0100 and 03-0-0080 were analyzed at a further dilution. The reporting limits have been adjusted accordingly.

XIII. Tentatively Identified Compounds (TICs)

TICs reports were not required for this SDG.

XIV. System Performance

No raw data review was conducted for this SDG, QC data at large indicates acceptable performance.

XV. Overall Assessment of Data

All data were found to be acceptable per specifications as noted above under introduction/summary. Validation flags of an advisory nature are summarized at the end of this report.

XV. Field Duplicates

No field duplicates have been identified for this SDG.

ELF Atochem Volatiles - Data Qualification Summary - SDG RC256

SDG	Sample	Analyte	Flag	A or P	Reason
RC256	03-0-0100 18-0-0250 18-0-0200 18-0-0100 03-0-0080	Methylene Chloride	J(detects)/UJ(non-detects)	A	Initial Calibration %RSD
RC256	03-0-0100 18-0-0250 18-0-0200 18-0-0100 03-0-0080	Acetone Methylene Chloride	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A	Continuing Calibration %D

ELF Atochem Volatiles - Blanks Data Qualification Summary - SDG RC256

Sample	Analyte	Reported Concentration	Modified Final Concentration
18-0-0100	Acetone	5200000	5200000U
18-0-0250	Acetone	2900	2900U

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC257

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Dilution	Matrix
GA-SB-04-0-0005	Site Sample	1000.00	Soil
GA-SB-04-0-0005DL	Dilution of Site Sample	10000.00	Soil
GA-SB-02-0-0040	Site Sample	1.00	Soil
GA-SB-02-0-0025	Site Sample	100.00	Soil
GA-SB-02-0-0025MS	Site Sample	100.00	Soil
GA-SB-02-0-0025MSD	Site Sample	100.00	Soil
GA-SB-02-0-0025DL	Dilution of Site Sample	1000.00	Soil
GA-SB-02-0-0060	Site Sample	100.00	Soil
GA-SB-05-0-0040	Site Sample	1.00	Soil
GA-SB-05-0-0060	Site Sample	100.00	Soil
GA-SB-05-3	Site Sample	1.00	Water
GA-SB-04-0-0060	Site Sample	100.00	Soil
GA-SB-05-0-0020	Site Sample	1.00	Soil
GA-SB-05-0-0020RE	Re-extract of Site Sample	1.00	Soil
GA-SB-04-0-0020	Site Sample	1.00	Soil
GA-SB-04-0-0020DL	Dilution of Site Sample	10.00	Soil
GA-SB-05-0-0005	Site Sample	1000.00	Soil
GA-SB-05-0-0005DL	Dilution of Site Sample	10000.00	Soil
GA-SB-05-0-0005DL2	Dilution of Site Sample	100000.00	Soil
GA-SB-04-0-0040	Site Sample	100.00	Soil

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required.

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviation (%RSD) were within ±15%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15% with the following exceptions:

Calibration Date	Analyte	%D	Associated Samples	Flag	A or P
10/22/96 12:11	4,4'DDT	31.0	GA-SB-02-0-0060 GA-SB-04-0-0060	J(detects)/UJ(non-detects)	A
10/24/96 5:04	4,4'DDT	77.0	GA-SB-02-0-0025 GA-SB-05-0-0060 GA-SB-04-0-0005 GA-SB-05-0-0005DL	J(detects)/UJ(non-detects)	A
10/30/96 11:26	4,4'DDT	29.3	GA-SB-05-0-0020RE	J(detects)/UJ(non-detects)	A

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks with the following exceptions:

Blank	Compound	Concentration (µg/Kg)	Associated Samples
PSB11016	4,4'-DDT	23	GA-SB-04-0-0005 GA-SB-04-0-0005DL GA-SB-02-0-0040 GA-SB-02-0-0025 GA-SB-02-0-0025DL GA-SB-02-0-0060 GA-SB-05-0-0040 GA-SB-05-0-0060 GA-SB-05-0-0020 GA-SB-04-0-0020 GA-SB-04-0-0020DL GA-SB-05-0-0005 GA-SB-05-0-0005DL GA-SB-05-0-0005DL2 GA-SB-02-0-0040MS GA-SB-02-0-0040MSD

Samples are qualified as non-detects if the sample result is less than five-times the blank concentration. Blanks qualification are as follows:

Sample	Analyte	Reported Concentration	Modified Final Concentration
GA-SB-02-0-0040	4,4'-DDT	73	73U
GA-SB-05-0-0040	4,4'-DDT	15	15U
GA-SB-05-0-0020	4,4'-DDT	81	81U
GA-SB-04-0-0020	4,4'-DDT	100E	100U

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

with the following exceptions:

Sample	Surrogate	%R	Associated Analytes	Flag	A or P
GA-SB-05-0-0020DL2	Tetrachloro-m-xylene	[illegible]	All target analytes	none	A

Samples are not flagged unless both surrogates are out of QC limits.

Surrogates were diluted out of the diluted samples; thus recovery data is not available.

b. Laboratory Control Sample

One water and one soil laboratory control samples were analyzed for this SDG.

All percent recoveries (%R) were within the laboratory specific QC limits.

c. Matrix Spike

One matrix spike/matrix spike duplicate sample pair was analyzed.

The percent recoveries were within laboratory specific QC limits with the following exceptions:

Sample	Analyte	%R	Associated Samples	Flag	A or P
GA-SB-02-0-0040MS	4,4'-DDT	0.0	All associated project samples	Flags will be assigned on a project-wide basis	A
GA-SB-02-0-0040MSD	4,4'-DDT	0.0	All associated project samples	Flags will be assigned on a project-wide basis	A

d. Duplicates

One matrix spike/matrix spike duplicate sample pair was analyzed.

The relative percent differences were within laboratory specific QC limits.

V. Sample Result Verification

Raw data were not checked for this SDG.

VI. Overall Assessment

Data flags are summarized at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG

ELF Atochem Pesticides Data Qualification Summary - SDG RC257

SDG	Sample	Analyte	Flag	A or P	Reason
RC257	GA-SB-02-0-0025 GA-SB-05-0-0060 GA-SB-04-0-0005 GA-SB-05-0-0005DL GA-SB-05-0-0020RE	4,4'DDT	J(detects)/UJ(non-detects)	A	Continuing Calibration %D

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RC257

Sample	Analyte	Reported Concentration	Modified Final Concentration
GA-SB-02-0-0040	4,4'-DDT	73	73U
GA-SB-05-0-0040	4,4'-DDT	15	15U
GA-SB-05-0-0020	4,4'-DDT	81	81U
GA-SB-04-0-0020	4,4'-DDT	100E	100U

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC273

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Dilution	Matrix
RP-SB-17-0-0100	Site Sample	50000.00	Soil
RP-SB-17-0-0150	Site Sample	50000.00	Soil
RP-SB-17-0-0200	Site Sample	100000.00	Soil
RP-SB-19-0-0150	Site Sample	100.00	Soil
RP-SB-19-0-0250	Site Sample	10.00	Soil
RP-SB-19-0-0250RE	Re-extraction of Site Sample	1.00	Soil
RP-SB-16-0-0050	Site Sample	5000.00	Soil
RP-SB-22-0-0050	Site Sample	50.00	Soil
RP-SB-23-0-0050	Site Sample	50.00	Soil
GA-SB-06-0-0020	Site Sample	50.00	Soil
RP-SB-20-3	Site Sample	1.00	Water

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required.

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviation (%RSD) were within ±15%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15% with the following exceptions:

Calibration Date	Analyte	%D	Associated Samples	Flag	A or P
10/30/96 11:26	4,4'-DDT	29.3	RP-SB-20-3	J(detects)/UJ(non-detects)	A

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks with the following exceptions:

Blank	Compound	Concentration (ppm)	Associated Samples
PWB11016	4,4'-DDT	0.18	RP-SB-20-3
PSB11018	4,4'-DDT	64	RP-SB-17-0-0100 RP-SB-17-0-0150 RP-SB-17-0-0200 RP-SB-19-0-0150 RP-SB-19-0-0250 RP-SB-16-0-0050 RP-SB-22-0-0050 RP-SB-23-0-0050 GA-SB-06-0-0020

Samples are qualified as non-detects if the sample result is less than five-times the blank concentration.

No data has been qualified for this SDG.

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below.

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

Surrogates were diluted out of the diluted samples; thus recovery data is not available.

b. Laboratory Control Sample

No laboratory control sample was included in this SDG.

c. Matrix Spike

No matrix spike was included in this SDG.

d. Duplicates

No duplicate analysis was included in this SDG.

V. Sample Result Verification

Raw data were not checked for this SDG.

VI. Overall Assessment

Data flags are summarized at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG.

ELF Atochem Pesticides Data Qualification Summary - SDG RC273

SDG	Sample	Analyte	Flag	A or P	Reason
RC273	RP-SB-20-3	4,4'-DDT	J(detects)/UJ(non-detects)	A	Continuing Calibration %D

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RC273

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC273

Parameters: Volatiles

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Matrix
17-0-0150	Site Sample	Soil
17-0-0200	Site Sample	Soil
17-0-0200DL	Dilution of Site Sample	Soil
19-0-0250	Site Sample	Soil
19-0-0250R	Reanalysis of Site Sample	Soil
20-3	Site Sample	Water
RP-101194-4	Site Sample	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8240B (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8240 requirements and as detailed in the following text.

This review follows EPA Functional Guidelines for Organic Data Review (Revised, February 1994) modified for Method 8240 requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified EPA protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section IV.

Field Duplicates are summarized in Section XI.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Collection dates were not provided for this SDGs. Samples were analyzed within 14 days of laboratory receipt as required.

II. GC/MS Instrument Performance Check

Instrument performance was checked at the beginning of each 12 hour period during which analysis is performed. All ion abundance requirements were met for BFB as listed below:

m/z	ION ABUNDANCE CRITERIA
50	15.0 - 40.0% of m/z 95
75	30.0 - 60.0% of m/z 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of m/z 95
173	Less than 2.0% of m/z 174
174	>50% of m/z 95
175	5.0 - 9.0% of m/z 174
176	95.0 - 101.0% of m/z 174
177	5.0 - 9.0% of m/z 176

III. Initial Calibration

An initial five-point calibration was performed using the required concentrations at the beginning of the analytical sequence.

Percent relative standard deviations (%RSD) were less than or equal to 30% for all calibration check compounds (CCC).

The following non-calibration check compounds had %RSDs greater than 30%:

Calibration Date/Time	Analyte	%RSD	Associated Samples	Flag	A or P
10/21/96 14:20-19:03	Methylene Chloride	32.4	17-0-0200 17-0-0200DL 19-0-0250 19-0-0250R 17-0-0150	J(detects)/UJ(non-detects)	A

Average relative response factors (RRF) for all volatile system performance check compounds (SPCC) were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-system performance check compounds had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform).

IV. Continuing Calibration

Continuing calibration was performed at the beginning of each 12-hour analysis period following the instrument performance check.

The percent difference (%D) between the initial calibration RRF and the continuing calibration RRF were within ±25.0% for all CCCs.

The following non-CCCs have percent differences (%D) greater than 25%:

Calibration Date/Time	Analyte	%D	Associated Samples	Flag	A or P
10/22/96 12:33	Acetone Methylene Chloride	65.5 52.2	17-0-0200 17-0-0200DL	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A
10/23/96 11:09	Acetone Methylene Chloride	51.3 51.9	19-0-0250 19-0-0250R 17-0-0150	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A

All of the SPCC continuing calibration RRF values were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-SPCCs had average relative response factors greater than or equal 0.300 (greater than 0.250 for bromoform).

V. Blanks

Method blank analyses were performed at the required frequencies. Initially no volatile contaminants were reported above the reporting limits. However, the laboratory was asked to calculate acetone and methylene chloride concentrations detected below the reporting limits as these were expected to be present.

Following is a list of blank results and associated samples.

Blank	Compound	Concentration (µg/Kg)	Associated Samples
J1023S01-BLK	Acetone	3.2	17-0-0150 19-0-0250 19-0-0250R
J1022M01-BLK	Acetone	400J	17-0-0200DL

No acetone was detected above the reporting limit in any of the associated samples.

VI. System Monitoring Compounds

Three system monitoring compounds were added to all samples and blanks.

All surrogate recoveries were within the laboratory QC limits listed below

	SOIL	WATER
Toluene-d8	81-117	88-110
Bromofluorobenzene	74-121	86-115
1,2-Dichloroethane-d4	70-121	76-114

with the following exceptions:

Sample	Surrogate	%R	Associated Analytes	Flag	A or P
19-0-0250	Bromofluorobenzene	130	All target analytes	J(detects)/UJ(non-detects)	A
19-0-0250R	Toluene-d8 Bromofluorobenzene	123 139	All target analytes	J(detects)/UJ(non-detects)	A

This sample was reanalyzed on a diluted basis and the surrogate recoveries were within laboratory QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

MS/MSDs were done on a 1 per every 20 samples frequency. The MS/MSD associated with this SDG was performed on sample 18-0-0250 of SDG RC256 and is reported in the data package for that SDG.

All percent recoveries were within the QC limits specified on CLP Form III VOA-2.

Matrix spike data will be evaluated on a project-wide basis.

VIII. Laboratory Control Sample (LCS)

No LCS analysis is required for this method.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard retention times were within ±30 seconds of the retention times of the associated 12-hour calibration standard. All internal standard area counts were within -50 percent to 100 percent of the associated 12-hour calibration standard with the following exceptions:

Sample	Internal Standard	IS Area (limits)	Associated Analytes	Flag	A or P
19-0-0250	Chlorobenzene	76155 (84422-337686)	All target analytes	J(detects)/UJ(non-detects)	A
19-0-0250R	Chlorobenzene	60577 (84422-337686)	All target analytes	J(detects)/UJ(non-detects)	A

Sample 19-0-0250 was reanalyzed and the internal standard was out of QC limits suggesting a possible matrix interference.

XI. Target Compound Identifications

No raw data review was conducted for this SDG.

XII. Compound Quantitation and CRQLs

No raw data review was conducted for this SDG.

Due to levels of target analytes, samples 17-0-0150 and 17-0-0200 were analyzed on a diluted basis. In order to report target analytes within calibration range, sample 17-0-0200 was reanalyzed by medium level protocol. The reporting limits have been adjusted accordingly.

The form I lists the dilution factor for samples 17-0-0150 and 17-0-0200DL as 1.0 however, the case narrative states that this sample was diluted. The reporting limits for this sample have also been adjusted according to a different dilution factor. The laboratory has been requested to issue a dilution factor table for this project.

XIII. Tentatively Identified Compounds (TICs)

TICs reports were not required for this SDG.

XIV. System Performance

No raw data review was conducted for this SDG, QC data at large indicates acceptable performance.

XV. Overall Assessment of Data

All data were found to be acceptable per specifications as noted above under introduction/summary. Validation flags [illegible] are summarized at the end of this report

XV. Field Duplicates

No field duplicates have [illegible]

ELF Atochem Volatiles - Data Qualification Summary - SDG RC273

SDG	Sample	Analyte	Flag	A or P	Reason
RC273	17-0-0200 17-0-0200DL 19-0-0250 19-0-0250R 17-0-0150	Methylene Chloride	J(detects)/UJ(non-detects)	A	Initial Calibration %RSD
RC273	17-0-0200 17-0-0200DL	Acetone Methylene Chloride	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A	Continuing Calibration %D
RC273	19-0-0250 19-0-0250R 17-0-0150	Acetone Methylene Chloride	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A	Continuing Calibration %D
RC273	19-0-0250 19-0-0250R	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery
RC273	19-0-0250 19-0-0250R	All target analytes	J(detects)/UJ(non-detects)	A	Internal Standards

ELF Atochem Volatiles - Blanks Data Qualification Summary - SDG RC273

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC274

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Dilution	Matrix
RP-SB-16-0-0150	Site Sample	500.00	Soil
RP-SB-16-0-0200	Site Sample	100000.00	Soil
RP-SB-20-0-0150	Site Sample	200.00	Soil
RP-SB-20-0-0200	Site Sample	100.00	Soil
RP-SB-21-0-0050	Site Sample	100000.00	Soil
RP-SB-21-0-0185	Site Sample	200000.00	Soil

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required.

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviation (%RSD) were within ±15%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15%.

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks with the following exceptions:

Blank	Compound	Concentration (ppm)	Associated Samples
PSB11018	4,4'-DDT	64	All samples in this SDG.

Samples are qualified as non-detects if the sample result is less than five-times the blank concentration.

No data has been qualified for this SDG.

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below.

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

Surrogates were diluted out of the diluted samples; thus recovery data is not available.

b. Laboratory Control Sample

No laboratory control sample was included in this SDG.

c. Matrix Spike

No matrix spike was included in this SDG.

d. Duplicates

No duplicate analysis was included in this SDG.

V. Sample Result Verification

Raw data were not checked for this SDG.

VI. Overall Assessment

Data flags are summarized at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG.

ELF Atochem Pesticides Data Qualification Summary - SDG RC274

No data has been qualified for this SDG.

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RC274

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC274

Parameters: Volatiles

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Matrix
16-0-0150	Site Sample	Soil
20-0-0200	Site Sample	Soil
20-0-0200MS	Matrix Spike	Soil
20-0-0200MSD	Matrix Spike Duplicate	Soil
21-0-0185	Site Sample	Soil
21-0-0185DL	Dilution of Site Sample	Soil

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8240B (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8240 requirements and as detailed in the following text.

This review follows EPA Functional Guidelines for Organic Data Review (Revised, February 1994) modified for Method 8240 requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified EPA protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section IV.

Field Duplicates are summarized in Section XI.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Collection dates were not provided for this SDGs. Samples were analyzed within 14 days of laboratory receipt as required.

II. GC/MS Instrument Performance Check

Instrument performance was checked at the beginning of each 12 hour period during which analysis is performed. All ion abundance requirements were met for BFB as listed below:

m/z	ION ABUNDANCE CRITERIA
50	15.0 - 40.0% of m/z 95
75	30.0 - 60.0% of m/z 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of m/z 95
173	Less than 2.0% of m/z 174
174	>50% of m/z 95
175	5.0 - 9.0% of m/z 174
176	95.0 - 101.0% of m/z 174
177	5.0 - 9.0% of m/z 176

III. Initial Calibration

An initial five-point calibration was performed using the required concentrations at the beginning of the analytical sequence.

Percent relative standard deviations (%RSD) were less than or equal to 30% for all calibration check compounds (CCC).

The following non-calibration check compounds had %RSDs greater than 30%:

Calibration Date/Time	Analyte	%RSD	Associated Samples	Flag	A or P
10/21/96 14:20-19:03	Methylene Chloride	32.4	All samples in this SDG	J(detects)/UJ(non-detects)	A

Average relative response factors (RRF) for all volatile system performance check compounds (SPCC) were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-system performance check compounds had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform).

IV. Continuing Calibration

Continuing calibration was performed at the beginning of each 12-hour analysis period following the instrument performance check.

The percent difference (%D) between the initial calibration RRF and the continuing calibration RRF were within ±25.0% for all CCCs.

The following non-CCCs have percent differences (%D) greater than 25%:

Calibration Date/Time	Analyte	%D	Associated Samples	Flag	A or P
10/23/96 11:09	Acetone Methylene Chloride	51.3 51.9	21-0-0185	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A
10/24/96 11:09	Acetone Methylene Chloride	46.6 49.9	20-0-0200 16-0-0150 21-0-0185DL 20-0-0200MS 20-0-0200MSD	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A

All of the SPCC continuing calibration RRF values were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-SPCCs had average relative response factors greater than or equal 0.300 (greater than 0.250 for bromoform).

V. Blanks

Method blank analyses were performed at the required frequencies. Initially no volatile contaminants were reported above the reporting limits. However, the laboratory was asked to calculate acetone and methylene chloride concentrations detected below the reporting limits as these were expected to be present.

Following is a list of blank results and associated samples.

Blank	Compound	Concentration (µg/Kg)	Associated Samples
J1023S01-BLK	Acetone	3.2	21-0-0185
J1024S01-BLK	Acetone	4.0J	16-0-0150 20-0-0200
J1024M01-BLK	Acetone	270J	21-0-0185DL

Sample	Analyte	Reported Concentration	Modified Final Concentration
[illegible]	Acetone	50	50U

[illegible] Monitoring Compounds

[illegible] system monitoring compounds [illegible]

[illegible] surrogate recoveries were within [illegible]

	SOIL	WATER
Toluene-d8	81-117	88-110
Bromofluorobenzene	74-121	86-115
1,2-Dichloroethane-d4	70-121	76-114

with the following exceptions:

Sample	Surrogate	%R	Associated Analytes	Flag	A or P
21-0-0185	Bromofluorobenzene	72	All target analytes	J(detects)/UJ(non-detects)	A

This sample was reanalyzed on a diluted basis and the surrogate recoveries were within laboratory QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

An MS/MSD pair was analyzed at the frequency of one per every 20 samples.

All percent recoveries were within the QC limits specified on CLP Form III VOA-2.

Matrix spike data will be evaluated on a project-wide basis.

VIII. Laboratory Control Sample (LCS)

No LCS analysis is required for this method.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard retention times were within ±30 seconds of the retention times of the associated 12-hour calibration standard. All internal standard area counts were within -50 percent to 100 percent of the associated 12-hour calibration standard.

XI. Target Compound Identifications

No raw data review was conducted for this SDG.

XII. Compound Quantitation and CRQLs

No raw data review was conducted for this SDG.

Due to levels of target analytes, sample 16-0-0150 and 21-0-0185 were analyzed on a diluted basis. In order to report target analytes within calibration range, sample 21-0-0185 was reanalyzed on a diluted basis at the medium level protocol. The reporting limits for these sample have been adjusted accordingly.

The form I lists the dilution factor for samples 16-0-1050 and 21-0-0185 as 1.0 however, the case narrative states that this sample was diluted. The reporting limits for these samples have also been adjusted according to a different dilution factor. The laboratory has been requested to issue a dilution factor table for this project.

XIII. Tentatively Identified Compounds (TICs)

TICs reports were not required for this SDG.

XIV. System Performance

No raw data review was conducted for this SDG, QC data at large indicates acceptable performance.

XV. Overall Assessment of Data

All data were found to be acceptable per specifications as noted above under introduction/summary. Validation flags of an advisory nature are summarized at the end of this report.

XV. Field Duplicates

No field duplicates have been identified for this SDG.

ELF Atochem Volatiles - Data Qualification Summary - SDG RC274

SDG	Sample	Analyte	Flag	A or P	Reason
RC274	16-0-0150 20-0-0200 21-0-0185 21-0-0185DL	Methylene Chloride	J(detects)/UJ(non-detects)	A	Initial Calibration %RSD
RC274	21-0-0185	Acetone Methylene Chloride	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A	Continuing Calibration %D
RC274	20-0-0200 16-0-0150 21-0-0185DL	Acetone Methylene Chloride	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A	Continuing Calibration %D
RC274	21-0-0185	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery

ELF Atochem Volatiles - Blanks Data Qualification Summary - SDG RC274

Sample	Analyte	Reported Concentration	Modified Final Concentration
16-0-0150	Acetone	30	30U

2Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC285

Parameters: Volatiles

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Matrix
1-0-1096	Site Sample	Soil
2-0-1096	Site Sample	Soil
3-0-1096	Site Sample	Soil
4-0-1096	Site Sample	Soil
07-03	Site Sample	Water
07-03MS	Matrix Spike	Water
07-03MSD	Matrix Spike Duplicate	Water
5-1-1096	Site Sample	Water
6-1-1096	Site Sample	Water
6-1-1096R	Reanalysis of Site Sample	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8240B (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8240 requirements and as detailed in the following text.

This review follows EPA Functional Guidelines for Organic Data Review (Revised, February 1994) modified for Method 8240 requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified EPA protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section IV.

Field Duplicates are summarized in Section XI.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Collection dates were not provided for this SDGs. Samples were analyzed within 14 days of laboratory receipt as required.

II. GC/MS Instrument Performance Check

Instrument performance was checked at the beginning of each 12 hour period during which analysis is performed. All ion abundance requirements were met for BFB as listed below:

m/z	ION ABUNDANCE CRITERIA
50	15.0 - 40.0% of m/z 95
75	30.0 - 60.0% of m/z 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of m/z 95
173	Less than 2.0% of m/z 174
174	>50% of m/z 95
175	5.0 - 9.0% of m/z 174
176	95.0 - 101.0% of m/z 174
177	5.0 - 9.0% of m/z 176

III. Initial Calibration

An initial five-point calibration was performed using the required concentrations at the beginning of the analytical sequence.

Percent relative standard deviations (%RSD) were less than or equal to 30% for all calibration check compounds (CCC).

The following non-calibration check compounds had %RSDs greater than 30%:

Calibration Date/Time	Analyte	%RSD	Associated Samples	Flag	A or P
10/21/96 14:20-19:03	Methylene Chloride	32.4	All samples in this SDG	J(detects)/UJ(non-detects)	A

Average relative response factors (RRF) for all volatile system performance check compounds (SPCC) were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-system performance check compounds had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform).

IV. Continuing Calibration

Continuing calibration was performed at the beginning of each 12-hour analysis period following the instrument performance check.

The percent difference (%D) between the initial calibration RRF and the continuing calibration RRF were within ±25.0% for all CCCs.

The following non-CCCs have percent differences (%D) greater than 25%:

Calibration Date/Time	Analyte	%D	Associated Samples	Flag	A or P
10/23/96 11:09	Acetone Methylene Chloride	51.3 51.9	1-0-1096 4-0-1096 2-0-1096	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A
10/25/96 12:55	Acetone Methylene Chloride	52.0 45.6	07-03 07-03MS 6-1-1096 6-1-1096R 07-03MSD 3-0-1096 5-1-1096	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A

All SPCC continuing calibration RRF values were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-SPCCs had average relative response factors greater than or equal 0.300 (greater than 0.250 for bromoform).

V. Blanks

Method blank analyses were performed at the required frequencies. Initially no volatile contaminants were reported above the reporting limits. However, the laboratory was asked to calculate acetone and methylene chloride concentrations detected below the reporting limits as these were expected to be present.

Following is a list of blank results and associated samples.

Blank	Compound	Concentration (µg/Kg)	Associated Samples
J1023S01-BLK	Acetone	3.2	1-0-1096
J1023M01-BLK	Acetone	1000J	2-0-1096 4-0-1096

No acetone was detected in any of the associated samples.

VI. System Monitoring Compounds

Three system monitoring compounds were added to all samples and blanks.

All surrogate recoveries were within the QC limits listed below

	SOIL	WATER
Toluene-d8	81-117	88-110
Bromofluorobenzene	74-121	86-115
1,2-Dichloroethane-d4	70-121	76-114

with the following exceptions:

Sample	Surrogate	%R	Associated Analytes	Flag	A or P
6-1-1096	Toluene-d8 Bromofluorobenzene	171 59	All target analytes	J(detects)/UJ(non-detects)	A
6-1-1096R	Toluene-d8 Bromofluorobenzene	154 158	All target analytes	J(detects)/UJ(non-detects)	A

Sample 6-1-1096 was reanalyzed (6-1-1096R) and the surrogate recoveries were outside laboratory QC limits suggesting matrix interference.

VII. Matrix Spike/Matrix Spike Duplicates

MS/MSDs were analyzed on a one per 20 sample frequency. The soil MS/MSD associated with this SDG was performed on sample 20-0-0200 in SDG RC274 and is reported with that SDG.

A water MS/MSD pair was analyzed with this SDG.

All percent recoveries were within the QC limits specified on CLP Form III VOA-1 and VOA-2.

Matrix spike data will be evaluated on a project-wide basis.

VIII. Laboratory Control Sample (LCS)

No LCS analysis is required for this method.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard retention times were within ±30 seconds of the retention times of the associated 12-hour calibration standard. All internal standard area counts were within -50 percent to 100 percent of the associated 12-hour calibration standard.

XI. Target Compound Identifications

No raw data review was conducted for this SDG.

XII. Compound Quantitation and CRQLs

No raw data review was conducted for this SDG.

Due to the levels of target analytes sample 5-1-1096 was analyzed on a diluted basis. Samples 2-0-1096 and 4-0-1096 were analyzed by medium level protocol and on a diluted basis. The reporting limits for these samples have been adjusted accordingly.

The form I lists the dilution factor for sample 5-1-1096 as 1.0 however, the case narrative states that this sample was diluted. The reporting limits for this sample have also been adjusted according to a dilution factor of 200%. The laboratory has been requested to issue a dilution factor table for this project.

XIII. Tentatively Identified Compounds (TICs)

TICs reports were not required for this SDG.

XIV. System Performance

No raw data review was conducted for this SDG, QC data at large indicates acceptable performance.

XV. Overall Assessment of Data

All data were found to be acceptable per specifications as noted above under introduction/summary. Validation flags of an advisory nature are summarized at the end of this report.

XV. Field Duplicates

No field duplicates have been identified for this SDG.

ELF Atochem Volatiles - Data Qualification Summary - SDG RC285

SDG	Sample	Analyte	Flag	A or P	Reason
RC285	1-0-1096 2-0-1096 3-0-1096 4-0-1096 07-03 5-1-1096 6-1-1096 6-1-1096R	Methylene Chloride	J(detects)/UJ(non-detects)	A	Initial Calibration %RSD
RC285	1-0-1096 4-0-1096 2-0-1096	Acetone Methylene Chloride	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A	Continuing Calibration %D
RC285	07-03 6-1-1096 6-1-1096R 3-0-1096 5-1-1096	Acetone Methylene Chloride	J(detects)/UJ(non-detects) J(detects)/UJ(non-detects)	A	Continuing Calibration %D
RC285	6-1-1096 6-1-1096R	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery

ELF Atochem Volatiles - Blanks Data Qualification Summary - SDG RC285

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC285

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Dilution	Matrix
IDW-1-0-1096	Site Sample	10000.00	Soil
IDW-2-0-1096	Site Sample	100000.00	Soil
IDW-3-0-1096	Site Sample	10000.00	Soil
IDW-4-0-1096	Site Sample	25000.00	Soil
GA-SB-07-0-0040	Site Sample	10000.00	Soil
GA-SB-07-0-0040MS	Matrix Spike	10000.00	Soil
GA-SB-07-0-0040MSD	Matrix Spike Duplicate	10000.00	Soil
GA-SB-07-03	Site Sample	1.00	Water
IDW-5-1-1096	Site Sample	10.00	Water
IDW-6-1-1096	Site Sample	500.00	Water

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required.

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviation (%RSD) were within ±15%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15% with the following exceptions:

Calibration Date	Analyte	%D	Associated Samples	Flag	A or P
10/30/96 11:26	4,4'-DDT	29.3	none	J(detects)/UJ(non-detects)	A

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks with the following exceptions:

Blank	Compound	Concentration (ppm)	Associated Samples
PSB11018	4,4'-DDT	64	All soil samples in this SDG

Samples are qualified as non-detects if the sample result is less than five-times the blank concentration.

No data has been qualified for this SDG.

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below.

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

Surrogates were diluted out of the diluted samples; thus recovery data is not available.

b. Laboratory Control Sample

One laboratory control sample was analyzed for this SDG.

All percent recoveries were within laboratory specific QC limits.

c. Matrix Spike

One matrix spike/matrix spike duplicate sample pair was analyzed.

The spike recoveries for the MS/MSD could not be determined due to the required dilution.

d. Duplicates

One matrix spike/matrix spike duplicate pair and one laboratory control sample spike/duplicate pair were analyzed for this SDG.

The relative percent difference for the MS/MSD could not be determined due to the required dilution.

The relative percent difference for the LCS spike/duplicate pair were within laboratory specific QC limits.

V. Sample Result Verification

Raw data were not checked for this SDG.

VI. Overall Assessment

Data flags are documented at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG.

ELF Atochem Pesticides Data Qualification Summary - SDG RC285

No data has been qualified for this SDG.

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RC285

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC669

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Dilution	Matrix
GA-SB10-0-0020	Site Sample	20.00	Soil
GA-SB10-0-0040	Site Sample	10.00	Soil
GA-SB10-5-0005	Site Sample	10.00	Soil
GA-SB10-0-0060	Site Sample	20.00	Soil
GA-SB11-0-0005	Site Sample	100.00	Soil
GA-SB11-0-0020	Site Sample	1.00	Soil
GA-SB11-0-0040	Site Sample	1.00	Soil
GA-SB11-0-0060	Site Sample	1.00	Soil

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required.

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviation (%RSD) were within ±15%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15%.

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks.

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below.

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

Surrogates were diluted out of the diluted samples; thus recovery data is not available.

b. Laboratory Control Sample

No laboratory control sample was included in this SDG.

c. Matrix Spike

No matrix spike was included in this SDG.

d. Duplicates

No duplicate analysis was included in this SDG.

V. Sample Result Verification

Raw data were not checked for this SDG.

VI. Overall Assessment

Data flags are summarized at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG.

ELF Atochem Pesticides Data Qualification Summary - SDG RC669

No data has been qualified for this SDG.

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RC669

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC670

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Dilution	Matrix
RP-SB37-0-0100	Site Sample	1.00	Soil
RP-SB37-0-0200	Site Sample	1.00	Soil
RP-SB28-0-0200	Site Sample	5.00	Soil
RP-SB29-0-0050	Site Sample	1.00	Soil
RP-SB30-0-0050	Site Sample	5.00	Soil
RP-SB31-0-0050	Site Sample	5000.00	Soil
RP-SB31-0-1040	Site Sample	1000.00	Soil
RP-SB32-0-0180	Site Sample	1.00	Soil
RP-SB25-0-0020	Site Sample	500.00	Soil
RP-SB26-0-0100	Site Sample	10.00	Soil
RP-SB27-0-0020	Site Sample	10.00	Soil
RP-SB27-0-0200	Site Sample	10.00	Soil
RP-SB28-0-0100	Site Sample	1.00	Soil
RP-SB33-0-0020	Site Sample	10000.00	Soil
RP-SB34-0-0100	Site Sample	50.00	Soil

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required.

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviations (%RSD) were within ±15%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15%.

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks with the following exceptions:

Blank	Compound	Concentration (ppm)	Associated Samples
PSB11220	4,4'-DDT	640	SB37-0-0100 SB37-0-0200 SB28-0-0200 SB29-0-0050 SB31-0-0140 SB32-0-0180 SB26-0-0100 SB27-0-0020 SB27-0-0200 SB28-0-0100 SB33-0-0200 SB34-0-0100

Samples are qualified as non-detects if the sample result is less than five times the blank concentration. Blanks qualification are as follows:

Sample	Analyte	Reported Concentration	Modified Final Concentration
SB37-0-0100	4,4'-DDT	1700	1700U
SB37-0-0200	4,4'-DDT	2800	2800U
SB29-0-0050	4,4'-DDT	540	540U
SB28-0-0100	4,4'-DDT	1300	1300U
SB33-0-0200	4,4'-DDT	3100	3100U

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below.

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

Surrogates were diluted out of the diluted samples; thus recovery data is not available.

b. Laboratory Control Sample

No laboratory control sample was included in this SDG.

c. Matrix Spike

No matrix spike was included in this SDG.

d. Duplicates

No duplicate analysis was included in this SDG.

V. Sample Result Verification

Raw data were not checked for this SDG.

VI. Overall Assessment

Data flags are summarized at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG.

ELF Atochem Pesticides Data Qualification Summary - SDG RC670

No data has been qualified for this SDG.

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RC670

Sample	Analyte	Reported Concentration	Modified Final Concentration
SB37-0-0100	4,4'-DDT	1700	1700U
SB37-0-0200	4,4'-DDT	2800	2800U
SB29-0-0050	4,4'-DDT	540	540U
SB28-0-0100	4,4'-DDT	1300	1300U
SB33-0-0200	4,4'-DDT	3100	3100U

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC671

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Dilution	Matrix
GA-SB08-0-0020	Site Sample	1.00	Soil
GA-SB08-0-0040	Site Sample	1.00	Soil
GA-SB08-0-0060	Site Sample	1.00	Soil
GA-SB08-0-0005	Site Sample	10.00	Soil
GA-SB09-0-0005	Site Sample	100.00	Soil
GA-SB09-0-0020	Site Sample	100.00	Soil
GA-SB09-0-0040	Site Sample	20.00	Soil
GA-SB09-0-0060	Site Sample	1.00	Soil

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required.

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviations (%RSD) were within ±15%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15%.

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks.

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below.

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

Surrogates were diluted out of the diluted samples; thus recovery data is not available.

b. Laboratory Control Sample

No laboratory control sample was included in this SDG.

c. Matrix Spike

No matrix spike was included in this SDG.

d. Duplicates

No duplicate analysis was included in this SDG.

V. Sample Result Verification

Raw data were not checked for this SDG.

VI. Overall Assessment

Data flags are summarized at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG.

ELF Atochem Pesticides Data Qualification Summary - SDG RC671

No data has been qualified for this SDG.

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RC671

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC672

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Dilution	Matrix
MWA3-0-0240	Site Sample	2.00	Soil
MWA3-0-0240	Site Sample	1.00	Soil
GA-MWA3-3	Site Sample	1.00	Water
GA-MWA4-0-0240	Site Sample	20.00	Soil
GA-MWA4-0-0278	Site Sample	1.00	Soil
GA-MWA4-0-0300	Site Sample	1.00	Soil
GA-MWA1-0-0140	Site Sample	1.00	Soil
GA-MWA1-0-0190	Site Sample	1.00	Soil
GA-MWA1-0-0260	Site Sample	1.00	Soil
GA-MWA2-0-0240	Site Sample	1.00	Soil
GA-MWA2-0-0290	Site Sample	1.00	Soil
GA-MWA3-0-0220	Site Sample	1.00	Soil
IDW-07-0-1213	Site Sample	5000.00	Soil
IDW-08-1-1213	Site Sample	500.00	Water

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required.

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviations (%RSD) were within ±15%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15%.

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks.

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below.

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

Surrogates were diluted out of the diluted samples; thus recovery data is not available.

b. Laboratory Control Sample

No laboratory control sample was included in this SDG.

c. Matrix Spike

No matrix spike was included in this SDG.

d. Duplicates

No duplicate analysis was included in this SDG.

V. Sample Result Verification

Raw data were not checked for this SDG.

VI. Overall Assessment

Data flags are summarized at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG.

ELF Atochem Pesticides Data Qualification Summary - SDG RC672

No data has been qualified for this SDG.

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RC672

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC672

Parameters: Volatiles

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Matrix
MWA3-0-0240	Site Sample	Soil
MWA3-0-0275	Site Sample	Soil
MWA3-4	Site Sample	Water
MWA4-3	Site Sample	Water
MWA4-0	Site Sample	Soil
MWA4-0R	Reanalysis of Site Sample	Soil
MWA4-0-0278	Site Sample	Soil
MWA4-0-0278D	Dilution of Site Sample	Soil
MWA4-0-0300	Site Sample	Soil
MWA1-0-0140	Site Sample	Soil
MWA1-0-0190	Site Sample	Soil
MWA1-0-0190R	Reanalysis of Site Sample	Soil
MWA1-0-0260	Site Sample	Soil
MWA2-0-0240	Site Sample	Soil
MWA2-0-0290	Site Sample	Soil
MWA2-0-0290D	Dilution of Site Sample	Soil
MWA3-0-0220	Site Sample	Soil
07-0-1213	Site Sample	Soil
08-1-1213	Site Sample	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8240B (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8240 requirements and as detailed in the following text.

This review follows EPA Functional Guidelines for Organic Data Review (Revised, February 1994) modified for Method 8240 requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified EPA protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section IV.

Field Duplicates are summarized in Section XI.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Collection dates were not provided for this SDGs. Original samples were analyzed within 14 days of laboratory receipt as required with the following exceptions:

Sample	Holding Time	Associated Analytes	Flag	A or P
MWA4-0-0300	24 days	All target analytes	J(detects)/R(non-detects)	P

II. GC/MS Instrument Performance Check

Instrument performance was checked at the beginning of each 12 hour period during which analysis is performed. All ion abundance requirements were met for BFB as listed below:

m/z	ION ABUNDANCE CRITERIA
50	15.0 - 40.0% of m/z 95
75	30.0 - 60.0% of m/z 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of m/z 95
173	Less than 2.0% of m/z 174
174	>50% of m/z 95
175	5.0 - 9.0% of m/z 174
176	95.0 - 101.0% of m/z 174
177	5.0 - 9.0% of m/z 176

III. Initial Calibration

An initial five-point calibration was performed using the required concentrations at the beginning of the analytical sequence.

Percent relative standard deviations (%RSD) were less than or equal to 30% for all calibration check compounds (CCC).

All non-calibration check compounds had %RSDs less than or equal to 30%.

Average relative response factors (RRF) for all volatile system performance check compounds (SPCC) were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-system performance check compounds had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform) with the following exceptions:

Calibration Date	Analyte	RRF	Associated Samples	Flag	A or P
12/18/96	2-Hexanone	0.252	none	J(detects)/R(non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the beginning of each 12-hour analysis period following the instrument performance check.

The percent difference (%D) between the initial calibration RRF and the continuing calibration RRF were within ±25.0% for all CCCs.

All non-CCCs have percent differences (%D) less than 25%:

All of the SPCC continuing calibration RRF values were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-SPCCs had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform) with the following exceptions:

Calibration Date/Time	Analyte	RRF	Associated Samples	Flag	A or P
12/19/96 11:17	2-Hexanone	0.211	MWA3-4 MWA4-3 08-1-1213	J(detects)/R(non-detects)	A

V. Blanks

Method blank analyses were performed at the required frequencies. Initially no volatile contaminants were reported above the reporting limits. However, the laboratory was asked to calculate acetone and methylene chloride concentrations detected below the reporting limits as these were expected to be present.

Following is a list of blank results and associated samples.

Blank Date	Compound	Concentration (µg/L)	Associated Samples
J0107M01-BLK	Acetone	880J	MWA4-0-0300

No acetone was detected above the reporting limit in the associated sample.

VI. System Monitoring Compounds

Three system monitoring compounds were added to all samples and blanks.

All surrogate recoveries were within the QC limits listed below.

	SOIL	WATER
Toluene-d8	81-117	88-110
Bromofluorobenzene	74-121	86-115
1,2-Dichloroethane-d4	70-121	76-114

with the following exceptions:

Sample	Surrogate	%R	Associated Analytes	Flag	A or P
MWA1-0-0190R	Dibromofluoromethane	4	All target analytes	J(detects)/UJ(non-detects)	A
MWA1-0-0190	Toluene-d8	80	All target analytes	J(detects)/UJ(non-detects)	A
MWA2-0-0290	Toluene-d8	79	All target analytes	J(detects)/UJ(non-detects)	A
MWA4-0-0278	Toluene-d8	70	All target analytes	J(detects)/UJ(non-detects)	A

VII. Matrix Spike/Matrix Spike Duplicates

No matrix spike analysis was included in this SDG.

VIII. Laboratory Control Sample (LCS)

No LCS analysis is required for this method.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard retention times were within ±30 seconds of the retention times of the associated 12-hour calibration standard. All internal standard area counts were within -50 percent to 100 percent of the associated 12-hour calibration standard.

XI. Target Compound Identifications

No raw data review was conducted for this SDG.

XII. Compound Quantitation and CRQLs

No raw data review was conducted for this SDG.

Due to levels of target analytes samples MWA4-0-0278, MWA4-0-0300 and MWA2-0-0290 were analyzed on a diluted basis. The reporting limits have been adjusted accordingly.

The form I lists the dilution factor for samples MWA4-0-0278, MWA4-0-0300 and MWA2-0-0290 as 1.0 however, the case narrative states that this sample was diluted. The reporting

limits for these samples have also been adjusted according to a different dilution factor. The laboratory has been requested to issue a dilution factor table for this project.

XIII. Tentatively Identified Compounds (TICs)

TICs reports were not required for this SDG.

XIV. System Performance

No raw data review was conducted for this SDG, QC data at large indicates acceptable performance.

XV. Overall Assessment of Data

All data were found to be acceptable per specifications as noted above under introduction/summary. Validation flags of an advisory nature are summarized at the end of this report.

XV. Field Duplicates

No field duplicates have been identified for this SDG.

ELF Atochem Volatiles - Data Qualification Summary - SDG RC672

SDG	Sample	Analyte	Flag	A or P	Reason
RC672	MWA4-0-0300	All target analytes	J(detects)/R(non-detects)	P	Holding Time
RC672	MWA1-0-0190R	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery
RC672	MWA1-0-0190	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery
RC672	MWA2-0-0290	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery
RC672	MWA4-0-0278	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery

ELF Atochem Volatiles - Blanks Data Qualification Summary - SDG RC672

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC736

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Dilution	Matrix
GA-MWA1-1	Site Sample	5.00	Water
GA-MWA3-1	Site Sample	1.00	Water
GA-MWA3-2	Site Sample	1.00	Water
GA-MWA2-1	Site Sample	1.00	Water
GA-MWA4-1	Site Sample	5.00	Water
GA-MWA4-3	Site Sample	1.00	Water

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required with the following exceptions:

Sample	Holding Time (Extraction)	Associated Analytes	Flag	A or P
GA-MWA4-3	8 days	All target analytes	J(detects)/UJ(non-detects)	P

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviations (%RSD) were within ±15%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15% with the following exceptions:

Calibration Date/Time	Analyte	%D	Associated Samples	Flag	A or P
1/24/97 00:28	Methoxychlor	19.5	GA-MWA4-1	J(detects)/UJ(non-detects)	A

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks.

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below.

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

b. Laboratory Control Sample

No laboratory control sample was included in this SDG.

c. Matrix Spike

No matrix spike was included in this SDG.

d. Duplicates

No duplicate analysis was included in this SDG.

V. Sample Result Verification

Raw data were not checked for this SDG.

VI. Overall Assessment

Data flags are summarized at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG.

ELF Atochem Pesticides Data Qualification Summary - SDG RC736

SDG	Sample	Analyte	Flag	A or P	Reason
RC736	GA-MWA4-3	All target analytes	J(detects)/UJ(non-detects)	P	Holding Time
RC736	GA-MWA4-1	Methoxychlor	J(detects)/UJ(non-detects)	A	Continuing Calibration

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RC736

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC736

Parameters: Volatiles

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Matrix
GA-MWA1-1	Site Sample	Water
GA-TB1	Site Sample	Water
GA-MWA3-1	Site Sample	Water
GA-MWA3-2	Site Sample	Water
GA-MWA2-1	Site Sample	Water
GA-MWA2-1DL	Dilution of Site Sample	Water
GA-MWA4-1	Site Sample	Water
GA-MWA4-3	Site Sample	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8240B (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8240 requirements and as detailed in the following text.

This review follows EPA Functional Guidelines for Organic Data Review (Revised, February 1994) modified for Method 8240 requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified EPA protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section IV.

Field Duplicates are summarized in Section XI.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Collection dates were not provided for this SDGs. Original samples were analyzed within 14 days of laboratory receipt.

II. GC/MS Instrument Performance Check

Instrument performance was checked at the beginning of each 12 hour period during which analysis is performed. All ion abundance requirements were met for BFB as listed below:

m/z	ION ABUNDANCE CRITERIA
50	15.0 - 40.0% of m/z 95
75	30.0 - 60.0% of m/z 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of m/z 95
173	Less than 2.0% of m/z 174
174	>50% of m/z 95
175	5.0 - 9.0% of m/z 174
176	95.0 - 101.0% of m/z 174
177	5.0 - 9.0% of m/z 176

III. Initial Calibration

An initial five-point calibration was performed using the required concentrations at the beginning of the analytical sequence.

Percent relative standard deviations (%RSD) were less than or equal to 30% for all calibration check compounds (CCC).

All non-calibration check compounds had %RSDs less than or equal to 30%.

Average relative response factors (RRF) for all volatile system performance check compounds (SPCC) were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-system performance check compounds had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform) with the following exceptions:

Calibration Date	Analyte	RRF	Associated Samples	Flag	A or P
12/18/96	2-Hexanone	0.252	All samples in this SDG	J(detects)/R(non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the beginning of each 12-hour analysis period following the instrument performance check.

The percent difference (%D) between the initial calibration RRF and the continuing calibration RRF were within ±25.0% for all CCCs.

All non-CCCs have percent differences (%D) less than 25%:

All of the SPCC continuing calibration RRF values were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-SPCCs had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform) with the following exceptions:

Calibration Date/Time	Analyte	RRF	Associated Samples	Flag	A or P
1/10/97 14:53	2-Hexanone	0.277	GA-MWA4-1 GA-MWA2-1DL	J(detects)/R(non-detects)	A

V. Blanks

Method blank analyses were performed at the required frequencies. Initially no volatile contaminants were reported above the reporting limits. However, the laboratory was asked to calculate acetone and methylene chloride concentrations detected below the reporting limits as these were expected to be present.

VI. System Monitoring Compounds

Three system monitoring compounds were added to all samples and blanks.

All surrogate recoveries were within the QC limits listed below.

	SOIL	WATER
Toluene-d8	81-117	88-110
Bromofluorobenzene	74-121	86-115
1,2-Dichloroethane-d4	70-121	76-114

VII. Matrix Spike/Matrix Spike Duplicates

No matrix spike analysis was included in this SDG.

VIII. Laboratory Control Sample (LCS)

No LCS analysis is required for this method.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard retention times were within ±30 seconds of the retention times of the associated 12-hour calibration standard. All internal standard area counts were within -50 percent to 100 percent of the associated 12-hour calibration standard.

XI. Target Compound Identifications

No raw data review was conducted for this SDG.

XII. Compound Quantitation and CRQLs

No raw data review was conducted for this SDG.

In order to report target analytes within calibration range, samples GA-MWA1-1 and GA-MWA2-1 were analyzed on a diluted basis. The reporting limits have been adjusted accordingly.

The form I lists the dilution factor for samples GA-MWA1-1 and GA-MWA2-1DL as 1.0 however, the case narrative states that this sample was diluted. The reporting limits for these samples have also been adjusted according to a different dilution factor. The laboratory has been requested to issue a dilution factor table for this project.

XIII. Tentatively Identified Compounds (TICs)

TICs reports were not required for this SDG.

XIV. System Performance

No raw data review was conducted for this SDG, QC data at large indicates acceptable performance.

XV. Overall Assessment of Data

All data were found to be acceptable per specifications as noted above under introduction/summary. Validation flags of an advisory nature are summarized at the end of this report.

XV. Field Duplicates

No field duplicates have been identified for this SDG.

ELF Atochem Volatiles - Data Qualification Summary - SDG RC736

SDG	Sample	Analyte	Flag	A or P	Reason
RC736	GA-MWA1-1 GA-TB1 GA-MWA3-1 GA-MWA3-2 GA-MWA2-1 GA-MWA2-1DL GA-MWA4-1 GA-MWA4-3	2-Hexanone	J(detects)/R(non-detects)	A	Initial Calibration RRF
RC736	GA-MWA4-1 GA-MWA2-1DL	2-Hexanone	J(detects)/R(non-detects)	A	Continuing Calibration RRF

ELF Atochem Volatiles - Blanks Data Qualification Summary - SDG RC736

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RD099

Parameters: Pesticides

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Matrix
GA-MWA1-1	Site Sample	Water
GA-MWA2-1	Site Sample	Water
GA-MWA3-1	Site Sample	Water
GA-MWA4-1	Site Sample	Water
GA-MWA4-1DL	Dilution of Site Sample	Water
GA-MW99-2	Site Sample	Water
GA-MW99-2DL	Dilution of Site Sample	Water
GA-MWA4-3	Site Sample	Water

Introduction

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8080A (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8080A requirements and as detailed in the following text.

This review follows Method 8080A requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from method protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section III.

Field Duplicates are summarized in Section VII.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above with the exception of protocol violations for the initial calibration. These protocol violations did not lead to the rejection of any data.

I. Holding Times

Original samples were extracted within 7 days of laboratory receipt and analyzed within 40 days of extraction as required.

II. Calibration

a. Initial Calibration

A five point initial calibration was carried out as required. The percent relative standard deviations (%RSD) were within ±15% with the following exceptions:

Calibration Date/ Column	Analyte	%RSD	Associated Samples	Flag	A or P
3/21 Primary	alpha-BHC	17.01	All samples in this SDG	J(detects)/UJ(non-detects)	P
	gamma-BHC	18.07			
	delta-BHC	16.24			
	Heptachlor	16.69			
	Aldrin	17.99			
	Heptachlor epoxide	17.57			
	Endosulfan I	19.01			
	4,4'-DDE	19.24			
	Dieldrin	17.19			
	Endrin	18.24			
	Endosulfan II	17.13			
	4,4'-DDD	15.92			
	Endrin Aldehyde	16.58			
	Endosulfan sulfate	19.58			
	4,4'-DDT	16.30			
3/21 Primary	Methoxychlor	21.99	All samples in this SDG	none	A
3/21 Confirmation	gamma-BHC	19.71	All samples in this SDG	none	P
	delta-BHC	17.53			
	Heptachlor epoxide	19.61			
	Endosulfan I	18.74			
	4,4'-DDE	19.17			
	Dieldrin	18.78			
	Endrin	17.98			
	4,4'-DDD	16.18			
	Endosulfan II	19.00			
	4,4'-DDT	15.65			
	Endrin Ketone	19.66			
	DCB	15.75			
3/21 Confirmation	alpha-BHC	21.51	All samples in this SDG	none	A
	Heptachlor	20.96			
	Aldrin	20.65			
	Methoxychlor	23.70			

When the relative standard deviation (RSD) is >15% the laboratory is supposed to quantitate using the calibration curve. The laboratory only did this for compounds where the RSD is >20%.

b. Calibration Verification

Continuing calibration was performed at least once every 12 hours.

All percent differences (%D) between the initial average relative response factor (RRF) and the continuing RRF were less than 15% with the following exceptions:

Calibration Date/ Column	Analyte	%D	Associated Samples	Flag	A or P
3/22 Confirmation	4,4'-DDT Methoxychlor	-25.93 -16.07	GA-MWA1-1 GA-MWA2-1 GA-MWA3-1 GA-MWA4-1 GA-MW99-2	none	A
3/25 Confirmation	Endrin 4,4'-DDD Methoxychlor	-17.23 -17.62 -19.94	none	none	A

Samples are not flagged due to exceedances on the confirmation column only.

III. Blanks

Method blanks were performed per extraction batch as required.

Data qualification by the method blanks was based on the maximum contaminant concentration in the method blank in the analysis of each analyte. No pesticide contaminant concentrations were found above the reporting limit in the method blanks.

IV. Accuracy and Precision Data

a. Surrogate Recovery

Surrogates were added to all samples as required per the method. All surrogate recoveries (%R) for the undiluted samples were within laboratory specific QC limits as listed below

	SOIL	WATER
Tetrachloro-m-xylene	51-98	47-101
Decachlorobiphenyl	0-113	27-123

with the following exceptions:

Sample	Surrogate/ Column	%R	Associated Analytes	Flag	A or P
GA-MWA1-1	DCB (DB-5)	17	All target analytes	J(detects)/UJ(non-detects)	A
GA-MWA4-1	DCB (DB-5) DCB (DB-1701)	21 14	All target analytes	J(detects)/UJ(non-detects)	A
GA-MW99-2	DCB (DB-5) DCB (DB-1701)	23 16	All target analytes	J(detects)/UJ(non-detects)	A
GA-MWA4-1	DCB (DB-1701)	23	All target analytes	J(detects)/UJ(non-detects)	A
GA-MW99-2	DCB (DB-1701)	20	All target analytes	J(detects)/UJ(non-detects)	A

b. Laboratory Control Sample

One laboratory control sample was analyzed for this SDG.

All percent recoveries were within laboratory specific QC limits.

The spike recoveries for the laboratory control spike duplicate were low due to spillage of extract during sample preparation. It is the opinion of the reviewer that the results do not accurately reflect the quality of data and are therefore not considered.

c. Matrix Spike

No matrix spike was included in this SDG.

d. Duplicates

No duplicate analysis was included in this SDG.

V. Sample Result Verification

Raw data were not checked for this SDG.

VI. Overall Assessment

Data flags are summarized at the end of the report.

VII. Field Duplicates

No field duplicates were identified for this SDG.

ELF Atochem Pesticides Data Qualification Summary - SDG RD099

SDG	Sample	Analyte	Flag	A or P	Reason
RD099	GA-MWA1-1 GA-MWA2-1 GA-MWA3-1 GA-MWA4-1 GA-MWA4-1DL GA-MW99-2 GA-MW99-2DL GA-MWA4-3	alpha-BHC gamma-BHC delta-BHC Heptachlor Aldrin Heptachlor epoxide Endosulfan I 4,4'-DDE Dieldrin Endrin Endosulfan II 4,4'-DDD Endrin Aldehyde Endosulfan sulfate 4,4'-DDT	J(detects)/UJ(non-detects)	P	Initial Calibration
RD099	GA-MWA1-1 GA-MWA2-1 GA-MWA3-1 GA-MWA4-1 GA-MWA4-1DL GA-MW99-2 GA-MW99-2DL GA-MWA4-3	gamma-BHC delta-BHC Heptachlor epoxide Endosulfan I 4,4'-DDE Dieldrin Endrin 4,4'-DDD Endosulfan II 4,4'-DDT Endrin Ketone DCB	none	P	Initial Calibration
RD099	GA-MWA1-1	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery
RD099	GA-MWA4-1	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery
RD099	GA-MW99-2	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery
RD099	GA-MWA4-1	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery
RD099	GA-MW99-2	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery

ELF Atochem Pesticides Blank Data Qualification Summary - SDG RD099

No data has been qualified for this SDG.

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): RC255

Parameters: Volatiles

Laboratory: Quality Analytical Laboratory

Sample ID	Description	Matrix
GA-GW5	Site Sample	Water
GA-GW5DL	Dilution of Site Sample	Water
GA-GW6	Site Sample	Water
GA-GW7	Site Sample	Water
GA-GW10	Site Sample	Water
GA-GW11	Site Sample	Water
GA-GW11MS	Matrix Spike	Water
GA-GW11MSD	Matrix Spike Duplicate	Water
GA-GW8	Site Sample	Water
GA-GW8DL	Dilution of Site Sample	Water
GA-GW9	Site Sample	Water
RP-10996-4	Site Sample	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8240B (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8240 requirements and as detailed in the following text.

This review follows EPA Functional Guidelines for Organic Data Review (Revised, February 1994) modified for Method 8240 requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified EPA protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section IV.

Field Duplicates are summarized in Section XI.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Collection dates were not provided for this SDGs. Samples were analyzed within 14 days of laboratory receipt as required.

II. GC/MS Instrument Performance Check

Instrument performance was checked at the beginning of each 12 hour period during which analysis is performed. All ion abundance requirements were met for BFB as listed below:

m/z	ION ABUNDANCE CRITERIA
50	15.0 - 40.0% of m/z 95
75	30.0 - 60.0% of m/z 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of m/z 95
173	Less than 2.0% of m/z 174
174	>50% of m/z 95
175	5.0 - 9.0% of m/z 174
176	95.0 - 101.0% of m/z 174
177	5.0 - 9.0% of m/z 176

III. Initial Calibration

An initial five-point calibration was performed using the required concentrations at the beginning of the analytical sequence.

Percent relative standard deviations (%RSD) were less than or equal to 30% for all calibration check compounds (CCC).

All non-calibration check compounds had %RSDs less than or equal to 30%.

Average relative response factors (RRF) for all volatile system performance check compounds (SPCC) were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-system performance check compounds had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform).

IV. Continuing Calibration

Continuing calibration was performed at the beginning of each 12-hour analysis period following the instrument performance check.

The percent difference (%D) between the initial calibration RRF and the continuing calibration RRF were within ±25.0% for all CCCs.

All non-CCCs have percent differences (%D) less than 25%:

All of the SPCC continuing calibration RRF values were greater than or equal to 0.300 (greater than 0.250 for bromoform).

All non-SPCCs had average relative response factors greater than or equal to 0.300 (greater than 0.250 for bromoform).

V. Blanks

Method blank analyses were performed at the required frequencies. Initially no volatile contaminants were reported above the reporting limits. However, the laboratory was asked to calculate acetone and methylene chloride concentrations detected below the reporting limits as these were expected to be present.

Following is a list of blank results and associated samples.

Blank Date	Compound	Concentration (µg/L)	Associated Samples
M1015W01BLK	Acetone	2.6J	GA-GW10 GA-GW5 GA-GW8
M1016W01BLK	Acetone	4.5J	GA-GW11 GA-GW5DL GA-GW6 GA-GW7 GA-GW8DL GA-GW9 RP-10996-4 GA-GW11MS GA-GW11MSD

Sample	Analyte	Reported Concentration	Modified Final Concentration
GA-GW5DL	Acetone	460D	460U
GA-GW10	Acetone	34	34U
GA-GW8DL	Acetone	74D	74U
GA-GW9	Acetone	11	11U

VI. System Monitoring Compounds

Three system monitoring compounds were added to all samples and blanks.

All surrogate recoveries were within the QC limits listed below

	SOIL	WATER
Toluene-d8	81-117	88-110
Bromofluorobenzene	74-121	86-115
1,2-Dichloroethane-d4	70-121	76-114

with the following exceptions:

Sample	Surrogate	%R	Associated Analytes	Flag	A or P
GA-GW5	Toluene-d8 Bromofluorobenzene	121 118	All target analytes	J(detects)/UJ(non-detects)	A

This sample was reanalyzed on a diluted basis. The surrogate recoveries of the diluted sample were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

An MS/MSD pair was analyzed at the frequency of one per every 20 samples.

All percent recoveries were within the QC limits specified on CLP Form III VOA-1.

Matrix spike data will be evaluated on a project-wide basis.

VIII. Laboratory Control Sample (LCS)

No LCS analysis is required for this method.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard retention times were within ±30 seconds of the retention times of the associated 12-hour calibration standard. All internal standard area counts were within -50 percent to 100 percent of the associated 12-hour calibration standard.

XI. Target Compound Identifications

No raw data review was conducted for this SDG.

XII. Compound Quantitation and CRQLs

No raw data review was conducted for this SDG.

Due to levels of target analytes samples GA-GW6 and GA-GW11 were analyzed on a diluted basis. In order to report target analytes within calibration range, samples GA-GW5 and GA-GW8 were reanalyzed on a diluted basis. The reporting limits have been adjusted accordingly.

The form I lists the dilution factor for samples GA-GW5DL, GA-GW6DL, GA-GW11DL, and GA-GW8DL as 1.0 however, the case narrative states that this sample was diluted. The reporting limits for these samples have also been adjusted according to a different dilution factor. The laboratory has been requested to issue a dilution factor table for this project.

XIII. Tentatively Identified Compounds (TICs)

TICs reports were not required for this SDG.

XIV. System Performance

No raw data review was conducted for this SDG, QC data at large indicates acceptable performance.

XV. Overall Assessment of Data

All data were found to be acceptable per specifications as noted above under introduction/summary. Validation flags of an advisory nature are summarized at the end of this report.

XV. Field Duplicates

No field duplicates have been identified for this SDG.

ELF Atochem Volatiles - Data Qualification Summary - SDG RC255

SDG	Sample	Analyte	Flag	A or P	Reason
RC255	GA-GW5	All target analytes	J(detects)/UJ(non-detects)	A	Surrogate Recovery

ELF Atochem Volatiles - Blanks Data Qualification Summary - SDG RC255

Sample	Analyte	Reported Concentration	Modified Final Concentration
GA-GW5DL	Acetone	460D	460U
GA-GW10	Acetone	34	34U
GA-GW8DL	Acetone	74D	74U
GA-GW9	Acetone	11	11U

Data Validation Report

Project/Site Name: Elf Atochem

Sample Delivery Group (SDG): 611645

Parameters: Volatiles

Laboratory: American Environmental Network, Inc.

Sample ID	Description	Matrix
GA-GW12-1	Site Sample	Water
GA-GW13-1	Site Sample	Water
GA-GW14-1	Site Sample	Water
GA-GW15-1	Site Sample	Water
GA-GW15-4	Site Sample	Water
GA-GW16-1	Site Sample	Water
GA-GW17-1	Site Sample	Water
GA-GW18-1	Site Sample	Water

Introduction/Summary

This data review report covers the sample delivery group and associated samples listed on the cover sheet. The analyses were per USEPA Method 8260 (Test Methods for Evaluating Solid Waste -SW846, 3rd Ed., Rev. 1 1992). The quality assurance and quality control procedures (QA/QC) were per Method 8260 requirements and as detailed in the following text.

This review follows EPA Functional Guidelines for Organic Data Review (Revised, February 1994) modified for Method 8260 requirements; the following subsections correlate to the above guidelines. The sections detail noted deviations if any. Tables summarizing all data qualification flags are provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified EPA protocols or is of a technical advisory nature per sample matrix or method limitation.

Blank results are summarized in Section IV.

Field Duplicates are summarized in Section XI.

Raw data checks were not carried out for this SDG. The review was performed based on QC data.

All data were found to be acceptable per specifications noted above; data qualifiers, if any, summarized at the end of this report are of technical advisory nature and not due to laboratory error or deviation from specified protocols.

I. Holding Times

Samples were analyzed within 14 days of collection as required.

II. GC/MS Instrument Performance Check

No tuning data was included with this SDG.

III. Initial Calibration

No calibration data was included with this SDG.

IV. Continuing Calibration

No calibration data was included with this SDG.

V. Blanks

Method blank analyses were performed at the required frequencies. The following is a summary of blank detects and associated qualifiers.

Blank	Analyte	Concentration (µg/L)	Associated Samples	A or P
Method Blank	Methylene Chloride	3.4	All samples in this SDG	A

Sample	Analyte	Reported Concentration (µg/L)	Modified Final Concentration (µg/L)
GA-GW12-1	Methylene Chloride	25	25U
GA-GW13-1	Methylene Chloride	510	510U
GA-GW15-4	Methylene Chloride	13	13U

VI. System Monitoring Compounds

Three system monitoring compounds were added to all samples and blanks.

All surrogate recoveries were within the QC limits listed below:

Analyte	%R
1,2-Dichloroethane-d4	72-128
Toluene-d8	70-129
Bromofluorobenzene	66-132

VII. Matrix Spike/Matrix Spike Duplicates

Two MS/MSD pairs were analyzed.

All percent recoveries were within the QC limits listed below:

Analyte	%R	RPD
Benzene	82-134	20
Chlorobenzene	86-124	20
1,1-Dichloroethene	64-125	20
Toluene	85-133	20
Trichloroethene	87-131	20

Sample data qualifications for all MS/MSD results will be included in the site report.

VIII. Laboratory Control Sample (LCS)

No LCS analysis is required for this method.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

No internal standards data was provided.

XI. Target Compound Identifications

No raw data review was conducted for this SDG.

XII. Compound Quantitation and CRQLs

No raw data review was conducted for this SDG. Laboratory specific method detection limits were established per 40 CFR Part 136 Appendix B and have been provided along with the data validation reports under a separate cover.

XIII. Tentatively Identified Compounds (TICs)

TICs reports were not required for this SDG.

XIV. System Performance

No raw data review was conducted for this SDG. Qualification indicates acceptable performance.

XV. Overall Assessment of Data

All data were found to be acceptable per specifications as noted above under introduction/summary. Validation flags of an advisory nature are summarized at the end of this report.

ELF Atochem Volatiles - Data Qualification Summary - SDG 611645

No data has been qualified for this SDG.

ELF Atochem Volatiles - Blanks Data Qualification Summary - SDG 611645

Sample	Analyte	Reported Concentration	Modified Final Concentration
GA-GW12-1	Methylene Chloride	25	25U
GA-GW13-1	Methylene Chloride	510	510U
GA-GW15-4	Methylene Chloride	13	13U

Appendix H
Boring Logs

Project No: 8601192.001.0521

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : US-01

Ground surface: Coarse sand

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0	SO0174	0				GW	Silty, sandy GRAVEL, black (5Y2.5/1) to dark gray (5Y4/1), slightly moist, no odor.	
1	SO0175	24.9					Same as above w/ pale yellow clay nodules and black fiberous material.	
2	SO0176	46.6				SM	Fine to medium silty SAND, brown (7.5YR4/2), slightly moist, no odor.	
3	SO0177	0						
4							Total depth 4.0' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 4 January 1999

Well Casing Elevation: NA

Ground Surface Elevation: 33.89'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0621

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : US-02

Ground surface: Coarse sand

Geologist: Jeffrey W. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0	SO0178	0				GW	Silty, sandy GRAVEL, dark gray-brown (7YR3/2), slightly moist.	
1	SO0179	0						
2	SO0180	0					Same as above	
3	SO0181	0						
4							Total depth 4.0' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 4 January 1999

Well Casing Elevation: NA

Ground Surface Elevation: 33.81'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0621

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : US-03

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0	SO0182	0				GW	Silty, fine to medium, sandy GRAVEL w/ trace crystalline material, slightly moist.	
1	SO0183	0						
2	SO0184	0						
3	SO0185	0						
4							Total depth 4.0' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 4 January 1999

Well Casing Elevation: NA

Ground Surface Elevation: 33.63'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

ERM
915 118th Avenue SE
Suite 150
Bellevue, WA 98005
(425) 462-9591

BOREHOLE LOG

Site Id: MWA-37

Project Number: 5226.60
Project Name: ATOFINA Chemicals – Monitoring Well Installation
Location: Portland, Oregon
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: T. Browning
Date(s): 11/21/03
Initial Water Level: N/A

Total Depth: 33.50'
Completed Depth: 33.00'
Borehole Dia.: 10.00in

Blank Casing:				
type: Sch 40 PVC	dia: 2.00in	fm: 0.0'	to: 23.00'	
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 23.00'	to: 33.00'
Annular Fill:				
type: Grout			fm: 0.00'	to: 18.00'
type: Bentonite			fm: 18.00'	to: 21.00'
type: Sand Filter			fm: 21.00'	to: 33.50'

Depth (ft)	Graphic Log	USCS Code	Well Construction	Sample Recovery	% Recovery	Description/Soil Classification
						Asphalt/Gravel Base
		SM				SILTY SAND (SM): dark brown, fine to medium grained, medium dense, moist.
5					22	
10					61	SILTY SAND (SM): dark gray, interbedded with brown to dark gray silt.
		ML				SILT (ML): dark greenish gray, firm, moist.
15					16	
20					0	
		SM				SILTY SAND (SM): dark brown, dense, moist.
					<33	

ERM
915 118th Avenue SE
Suite 130
Bellevue, WA 98005
(425) 462-8591

BOREHOLE LOG

Project Number: 5226.60
Project Name: ATOFINA Chemicals – Monitoring Well Installation
Location: Portland, Oregon
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: T. Browning
Date(s): 11/21/03
Initial Water Level: N/A

Total Depth: 33.50'
Completed Depth: 33.00'
Borehole Dia.: 10.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 23.00'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 23.00'	to: 33.00'
Annular Fill:				
type: Grout			fm: 0.00'	to: 18.00'
type: Bentonite			fm: 18.00'	to: 21.00'
type: Sand Filter			fm: 21.00'	to: 33.50'

Depth (ft)	Graphic Log	USCS Code	Well Construction	Sample Recovery	% Recovery	Description/Soil Classification
30		▽			<33	Total Depth – 33.5' bgs Note: 18.0" samples collected between 23 and 33 feet contained 2 6.0" brass liners for geotechnical and analytical testing. Soil descriptions were made with remaining soil.
					<33	
					<33	
					<33	
					<33	
35					<33	
40						
45						

Project No: 8601192.001.0621

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : B-49

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0						GW	Silty, sandy GRAVEL.	
1	SO0149	0				SM	Fine to medium, silty SAND, grayish brown (10YR5/2), slightly moist, no odor.	
2	SO0150	0						
3	SO0151	0						
4	SO0152	0				ML SM	SILT, light gray (10YR7/2). Fine to medium, silty SAND, grayish brown (10YR5/2) slightly moist, no odor.	
5	SO0153	0				ML	Grading to micaceous SILT, grayish-brown (10YR5/2) wet, no odor.	
6	SO0154	0						
7	SO0155	0						
8	SO0156	43.3						
9	SO0157	0						
10	SO0158	0						
11							Total depth 8' BGS	
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 4 January 1999

Well Casing Elevation: NA

Ground Surface Elevation: 34.64'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0621

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : B-50

Ground surface: Asphalt

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1	SO0139	3.1				GW	Silty, sandy GRAVEL, dark gray-brown (10YR 3/2) slightly moist.	
2	SO0140	4				SM	Silty SAND, dark gray-brown (10YR3/2), slightly moist, no odor.	
3	SO0141	0				SP	Fine to medium SAND, dark gray-brown (10YR3/2), no odor.	
4	SO0142	1.1				ML	Grading to micaceous SILT, dark gray-brown (10YR3/2), wet, no odor.	
5	SO0143	3.1				SM	Silty SAND, dark gray-brown (10YR 3/2), wet, no odor.	
	SO0144	22.2						
	SO0145	3.4						
6	SO0146	43						
7	SO0147	3.1				ML	SILT, dark gray (2.5Y 4/1), wet, no odor, grading to very dark gray-brown (10YR4/3), wet, no odor.	
8	SO0148	0						
							Total depth 8.0' BGS	
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 4 January 1999

Well Casing Elevation: NA

Ground Surface Elevation: 34.52'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0621

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : B-51

Ground surface: Asphalt

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1	SO0129	NM				SP	Fine to medium SAND w/ trace silt (~ 1-2%) and gravel, very dark gray-brown (10YR3/2), moist, no odor.	
	SO0130	NM				ML	SILT lens (1/4" thick).	
2	SO0131	NM				SP	Fine to medium SAND w/ trace silt (~ 1-2%), very dark gray-brown (10YR3/2), slightly moist, no odor.	
3	SO0132	NM						
4	SO0133	0						
	SO0134	0						
5	SO0135	2.2						
6	SO0136	3.1						
	SO0137	2.2						
7	SO0138	13						
8							Total depth 8.0' BGS	
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 4 January 1999

Well Casing Elevation: NA

Ground Surface Elevation: 35.56'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 6601192.001.0621
Project: Acid Plant RI
Client: Elf Atochem
Location: Portland, OR

Borehole : B-51b
Ground surface: Asphalt
Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0171	0				SP	Fine to medium SAND w/ trace silt (~ 1-2%) and gravel, very dark gray-brown (10YR3/2), moist, no odor.	
1	SO0172	0						
2	SO0173	0						
							Total depth 2.0' BGS	

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 4 January 1999

Well Casing Elevation: NA
Ground Surface Elevation: 35.81'
Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0621

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : B-52

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1	SO0159	0				SP	Fine to medium SAND w/ trace silt (~ 1-2%), dark gray -brown (10YR4/2), slightly moist, no odor	
2	SO0160	0						
3	SO0161	0						
4	SO0162	0						
5	SO0163	0						
6	SO0164	0						
7	SO0165	0						
8	SO0166	0						
9	SO0167	0						
10	SO0168	6.7					Total depth 8' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 4 January 1999

Well Casing Elevation: NA

Ground Surface Elevation: 34.13'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0621
Project: Acid Plant RI
Client: Elf Atochem
Location: Portland, OR

Borehole : B-53
Ground surface: Asphalt
Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1						GW	Gravel fill	
2	SO0252	84	95%	7 7 4				
3						ML	SILT, black w/ trace pink sands, dry, strong odor.	
4	SO0253	1597	50%	4 4 3			White friable crystalline material and pink banding at 4.5', dry grading to moist.	
5	SO0254	14	80%	4 6 5		SW	Fine to coarse SAND, pinkish white (2.5Y8/2), slightly moist, strong odor.	
6	SO0255	4	100%	5 5 6				
8	SO0256	8.6	100%	4 5 6			Trace gravel (~ 2%), well-rounded, slight odor.	
10	SO0257	2.2	100%	6 7 8				
11	SO0258	2.2	100%	7 8 10			With thin black bands (staining), slightly moist, slight odor.	
13	SO0259	1.3	100%	10 14 15				
14	SO0260	1.3	100%	9 11 15				
16	SO0261	10.4	100%	10 11 15			Trace silt (~ 5%), color change to dark red-gray (2.5YR3/1), moist.	
17	SO0262	1.3	100%	5 15 12			Color change to reddish gray (2.5YR6/1), moist.	
18	SO0263	1.2	100%	5 12 16			Silt horizons, color change to dark red-gray (2.5YR3/1), slightly moist, slight odor.	
20	SO0264	1.3	100%	5 7 16				

Drilled By: Cascade Drilling
Drill Method: Hollow Stem Auger
Drill Date: 13 January 1999

Well Casing Elevation: NA
Ground Surface Elevation: 34.10'
Borehole Diameter: 10-1/4"

Datum: City of Portland Datum - 1929

EX™

Project No: 8601192.001.0621
Project: Acid Plant RI
Client: Elf Atochem
Location: Portland, OR

Borehole: B-53
Ground surface: Asphalt
Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
20								
21						SW	Fine to coarse SAND, reddish gray (2.5YR6/1), wet, slight odor	
22	SO0265	4	100%	8 12 11				
23	SO0266	1.3	100%	5 12 14				
24								
25	SO0267	3.1	100%	7 8 12			As above with gravel, slight color change to, reddish gray (2.5YR5/1)	
26	SO0268	1592	100%	12 20 22				
27								
28	SO0269	1405	100%	12 20 25			Residual NAPL visible from 27-30' BGS.	
29	SO0270	1132	100%	16 18 22				
30							Total depth 30.0' BGS	
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Drilled By: Cascade Drilling
Drill Method: Hollow Stem Auger
Drill Date: 13 January 1999

Well Casing Elevation: NA
Ground Surface Elevation: 34.10'
Borehole Diameter: 10-1/4"

Datum: City of Portland Datum - 1929

EX™

Project No: 8801192.001.0621

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : B-54

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1	SO0302	5.3	20%			GM	Silty GRAVEL, dark gray-brown (10YR 4/2) moist, no odor.	
2	SO0303	3.6	20%					
3	SO0304	2.3	20%					
4	SO0305	2.6	50%			SM	Silty fine SAND, brown (10YR 4/3), moist, no odor	
5	SO0306	18.3	100%					
6	SO0307	3.9	100%				Grading finer with depth, moist to wet, no odor.	
7	SO0308	3.9	100%			ML/ CL	Clayey SILT, dark gray (2.5 Y 4/1) slightly plastic, wet, no odor.	
8	SO0309	5.3	100%					
9	SO0310	10.3	100%					
10	SO0311	3.9	100%					
11							Total depth 10' BGS	
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 19 February 1999

Well Casing Elevation: NA

Ground Surface Elevation: Not measured

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0621
Project: Acid Plant RI
Client: Elf Atochem
Location: Portland, OR

Borehole : B-55

Ground surface: Coarse gravel
Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1						GW	GRAVEL fill.	
2	SO0271	3.9	50%			SM	Silty SAND gray (10 YR 5/1) wet, no odor.	
3	SO0272	5.3	100%					
4	SO0273	2.6	80%					
5	SO0274	2.6	100%					
6	SO0275	2.6	100%				As above w/ color change to pale yellow (2.5 Y 8/2) slight odor.	
7	SO0276	2.6	100%			ML	Fine, sandy SILT, pale yellow (2.5 Y 8/2), wet, slight odor.	
8	SO0277	2.6	100%					
9	SO0278	2.6	100%				changing to gravish brown (2.5 Y 5/2), wet, slight odor.	
10	SO0279	2.6	100%					
11	SO0280	2.6	100%				As above w/ trace wood debris, color change to dark gray-brown (2.5 Y 4/2), moist, no odor.	
12	–	–	0%			SP	Fine to medium SAND w/ trace silt, dark brown (7.5 YR 3/3) w/ rust red stained organics, moist, no odor.	
13	SO0281	3.9	100%					
14	SO0282	3.9	100%					
15	SO0283	2.6	100%					
16								
17								
18								
19								
20	SO0284	89.9	100%				Groundwater encountered @ approx. 20' BGS	

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 19 February 1999

Well Casing Elevation: NA
Ground Surface Elevation: Not measured
Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

EX™

Project No: 8601192.001.0621

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole: B-55

Ground surface: Coarse gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
20								
21						SP	Fine to medium SAND w/ trace silt, dark brown (7.5 YR 3/3) with rust red stained organics, wet, no odor.	
22								
23								
24	SO0285	9.3	100%		X			
25							Total depth 25.0' BGS	
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 19 February 1999

Well Casing Elevation: NA

Ground Surface Elevation: Not measured

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Project No: 8601192.001.0632

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : B-56

Ground surface: Coarse gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1						GW	Gravel fill.	
2	SO0286	0.0	50%			ML	Sandy SILT w/ trace gravel, very dark brown (10 YR, 4/2) moist, no odor.	
3	SO0287	0.0	50%					
4	SO0288	7.9	50%					
5	SO0289	3.9	50%					
6	SO0290	132	50%					
7	SO0291	1427	50%			SP	Fine to medium SAND w/ trace silt, dark brown (7.5 YR 3/3), moist, moderate odor.	
8	SO0292	261	80%					
9	SO0293	63.9	75%					
10	SO0294	98.9	100%					
11	SO0295	11.9	100%					
12	SO0296	6.6	100%					
13	SO0297	6.6	100%					
14	SO0298	221	100%					
15	SO0299	90.6	100%			ML	SILT w/ trace gravel.	
16						SP	Fine to medium SAND w/ trace silt, dark brown (7.5 YR 3/3), moist, slight odor.	
17								
18								
19	SO0300	89.9	100%				Groundwater encountered @ approx. 20' BGS.	
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 19 February 1999

Well Casing Elevation: NA

Ground Surface Elevation: Not measured

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

EX™

Project No: 8601192.001.0632

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole: B-56

Ground surface: Coarse gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
20								
21						SP	Fine to medium SAND w/ trace silt, dark brown (7.5 YR 3/3), wet, slight odor.	
22								
23								
24	SO0301	202	100%		X			
25							Total depth 25.0' BGS	
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 19 February 1999

Well Casing Elevation: NA

Ground Surface Elevation: Not measured

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 2 of 2

Project No: 8601192.001.0723

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : B-57

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0	SO0314	0	20%			GW	Sandy GRAVEL, dark grey (10YR 4/1) slightly moist	
1	SO0315	0	100%			SM	fine to medium silty SAND, very dark grey-brown (10YR 3/2) to dark grey-brown (2.5YR 4/2), moist	
2	SO0316	0	100%					
3	SO0317	0	100%			SM/ ML	Grading to fine, sandy, micaceous SILT, dark grey-brown (2.5YR 4/2), moist	
4	SO0318	0	100%			ML	micaceous SILT, dark grey-brown (2.5YR 4/2), moist	
5	SO0319	0	100%					
6	SO0320	0	100%					
7	SO0321	0	100%					
8							Total depth 8' BGS	
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 3 August 1999

Well Casing Elevation: NA

Ground Surface Elevation: 34.60'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0723

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : B-58

Ground surface: Asphalt

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1	SO0322	24.7	50%			GW	Sandy GRAVEL, dark grey (10YR 4/1), slightly moist	
2	SO0323	0	100%			ML	Micaceous SILT, light olive brown (2.5YR 5/3), slightly moist	
3	SO0324	0	100%			SM/ ML	Fine sandy, micaceous SILT to silty fine micaceous SAND, olive brown (2.5YR 4/3)	
4	SO0325	0	100%					
5	SO0326	3.0	100%			ML	SILT, dark olive brown (2.5Y 3/3), moist	
6	SO0327	0	100%					
7	SO0328	0	100%					
8	SO0329	0	100%				As above w/ rust red mottling, wet	
9							Total depth 8' BGS	
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 3 August 1999

Well Casing Elevation: NA

Ground Surface Elevation: 34.10'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0723

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole : B-59

Ground surface: Asphalt

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1						GW	Cuttings indicate sandy GRAVEL, dark grey (10YR 4/1), slightly moist	
2	SO0331	0	0%			SM	Silty fine to medium SAND, dark grey-brown (2.5Y 4/2), moist	
3	SO0332	0	100%				as above w/ fine to medium SAND lenses <1/4" thick and brick fragments, moist	
4	SO0333	0	100%					
5	SO0334	0	100%			ML	SILT lens ~4" thick w/ carbonized organics	
6						SM	Silty fine to medium SAND	
7	SO0335	0	100%			ML	SILT, dark grey-brown (2.5Y 4/2), wet	
8							becomes wet	
9	SO0336	0	100%				as above w/ color change to very dark grey (5Y 3/1), wet	
10								
11	SO0337	0	100%					
12						SM/ ML	Grading to silty very fine SAND to very fine sandy SILT, black (5Y 2.5/1), wet	
13	SO0338	0	100%					
14							SILT lens ~ 1/4" thick, black (5Y 2.5/1), moist	
15	SO0339	0	100%					
16							No recovery	
17			0%			SP		
18							Fine to medium SAND w/ trace silt ~2% and occasional fine to medium gravel, very dark grey to black (5Y 3/1 to 2.5/1), wet	
19	SO0340	0	100%					
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 3 August 1999

Well Casing Elevation: NA

Ground Surface Elevation: Not measured

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

EX™

Project No: 8601192.001.0723

Project: Acid Plant RI

Client: Elf Atochem

Location: Portland, OR

Borehole: B-59

Ground surface: Asphalt

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
20								
21			0%				No recovery, heaving sand	
22							Fine to medium SAND w/ trace silt – 2%, very dark grey to black (5Y 3/1 to 2.5/1), wet	
23	SO0341	0	90%				Fine to medium gravel lens @ 23.75'	
24							as above, increasing silt fraction, dense, moist	
25							Total depth 24.0' BGS	
26							Groundwater sample collected from temporary screen at 20-24' BGS	
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 3 August 1999

Well Casing Elevation: NA

Ground Surface Elevation: Not measured

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Project No: 8601192.002.0301
Project: Acid Plant RI
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Borehole : B-60

Ground surface: Asphalt
Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0	SO0913	0.0	100%	NA		SM/SP	Slightly silty, fine to medium SAND w/ trace fine gravel, olive-brown (2.5Y 4/3), slightly moist.	BACKFILLED w/ BENTONITE GROUT
1	SO0914	1.8	100%	NA				
2	SO0915	1.8	100%	NA				
3	SO0916	0.0	100%	NA				
4	SO0917	0.0	100%	NA		SM/ML	Silty fine, SAND to fine, sandy SILT w/ trace large gravel, grayish-brown (2.5Y 5/2), micaceous, slightly moist.	
5	SO0918	0.0	100%	NA		ML	SILT, grayish-brown (2.5Y 5/2), micaceous, moist.	
6	SO0919	0.0	100%	NA				
7	SO0920	0.0	100%	NA				
8			10%				Color change to dark gray-brown (2.5Y 4/2), moist to wet.	
9			10%					
10	SO0921	0.0	100%	NA			As above w/ trace fine to medium gravel and some rust red mottling.	
11			10%					
12	SO0922	0.0	100%	NA			Color change to very dark gray (5Y 3/1), moist to wet.	
13	SO0923	0.0	100%	NA				
14	SO0924	0.0	100%	NA			As above w/ trace carbonized wood debris.	
15	SO0925	0.0	100%	NA				
16	SO0926	0.0	100%	NA			As above w/ no wood debris.	
17	SO0927	0.0	100%	NA				
18	SO0928	0.0	100%	NA				
19								
20								

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 18 July 2000

Well Casing Elevation: NA
Ground Surface Elevation: 34.16'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

EX™

Project No: 8601192.002.0301

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-60

Ground surface: Asphalt

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
20	SO0929	0.0	100%	NA		ML	As above.	BACKFILLED w/ BENTONITE GROUT
21						SP	Fine to medium SAND, black (2.5Y 5.5/1), wet volcanic material.	
22							Total borehole depth 21.0' BGS Groundwater sample GW070003 collected from 9 to 13' BGS.	
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 July 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.16'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Project No: 8601192.002.0301

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-61

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0	SO0884	0.0	100%	NA		SP	Fine to medium SAND w/ trace gravel, dark gray-brown (10YR 4/2), dry.	BACKFILLED w/ BENTONITE GROUT
1	SO0885	0.0	100%	NA			As above, no gravel.	
2	SO0886	0.0	100%	NA			Grading to fine SAND, grayish-brown (10YR 5/2), slightly moist.	
3	SO0887	0.0	100%	NA		ML	SILT, grayish-brown (10YR 5/2), slightly moist.	
4	SO0888	0.0	100%	NA				
5	SO0889	0.0	100%	NA		SP/ ML	Fine sandy SILT to silty, fine SAND, grayish-brown (10YR 5/2), micaceous, slightly moist.	
6	SO0890	0.0	100%	NA				
7	SO0891	0.0	100%	NA		ML	SILT w/ trace wood fragments, lt. brown-gray (10YR 6/2), moist.	
8	SO0892	0.0	100%	NA		SP/ ML	As above w/ sand.	
9	SO0893	0.0	100%	NA		ML	SILT, very dark gray-brown (10YR 3/2).	
10	SO0894	0.0	100%	NA				
11	SO0895	0.0	100%	NA			Clayey silt lens.	
12	SO0896	0.0	100%	NA				
13	SO0897	0.0	100%	NA				
14	SO0898	0.0	100%	NA		SP/ ML	Fine sandy SILT to silty, fine SAND, grayish-brown (10YR 5/2), micaceous, moist.	
15	SO0899	0.0	100%	NA		ML	SILT, very dark gray-brown (2.5Y 4/2), wet.	
16	SO0900	0.0	100%	NA		SP	Fine to medium SAND, dark yellow-brown (10YR 4/4), slightly moist volcanic material.	
17	SO0901	0.0	100%	NA				
18	SO0902	0.0	100%	NA				
19	SO0903	0.0	100%	NA				
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 17 July 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.16'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Project No: 8601192.002.0301

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-61

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
20								
21	SO0904	0.0	100%	NA		SP	Fine to medium SAND, dark yellow-brown (10 YR 4/4), moist.	
22	SO0905	0.0	100%	NA				
23	SO0906	0.0	100%	NA			As above, wet, strong odor.	
24	SO0907	255	100%	NA				
25	SO0908	420	100%	NA				BACKFILLED w/ BENTONITE GROUT
26	SO0909	637	100%	NA			As above w/ some (~20%) silt, pale yellow (2.5 Y 8/2).	
27	SO0910	628	100%	NA				
28	SO0911	534	100%	NA			SILT lens. Color change to dark gray-brown (2.5Y 4/2), wet, moderate odor.	
29	SO0912	218	100%	NA			SILT lens.	
30							Total borehole depth 29.0' BGS Groundwater sample GW070002 collected from 24 to 28' BGS.	
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 17 July 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.16'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Project No: 8601192.002.0301

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-62

Ground surface: Asphalt

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0850	0	80%	NA		SM	Silty, fine to medium SAND w/ root fragments, brown, dry.	BACKFILLED w/BENTONITE GROUT
1	SO0851	0	75%	NA		GM	Silty, sandy GRAVEL, brown, moist.	
2	SO0852	0	50%	NA				
3	SO0853	0	50%	NA			As above w/ slag (> 2" dia.)	
4	SO0854	0	50%	NA				
5	SO0855	0	30%	NA				
6	SO0856	0	0%	NA			Probe refusal @ 6' BGS.	
7							Total depth of borehole 6' BGS	
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 17 July 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.38'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-63

Ground surface: Grass and sand

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0857	0	80%	NA		SM	Silty, fine to medium SAND w/ trace gravel (~10%), very dark gray-brown (10YR 3/2), slightly moist.	BACKFILLED W/BENTONITE GROUT
1	SO0858	0	80%	NA		GM	Slightly silty, sandy GRAVEL, very dark gray-brown (10YR 3/2), slightly moist.	
2	SO0859	0	80%	NA				
3	SO0860	0	75%	NA			As above w/ abundant brick fragments from 3.5 to 4.0' BGS.	
4	SO0861	0	75%	NA			As above w/ abundant construction debris.	
5	SO0862	0	75%	NA			As above w/ trace wood debris.	
6	SO0863	0	100%	NA				
7	SO0864	0	100%	NA			Color change to very dark brown (10YR 2/2).	
8	SO0865	0	30%	NA				
9	SO0866	0	20%	NA			As above w/ trace wood fragments.	
10							Probe refusal @ 10' BGS.	
11							Total depth of borehole 10' BGS.	
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 17 July 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.38'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301
Project: Acid Plant RI
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Boring Number: B-64
Ground surface: Asphalt
Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0867	0	100%	NA		GW	Fine to medium, sandy GRAVEL, very dark gray-brown (10YR 3/2), slightly moist.	BACKFILLED W/BENTONITE GROUT
1	SO0868	0	100%	NA		SP	Fine to medium SAND, very dark gray-brown (10YR 3/2), slightly moist.	
2	SO0869	0	80%	NA			As above w/ trace gravel (~20%).	
3	SO0870	0	50%	NA				
4	SO0871	0	100%	NA				
5	SO0872	0	100%	NA				
6	SO0873	0	100%	NA			As above w/ trace fine to coarse gravel.	
7	SO0874	0	100%	NA				
8	SO0875	0	100%	NA				
9	SO0876	0	100%	NA				
10	SO0877	0	30%	NA			As above, moist to wet.	
11	SO0878	0	20%	NA				
12	SO0879	0	100%	NA				
13	SO0880	0	100%	NA				
14	SO0881	0	60%	NA				
15	SO0882	0	60%	NA				
16	SO0883	0	50%	NA				
17							Total depth of borehole 17' BGS. Groundwater sample GW070001 collected from 24 to 28' BGS.	
18								
19								
20								

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 17 July 2000

Well Casing Elevation: NA
Ground Surface Elevation: 34.38'
Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929
Sheet: 1 of 1

EX™

Project No: 8601192.002.0301
Project: Acid Plant RI
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Borehole : B-65

Ground surface: Gravel
Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1	SO1056	23.7	60%	NA		GM	Silty sandy GRAVEL, very dark brown (10YR 2/2), slightly moist.	
2						SM	Slightly silty, fine to medium SAND, very dark gray-brown (10YR 3/2), slightly moist.	
3	SO1057	0.0	60%	NA				
4							As above w/ trace rounded gravel.	BACKFILLED w/ BENTONITE GROUT
5	SO1058	0.0	100%	NA				
6								
7	SO1059	2.9	100%	NA				
8						ML	SILT, very dark gray-brown (10YR 3/2), wet.	
9	SO1060	2.9	100%	NA			Color change to very dark gray (2.5Y 3/1), wet.	
10						SM	Slightly silty, fine SAND, yellow-brown (10YR 5/4), micaceous, slightly moist.	
11	SO1061	2.9	100%	NA				
12						SM/ ML	Slightly silty fine SAND to slightly sandy SILT, dark gray (5YR 4/1), micaceous, moist.	
13	SO1062	0.0	100%	NA				
14								
15	SO1063	0.0	100%	NA				
16								
17	SO1064	2.9	100%	NA		ML	SILT, dark gray (5Y 4/1), wet.	
18								
19	SO1065	2.9		NA				
20								

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 2 May 2001

Well Casing Elevation: NA
Ground Surface Elevation: 34.96'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Project No: 8601192.002.0301

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-65

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
20								
21						ML	SILT, dark gray (5Y 4/1), wet.	BACKFILLED w/ BENTONITE GROUT
22								
23								
24								
25								
26	SO1066	2.9	100%	NA				
27							Total borehole depth 27.0' BGS Groundwater sample GW050101 collected from 26 to 30' BGS.	
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 May 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.96'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

EX™

Project No: 8601192.002.0301

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-66

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0						GM	Silty sandy GRAVEL, very dark gray-brown (10YR 3/2), slightly moist.	BACKFILLED w/ BENTONITE GROUT
1	SO1048	0.0	100%	NA		SM	Silty, fine to medium SAND w/ 1" thick silt lens, dark gray-brown (10YR 4/2), slightly moist (fill).
2							As above, becoming slightly silty w/ trace carbonized organic material, grayish brown (10YR 5/2).
3	SO1049	5.9	100%	NA			
4							
5	SO1050	0.0	100%	NA			
6						ML	SILT, grayish brown (10YR 5/2), micaceous, slightly moist.
7	SO1051	0.0	50%	NA			As above w/ rust red mottling.
8							
9	SO1052	0.0	80%	NA			Color change to dark gray (2.5Y 4/1), wet.
10							
11	SO1053	5.9	80%	NA		SM	Slightly silty, fine SAND, dark yellow-brown (10YR 4/4), micaceous, slightly moist.
12							
13	SO1054	0.0	100%	NA			As above, color horizons alternating between dark gray (2.5Y 4/1) and grayish brown (10YR 5/2), moist.
14							Total borehole depth 14' BGS.
15							
16							
17							
18							
19							
20							

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 May 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.06'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0724

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-67

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							Groundwater grab sample only. No lithologic data recorded. Groundwater sample GW050102 collected from 26 to 30' BGS.	BACKFILLED w/ BENTONITE GROUT
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 May 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.15'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0724

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-68

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							Groundwater grab sample only. No lithologic data recorded. Groundwater sample GW050109 collected from 31 to 36' BGS.	BACKFILLED w/ BENTONITE GROUT
2								
4								
6								
8								
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								
36								
38								
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 May 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.96'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0724

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-70

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							Groundwater grab sample only. No lithologic data recorded. Groundwater sample GW050106 and duplicate sample GW050107 collected from 31 to 36' BGS.	BACKFILLED w/ BENTONITE GROUT
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 3 May 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.32'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0724

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-69

Ground surface: Gravel

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							Groundwater grab sample only. No lithologic data recorded. Groundwater sample GW050105 collected from 31 to 36' BGS.	BACKFILLED w/ BENTONITE GROUT
35								
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 May 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.94'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-70b

Ground surface: Gravel

Geologist: Eron Dodak / David Lamadrid

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0								
1	SO1351			50			GW/SW	Sandy GRAVEL/gravelly SAND, gray (10YR 5/1), gravel to 1" dia., fine to coarse sand, damp to moist. (Fill)
2								
3	SO1352							
4							SW	Fine to medium SAND (sharp contact), dark yellow-brown (10YR 4/6), trace fines, moist, few thin silt lenses, ~1/2" thick, faint laminae, faint orange mottling.
5	SO1353			50				
6								As above.
7	SO1354							
8								
9	SO1355			70				
10							SM	Silty fine SAND, dark yellow-brown (10YR 4/6), moist to wet, carbonized organic chunk @ contact, grades to gray (N5/), some orange mottling, slightly micaceous.
11	SO1356						SW	
12								Fine to medium SAND, fine laminations, gray (N6/) and dark yellow-brown (10YR 4/6) with trace fines, orange mottling, moist.
13	SO1357			40				
14								Fine to medium SAND, dark yellow-brown (10YR 4/6), trace fines, some orange mottling, moist.
15	SO1358							
16							▽	Becomes wet.
17							ML	SILT lens, bluish gray (5B 5/1), wet.
18	SO1359			70			SW	Fine to medium SAND, dark yellow-brown (10YR 4/6), trace fines, some orange mottling, wet.
19								
20								

WELL CONSTRUCTION DETAIL: BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobes

Drill Date: 25 October 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.43'

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-70b

Ground surface: Gravel

Geologist: Eron Dodak / David Lamadrid

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20							SW	Fine to medium SAND, dark yellow-brown (10YR 4/6), uniform, very slightly micaceous, moist to wet.	BACKFILLED w/ BENTONITE GROUT
21	SO1360			60					
22	SO1361			80					
23									
24								Decreasing moisture with depth.	
25									
26	SO1362			50				As above, moist.	
27									
28									
29									
30	SO1163			50				As above, moist to wet @ 30'.	
31								Becomes wet.	
32									
33							ML	Fine, sandy SILT (sharp contact), fine sand (<10%), dark yellow-brown (10YR 4/4), few thin lenses (1/4" thick) w/ wood debris, wet. Silty, fine to medium SAND lens (2" thick) @ 34' BGS w/ apparent single brick pebble.	
34	SO1364			90					
35									
36								Bottom of boring at 36' BGS.	
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 25 October 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.43'

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Sheet: 2 of 2

Project No: 8501192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-71

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0							AS	Asphalt
2	SO1140			100			SP	Fine SAND w/ trace silt, dark yellowish brown (10YR 4/6), damp, loose.
4								Increasing silt (~1-3%), same as above.
5							ML	SILT lens (2" thick), dark yellowish brown (10YR 4/6), moist.
6	SO1141			100			SP	Fine SAND w/ trace silt, dark yellowish brown (10YR 4/6), damp, loose.
7							ML	SILT lens, same as silt lens above.
8							SP	Color change to dark gray (5Y 4/1).
10	SO1142			50			SM	Silty SAND, dark gray (5Y 4/1), slightly moist, sand is fine and well sorted.
12							SP	Fine SAND w/ trace silt, bands of color change from 12-14" BGS ~1-2" thick. Silt contents less than 5%, slightly moist.
14	SO1143			100				
17							ML	Silt w/ trace fine sand, very moist, dark gray (5Y 4/1), some mica observed.
18	SO1144			100				
20							SP	Fine sand dark yellowish brown (10YR 4/4), moist.

WELL CONSTRUCTION DETAIL

BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 25 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.43'

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Sheet: 1 of 2

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-71

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20–21	SO1145			50			SP	Fine sand dark yellowish brown (10YR 4/4), moist.	BACKFILLED w/ BENTONITE GROUT
22–23									
24–25	SO1146			13					
26–27									
28–29	SO1147			50				Increasing moisture from moist to wet.	
30–31									
32–33	SO1148			100					
34–35									
36								Bottom of boring at 36' BGS.	
37–40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobes

Drill Date: 25 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.43'

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-72

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0							AS	Asphalt
1							SP	Fine SAND, dark yellowish brown (10YR 4/6), slightly moist, loose.
2	SO1149			50				
3								
4							ML	SILT lens, very tight, same color as sand.
5							SP	Fine SAND, dark yellowish brown (10YR 4/6), slightly moist, loose.
6	SO1150			100				Silt (<5%) in 1" lenses at 6' and 7.5' BGS.
7								
8								
9								
10	SO1151			50				
11								Color change to dark gray (5Y 4/1), some fine sub-angular gravel at 11.5' BGS.
12							ML	SILT lens, same color as above, slightly moist.
13							SP	Fine SAND, dark yellowish brown (10YR 4/6), color change at 13' BGS to dark gray (5Y 4/1).
14	SO1152			100				
15								Grading to yellow-brown (10YR 5/1).
16								Fine gravel at 16.5' BGS.
17							ML	SILT with trace fine sand, very moist, (5Y 4/1), dark gray, some mica.
18	SO1153			100			SP	Fine SAND (10YR 4/6), dark yellowish brown, slightly moist.
19								
20								

WELL CONSTRUCTION DETAIL

BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 25 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.13

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-72

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20–24	SO1154			100			SP	Fine SAND, dark yellowish brown (10YR 4/6), slightly moist.	BACKFILLED w/ BENTONITE GROUT
24–28	SO1155			88					
28–32	SO1156			88				Increasing moisture at 31.5' BGS to very moist.	
32–36	SO1157			75					
36–38	SO1158			50				Fine SAND w/ trace silt (~5%), moist, trace wood chips, maximum dimension is 1/8".	
38–40				0				No recovery.	

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 25 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.13

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-72

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
40	SO1159			50			SP	Fine SAND with trace silt (~5%), moist.	
41									
42	SO1160			100					BACKFILLED w/ BENTONITE GROUT
43								Minerals include - mica, potassium, feldspar and quartz	
44									
45								Wood debris at 45' BGS.	
46								Bottom of boring at 46' BGS.	
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobes

Drill Date: 25 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.13

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Sheet: 3 of 3

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-73

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0	SO1161			100			AS	Asphalt
1							SM	Silty SAND, fine sand, ~10-15% silt, yellowish brown (10YR 5/4), fine gravel at 2' BGS, loose, slightly moist.
2								
3								
4	SO1162			100				
5								
6								
7								
8	SO1163			100				
9								
10							ML	SILT, yellowish brown (10YR 5/4) with orange mottling, trace wood chips, slightly wet.
11							SM	Silty SAND, fine sand, ~10-15% silt, yellowish brown (10YR 5/4), loose, slightly moist.
12	SO1164			75				
13								
14								Fine gravel at 14' BGS.
15								
16	SO1165						ML	SILT, wet, dark gray (5Y 4/1), micaceous.
17								
18							SP	Fine SAND, dark yellowish brown, (10YR 3/6), slightly moist.
19								
20								

WELL CONSTRUCTION DETAIL

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 25 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.08

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Project No: B601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-73

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20	SO1166			100			SP	Fine sand, dark yellowish brown (10YR 3/6), slightly moist.	BACKFILLED w/ BENTONITE GROUT
24	SO1167			75					
28	SO1168			100				Moisture increasing to wet.	
32							ML	SILT with trace fine sand, light olive-brown (2.5 Y 5/3), moist, micaceous.	
								Bottom of boring at 32' BGS.	

Drilled By: Cascade Drilling, Inc

Drill Method: Geoprobe®

Drill Date: 25 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.08

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-74

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0								
1								Concrete
2	SO1206			50			SP	Fine SAND, dark yellowish brown (10YR 4/6), damp.
3								
4								
5	SO1207			88				
6								
7	SO1208						ML	SILT lens, dark yellowish brown (10YR 4/6).
8							SM	Silty SAND, dark yellowish brown (10YR 4/6), damp. Increasing silt (5-15%) with depth.
9	SO1209			100				
10							ML	SILT, very moist, dark yellowish brown (10YR 4/6).
11	SO1210						SM	Silty SAND, sand is fine, silt is 10-20%, same color as above, very slightly moist, increasing moisture with depth, trace wood chips at 12' BGS.
12								
13	SO1211			88				
14							SP	Fine SAND, dark yellowish brown (10YR 4/6), damp.
15	SO1212							
16							ML	SILT lens, same as above.
17							SP	Fine SAND, dark yellowish brown (10YR 4/6), damp.
18	SO1213			88			ML	SILT, wet to saturated, same color as above.
19								
20								

WELL CONSTRUCTION DETAIL

BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 27 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.06

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-74

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
21							ML	SILT, dark yellowish brown (10YR 4/6), wet to saturated.	
22	SO1214			100			SP	Fine SAND, dark gray (5Y 4/1), moist.	BACKFILLED w/ BENTONITE GROUT
23									
24								Bottom of boring at 24' BGS.	
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 27 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.06

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Sheet: 2 of 2

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-75

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0								Concrete
1							SP	Fine SAND, olive-brown (2.5Y 4/3) with trace fine gravel and trace coarse sand, slightly moist, loose.
2	SO1215			50				
3								SILT lens,olive-brown (2.5Y 4/3), (1" thick) @ 3' BGS.
4								
5	SO1216			50				
6								
7	SO1217						SM	Silty SAND, olive-brown (2.5Y 4/3), mica observed, damp.
8								
9	SO1218			75				
10							ML	SILT, olive-brown (2.5Y 4/3), very moist.
11	SO1219						SM	Silty SAND, olive-brown (2.5Y 4/3), micaceous, damp.
12								
13	SO1220			50			ML	SILT, olive-brown (2.5Y 4/3), very moist.
14							SM	Silty SAND, olive-brown (2.5Y 4/3), micaceous, damp.
15	SO1221							
16							ML	SILT, olive-brown (2.5Y 4/3), very moist.
17	SO1222			100			SP	Fine SAND, olive-brown (2.5Y 4/3) with trace fine gravel and trace coarse sand, slightly moist.
18							ML	SILT, olive-brown (2.5Y 4/3) w/ trace fine sand, wet.
19	SO1223						SP	SAND, olive-brown (2.5Y 4/3) with trace fine gravel and trace coarse sand, slightly moist.with increasing silt (less than 5%).
20								

WELL CONSTRUCTION DETAIL

BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobes

Drill Date: 27 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.02

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-75

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
21	SO1224			100			SM	Silty SAND, olive-brown (2.5Y 4/3), wet.	
22									
23	SO1225						SP	Fine SAND, dark olive-brown (2.5Y 3/3), slightly wet, loose.	
24									BACKFILLED w/ BENTONITE GROUT
25	SO1226			38			SM	Silty SAND, same color as above, sand is fine, silt ~5-15%.	
26									
27									
28								Becomes very slow drilling.	
29								Driller reports sill at 29.5' (based on rig resistance).	
30								Bottom of boring at 29.5' BGS.	
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 27 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.02

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-76

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0								
1								Concrete
2	SO1227			50			SP	Fine SAND, trace silt (less than 5%), trace fine gravel, loose, damp, olive-brown (2.5Y 4/3), trace wood debris.
3								
4								
5	SO1228			75				
6								
7	SO1229							
8								
9	SO1230			75			ML	SILT, olive-brown (2.5Y 4/3), wet.
10							SP	Fine SAND, olive-brown (2.5Y 4/3), trace orange mottling, trace silt.
11	SO1231							Saturated sand lens at 11' BGS, with band of orange mottling below.
12								
13	SO1232			75				
14								
15	SO1233							
16								
17	SO1234			100				
18								
19	SO1235							
20								

WELL CONSTRUCTION DETAIL

BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 27 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.84

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-76

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
21	SO1235						SP	Fine SAND, olive-brown (2.5Y 4/3), trace silt. Trace gravel @ 20.5' BGS.	BACKFILLED w/ BENTONITE GROUT
22								Sand is compacted 22-22.5' BGS, color change to black (10YR 2/1).	
23	SO1236			100			ML	Sandy SILT (sand: ~10-15%), olive-brown (10YR 2/1), wet.	
24								Bottom of boring at 24' BGS.	
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 27 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.94

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-77

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0								
0								Concrete
1	SO1184			100			SM	Silty fine SAND (silt: 5-15%), dark yellowish brown (10YR 4/4), trace fine gravel angular to sub-angular, throughout (some chert observed), damp.
2								
3	SO1185							
4								
5	SO1186			88				
6								
7	SO1187							
8								
9	SO1188			75				
10							ML	SILT, dark yellowish brown (10YR 4/4), wet.
11	SO1189						SM	Silty fine SAND, dark yellowish brown (10YR 4/4), damp.
12								
13								
14	SO1190			25				
15								Trace fine gravel at 15-15.5' BGS.
16							SP	Fine SAND, slightly moist, dark yellowish brown (10YR 3/6)
16							SM	Silty fine SAND, dark yellowish brown (10YR 4/4).
17	SO1191			100			SP	Fine SAND dark yellowish brown (10YR 3/6), slightly moist.
18								
19	SO1192							
20								

WELL CONSTRUCTION DETAIL

BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 26 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.88

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-77

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
21	SO1193			75			SP	Fine SAND, dark yellow-brown (10YR 4/4), slightly moist.	
22									
23	SO1194							Color change to dark yellowish brown (10YR 3/6).	
24									
25							SM	Silty fine SAND (silt ~10-15%), dark yellowish brown (10YR 4/6), wet.	
26	SO1195			100					BACKFILLED w/ BENTONITE GROUT
27									
28									
29									
30	SO1196			25					
31							ML	SILT (driller reported silt at 30' BGS).	
32								Bottom of boring at 32' BGS.	
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 26 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.88

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Sheet: 2 of 2

EX™

Project No: 9601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-78

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0							AS	Asphalt
1							SW	Gravelly fine to coarse SAND, gray (2.5Y 5/1), dry.
2	SO1243			100			ML	SILT, light olive-brown (2.5Y 5/6), slightly moist.
3							SP	Fine SAND, slightly moist, olive-brown (2.5Y 4/4), loose.
4								
5	SO1244			75			ML	SILT lens (1" thick), light olive-brown (2.5Y 5/6), slightly moist.
6							SP	Fine SAND, slightly moist, olive-brown (2.5Y 4/4), loose.
7	SO1245						ML	SILT lens (1" thick), light olive-brown (2.5Y 5/6), slightly moist.
8							SP	Fine SAND, slightly moist, olive-brown (2.5Y 4/4), loose. Trace silt with depth (< 5%).
9	SO1246			88			ML	SILT, light olive-brown (2.5Y 5/6), very wet to saturated.
10							SP	Fine SAND, slightly moist, olive-brown (2.5Y 4/4) w/ orange mottling @ 9.0' BGS, loose.
11	SO1247						ML	SILT lens (1" thick), light olive-brown (2.5Y 5/6), slightly moist.
12							SP	Fine SAND, slightly moist, olive-brown (2.5Y 4/4), loose.
13	SO1248			100				
14								
15	SO1249							
16								
17	SO1250			94			ML	SILT lens (3" thick), light olive-brown (2.5Y 5/6), slightly moist.
18							SP	Fine SAND, dark grayish brown (2.5Y 4/2), slightly wet.
19	SO1251							
20								

WELL CONSTRUCTION DETAIL: BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobes

Drill Date: 28 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.48

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-78

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
21	SO1252			88			SP	Fine SAND, dark grayish brown (2.5Y 4/2, slightly wet. Increasing moisture to wet at 21' BGS.	BACKFILLED w/ BENTONITE GROUT
22									
23							ML	Sandy SILT (sand is fine ~10%), olive-brown (25Y 4/4), wet to saturated.	
24								Bottom of boring at 24' BGS.	
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 28 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.48

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-79

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0							AS	Asphalt
1							SW	Gravelly SAND, olive-brown (2.5Y 4/3), fine to coarse sand and fine, subangular, gravel.
2	SO1253			75			SP	Fine SAND, olive-brown (2.5Y 4/4), slightly moist, loose.
3								
4								
5								
6	SO1254			94			ML	SILT lens (2" thick), olive-brown (2.5Y 4/4), slightly wet.
7							SP	Fine SAND, olive-brown (2.5Y 4/4), slightly moist, loose.
8								
9								Fine gravel observed at 9' BGS.
10	SO1255			94				
11								
12								
13								
14	SO1256			94				
15							ML	SILT lens (2" thick), olive-brown (2.5Y 4/4) w/ orange mottling.
16							SP	Fine SAND, olive-brown (2.5Y 4/4), slightly moist, loose. Sand is compacted 16-16.5' BGS, increasing moisture with depth starting at 17' BGS.
17								
18	SO1257			94				
19								
20							ML	SILT, olive-brown (2.5Y 4/4) w/ trace sand at 19.5' BGS, very wet.
								Bottom of boring at 20' BGS.

WELL CONSTRUCTION DETAIL: BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobes

Drill Date: 28 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.94

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201
Project: Chlorate Plant Investigation
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Boring Number: B-80
Ground surface: Concrete
Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0									
1								Concrete	
2	SO1197			31			SM	Silty SAND, (silt: 5-15% , sand is fine), olive-brown (2.5Y 4/3), trace fine gravel throughout, slightly moist.	
3									
4									
5	SO1198			50					
6									
7	SO1199								
8									
9	SO1200			100					
10							ML	SILT, olive-brown (2.5Y 4/3), very moist to wet.	
11	SO1201								
12							SP	Fine sand, dark yellowish brown (10YR 4/6), slightly moist, loose.	
13	SO1202			75			SM	Silty SAND, (silt: 5-15%, sand is fine), olive-brown (2.5Y 4/3), trace fine gravel throughout, slightly moist.	
14									
15	SO1203								
16									
17								Wet from 17'-19.5' BGS.	
18	SO1204			100					
19									
20							ML	SILT, olive-brown (2.5Y 4/3), wet.	

Drilled By: Cascade Drilling, Inc.
Drill Method: Geoprobe®
Drill Date: 26 September 2001

Well Casing Elevation: NA
Ground Surface Elevation: 35.83
Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-80

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
21							ML	SILT, olive-brown (2.5Y 4/4) w/ trace to some fine sand, wet.	
22	SO1205			50					BACKFILLED w/ BENTONITE GROUT
23									
24								Bottom of boring at 24' BGS.	
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobes

Drill Date: 26 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.83

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-81

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO1237			50				Concrete	
1							SP	Fine SAND, olive-brown (2.5Y 4/3) w/ trace silt, slightly moist.	
2									
3									
4	SO1238			50					
5									
6								As above w/ fine to coarse gravel at 6' BGS.	BACKFILLED w/ BENTONITE GROUT
7									
8	SO1239			50					
9							ML	SILT, olive-brown (2.5Y 4/3), moist.	
10							SP	Fine SAND, olive-brown (2.5Y 4/3) w/ trace silt, slightly moist.	
11									
12	SO1240			50					
13								As above w/ fine to coarse gravel at 13' BGS.	
14									
15									
16	SO1241			100				As above, wet to saturated at 16.5' BGS.	
17									
18							ML	Sandy SILT, sand is fine (~10-15%), very wet to saturated.	
19									
20									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 27 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.93

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-81

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
21							SP	Fine SAND, olive-brown (2.5Y 4/3) w/ trace silt.	
22	SO1242			25					BACKFILLED w/ BENTONITE GROUT
23									
24								Bottom of boring at 24' BGS.	
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 27 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.93

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-82

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0	SO1266			42				Asphalt
1							SP	Fine SAND, olive-brown (2.5Y 4/3) w/ fine gravels (~2" thick) @ 1' BGS, slightly moist. As above w/ trace silt at 2' BGS.
2								
3								
4	SO1267			75				
5							GW	Fine GRAVEL lens (~2" thick).
							SP	Fine SAND, olive-brown (2.5Y 4/3).
6							ML	SILT lens (~2" thick), olive-brown (2.5Y
7							SP	4/3), wet. Fine SAND, olive-brown (2.5Y 4/3) w/ trace silt, slightly moist.
8	SO1268			75				
9								Color change to dark gray-brown (2.5Y 4/2).
10								
11								
12	SO1269			75				Sand is wet to saturated starting at 12' BGS.
13								
14								
15								
16	SO1270			75				
17								
18								
19							ML	SILT lens (~1" thick), olive-brown (2.5Y 4/3), wet.
20								

WELL CONSTRUCTION DETAIL: BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 28 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.01

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-82

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20–24	SO1271			88			SP	Fine SAND, gray-brown (2.5Y 4/2) w/ trace silt, wet to saturated.	BACKFILLED w/ BENTONITE GROUT
24–28	SO1272			75			SP		
28							ML	Sandy SILT, sand is fine (~10%), wet to saturated.	
								Bottom of boring at 28' BGS.	

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 28 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.01

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-83

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO1258			50				Asphalt	
1							SW	Gravely SAND, olive-brown (2.5Y 4/4), gravel is fine, sand is fine to coarse, wet.	
2							SP	Fine SAND, olive-brown (2.5Y 4/4), loose, moist.	
3									
4	SO1259			75					
5									BACKFILLED w/ BENTONITE GROUT
6									
7									
8							ML	SILT, olive-brown (2.5Y 4/4), wet.	
	SO1260			79			SP	Fine SAND, olive-brown (2.5Y 4/4), loose, moist.	
9									
10									
11							ML	SILT lens (3" thick), olive-brown (2.5Y 4/4), very wet.	
12							SP	Fine SAND, olive-brown (2.5Y 4/4), loose, moist. Wood debris (6" thick) and fibers at 11'-11.5' BGS.	
	SO1261			75				Increasing moisture with depth, saturated @ 12' BGS.	
13									
14									
15									
16	SO1262			100					
17									
18									
19								Silt increasing w/ depth (~ 5%) @ 19.5' BGS. Wood debris @ 20' BGS.	
20									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 28 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.38

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-83

Ground surface: Asphalt

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
20	SO1263			100			SP	Fine SAND, olive-brown (2.5Y 4/4), trace silt, saturated.	BACKFILLED w/ BENTONITE GROUT
21									
22							ML	SILT, very dark gray (2.5Y 3/1) w/ trace organic (wood?) debris, increasing sand content (3-10%) starting at 23' BGS, damp.	
23									
24								Bottom of boring at 24' BGS.	
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 28 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.38

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-84

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0								
0								Concrete
1	SO1169			67			SM	Silty fine SAND (silt: 5-15%), brown (10YR 4/3), damp.
2								
3	SO1170							
4								
5	SO1171			100				
6								
7	SO1172							
8								
9	SO1173			100				
10							ML	SILT, brown (10YR 4/3), very moist.
11	SO1174						SP	Fine SAND, brown (10YR 4/3), damp.
12								
13	SO1175			67				
14								
15	SO1176							
16								
17	SO1177			88			ML	SILT, dark grayish brown (10YR 4/2) w/ trace fine gravel, angular to subangular, micaceous.
18							SP	Fine SAND, dark yellowish brown (10YR 3/6) w/ trace silt, slightly moist, loose.
19	SO1178							
20								

WELL CONSTRUCTION DETAIL

BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobee

Drill Date: 26 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.90

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-84

Ground surface: Concrete

Geologist: Taryn Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
21	SO1179			75			SP	Fine SAND, dark yellowish brown (10YR 3/6) w/ trace silt, slightly moist, loose.	
22									
23	SO1180								
24									
25	SO1181			75					BACKFILLED w/ BENTONITE GROUT
26									
27	SO1182								
28									
29									
30	SO1183			75					
31									
32							ML	SILT, dark gray (2.5 Y 4/1) w/ trace orange mottling, slightly moist.	
								Bottom of boring at 32' BGS.	
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 26 September 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.90

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

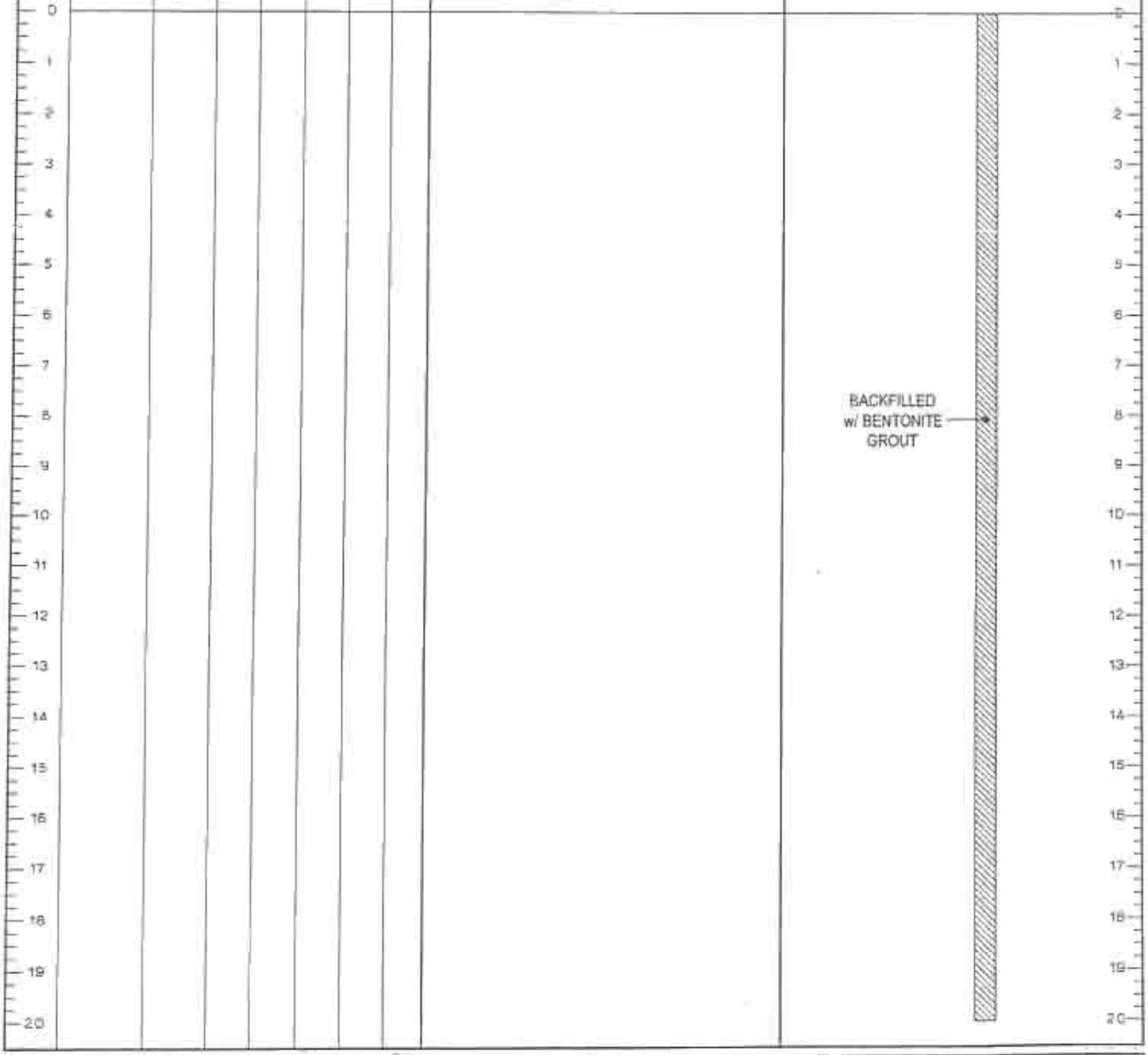
Location: Portland, OR

Borehole : B-85

Ground surface: Asphalt

Geologist: D. Lamadrid / E. Dodak

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								



Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 25 October 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.04'

Borehole Diameter: 2.0"

Datum: City of Portland Datum 1929

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

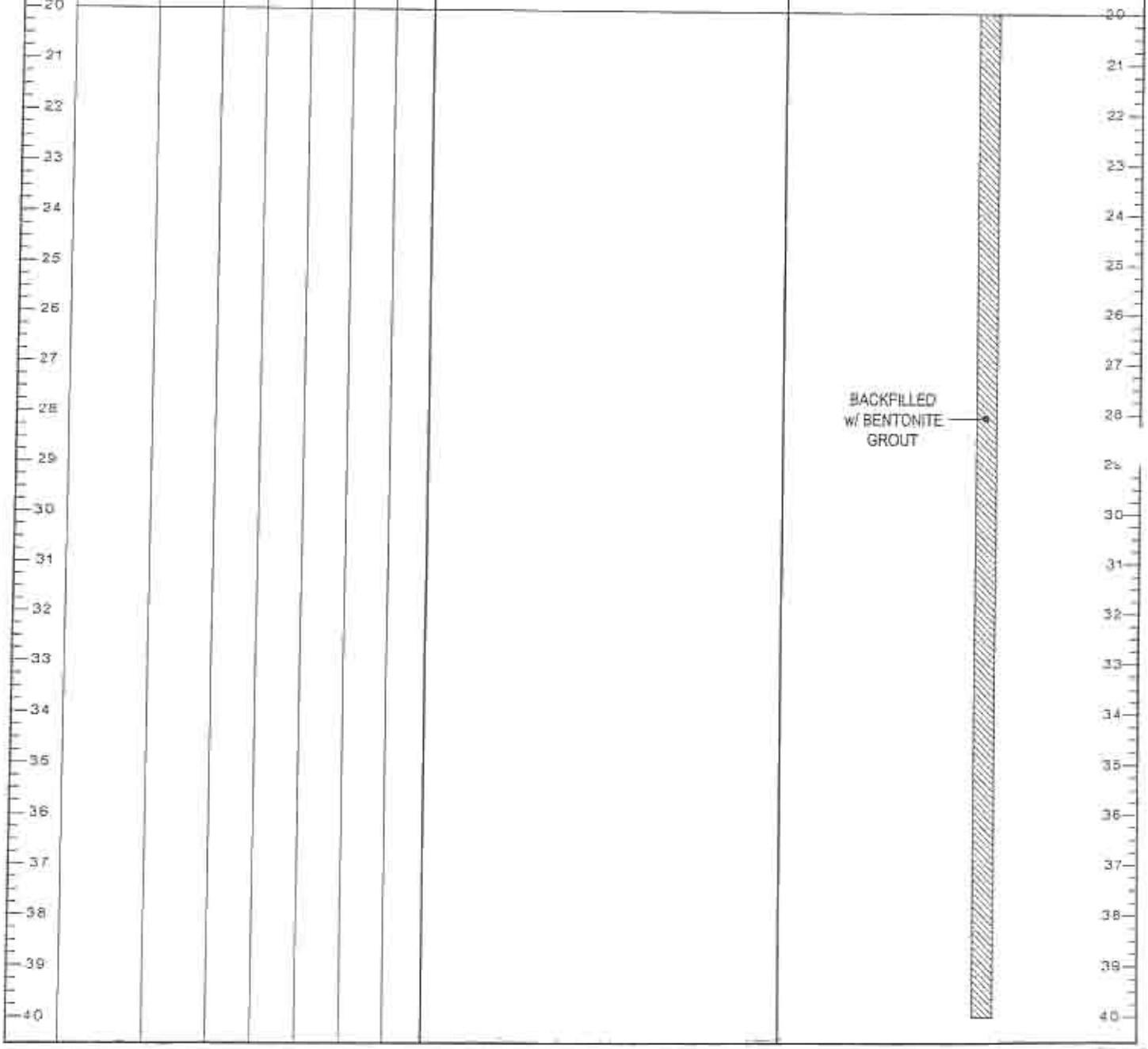
Location: Portland, OR

Borehole : B-85

Ground surface: Asphalt

Geologist: D. Lamadrid / E. Dodak

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)



Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 25 October 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.04'

Borehole Diameter: 2.0"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-85

Ground surface: Asphalt

Geologist: D. Lamadrid / E. Dodak

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
40									
41									
42									
43									
44									
45									BACKFILLED w/ BENTONITE GROUT
46									
47									
48									
49									
50							ML	SILT, light olive-brown (2.5Y 5/3), moist to wet.	
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 25 October 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.04'

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-86

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							Asphalt	
1						SP	Fine to medium SAND, predominantly fine sand, dark yellow-brown (10YR 3/6), few thin silt lens (1-2" thick) damp.	
2	SO1378		30%					
3								
4							Increasing moisture w/ depth to moist.	
5								
6	SO1379		60%					BACKFILLED w/ BENTONITE GROUT
7						ML/ SM	Silty fine SAND/sandy SILT, dark yellow-brown (10YR 3/6), wet.	
8								
9						SM	Slighty silty fine SAND (silt: ~10-15%), dark yellow-brown (10YR 3/6), dense, moist to wet.	
10	SO1380		100%			ML/ SM	Silty fine SAND/sandy SILT, dark yellow-brown (10YR 3/6), wet.	
11								
12								
13								
14	SO1381		100%					
15						SM	Slighty silty fine SAND (silt: ~5-15%), dark gray (N / 41), dense, wet.	
16								
17								
18	SO1382		100%			ML	Grades to fine sandy SILT.	
19						SP	Fine to medium SAND, dark brown (7.5YR 3/3), wet.	
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 1 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.12'

Borehole Diameter: 2.0"

Datum: City of Portland Datum 1929.

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole: B-86

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
20								
21	SO1383		100%			SM/ML	Silty fine SAND (silt: 10-20%), dark brown (7.5YR 3/3), wet	BACKFILLED w/ BENTONITE GROUT
						SP	Fine to medium SAND, very dark brown (7.5YR 2/2), moist, cemented.	
22							Drilling refusal due to hardness. Total depth 21.5' BGS	
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 1 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.12'

Borehole Diameter: 2.0"

Datum: City of Portland Datum 1929

Sheet: 2 of 2

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

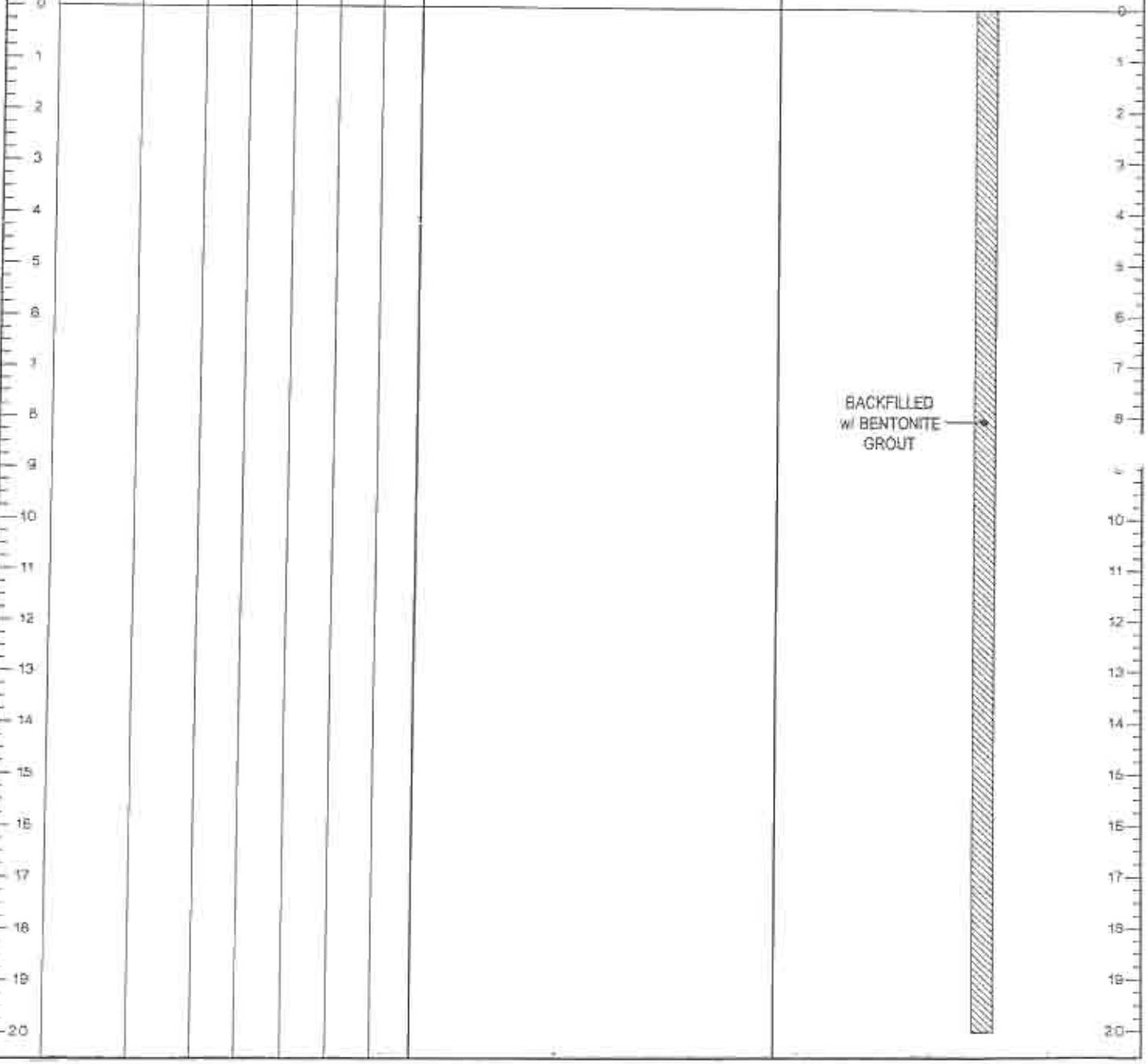
Location: Portland, OR

Borehole : B-86b

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)



Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.12'

Borehole Diameter: 2.0"

Datum: City of Portland Datum 1929

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole: B-86b

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
20								
21						ML	Slightly sandy SILT (fine sand: 20-30%), very dark gray (5Y 3/1), wet.	
22	SO1397		70%			SP	Fine to medium sand lens w/ trace silt.	
23						SM	Very silty fine SAND (silt: >30%), mottled dark gray and gray-brown (5Y 3/1 and 2.5Y 4/2), wet.	
24								
25							Decreasing silt w/ depth.	
26	SO1398		90%			ML	SILT, yellow-brown (10YR 5/8), w/ orange-brown mottling, wet.	
27								
28						SM/ ML	Silty fine SAND/sandy SILT, very dark gray(2.5Y 3/1), graduational zones, more silty, more sandy up to 3" thick, wet.	BACKFILLED w/ BENTONITE GROUT
29								
30	SO1399		100%					
31								
32								
33								
34	SO1400		100%					
35								
36							Total depth 36.0' BGS	
37								
38								
39								
40								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.12'

Borehole Diameter: 2.0"

Datum: City of Portland Datum 1929

Sheet: 2 of 2

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-87

Ground surface: Asphalt

Geologist: D. Lamadrid/L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0								
0								Asphalt
1							SW	Fine to medium SAND, dark gray (5YR 4/1), damp.
2	SO1370			60				
3								Increased silt content to < 10%.
4								
5								
6	SO1371			75				
7							ML	Fine sandy SILT, yellowish brown (10YR 5/4), low to medium plasticity, wet.
8								
9								
10	SO1372			75				
11								
12							SP	Fine to medium SAND, predominantly fine sand, dark gray (5YR 4/1), slightly micaceous, uniform, moist.
13								
14	SO1373			90				
15								Gradational lenses with trace fines.
16								
17								Increasing moisture with depth.
18	SO1374			100			SM/ ML	Silty fine SAND/sandy SILT, dark gray (7.5YR 4/1), moist to wet.
19							SP	Fine to medium SAND, predominantly fine sand, dark gray (5YR 4/1), uniform, moist.
20								

WELL CONSTRUCTION DETAIL

BACKFILLED w/ BENTONITE GROUT

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 1 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.01

Borehole Diameter: 2"

Datum: NA

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-87

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20–21							ML	Fine to medium SAND, predominantly fine sand, dark gray (5YR 4/1), uniform, moist.	
21–24	SO1375			100			ML/SM	Interbedded fine sandy SILT and silty fine SAND, dark gray (5YR 5/1), ~4-5" thick beds, wet, slight organic odor. Organic debris @ 22' BGS.	
24–28	SO1376			100				~ 1' zone with dark appearance to water, possible organic odor.	BACKFILLED w/ BENTONITE GROUT
28–32	SO1377			100				Contacts become less distinct with depth.	
31–32							ML	Fine sandy SILT (sand: <10%), dark gray (10YR 5/1), moist to wet.	
32								Bottom of boring at 32' BGS.	

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 1 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.01

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Sheet: 2 of 2

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-88

Ground surface: Concrete

Geologist: D. Lamadrid/L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0									
1								Concrete	BACKFILLED w/ BENTONITE GROUT
2				50			SP	Fine to medium SAND, predominantly fine sand, yellow-brown (10YR 5/4), few silt lenses 1-2" thick, damp.	
3	SO1384								
4									
5	SO1385								
6				60				Grades to moist.	
7	SO1386								
8							SM	Silty fine SAND (silt 10-20%), yellow-brown (10YR 5/4), wet.	
9	SO1387								
10				75					
11	SO1388								
12							SM/ ML	Silty fine SAND/sandy SILT, yellow-brown (10YR 5/4), wet.	
13	SO1389								
14				100					
15	SO1390						SP	Fine to medium SAND, predominantly fine sand, very dark gray-brown (10YR 3/2), uniform, wet.	
16									
17	SO1391								
18				90				Silt lens (1" thick) w/ small organic debris.	
19	SO1392								
20							SM	Silty fine SAND (silt 10-20%), very dark gray (2.5Y 3/1), wet.	

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 1 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.22

Borehole Diameter: 2"

Datum: NA

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-88

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
21	SO1393						SM	Silty fine SAND, verk dark gray (2.5Y 3/1), wet.	
22				80			ML/ SM	Silty find SAND and sandy SILT, very dark gray (2.5Y 3/1), moist to wet.	
23	SO1394								
24									
25									BACKFILLED w/ BENTONITE GROUT
26	SO1395			60				Increased moisture with depth.	
27									
28									
29									
30	SO1396						ML	Fine sandy SILT (sand: 10-20%), very dark gray (2.5YR 3/1), very moist.	
31									
32								Bottom of boring at 32' BGS.	
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 1 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.22

Borehole Diameter: 2"

Datum: NA

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-89

Ground surface: Concrete

Geologist: D. Lamadrid/L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0									
0								Concrete	
1	SO1487						SP	Fine to medium SAND, predominantly fine sand, dark yellow-brown (10YR 3/4), damp. Refusal @ 2.2' BGS due to concrete.	BACKFILLED w/ BENTONITE CHIPS
2									
3								Bottom of boring @ 2.2' BGS	
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Drilled By: Cascade Drilling, Inc.

Drill Method: CME 55 Limited Access Push Probe

Date: 9 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.2 (not surveyed)

Borehole Diameter: 2"

Datum: City of Portland Datum 1929

Sheet: 1 of 1

EX™

Project No: 8601192.004.0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-90

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1							CONCRETE	
2						SW	Fine to medium SAND, dark yellow-brown (10YR 4/4), damp to moist.	
3	SO1475		100%	NA		SM	Slightly silty, fine to medium SAND (silt: 5-15 %), dark yellow-brown (10YR 4/4), damp to moist, faint laminae.	
4								
5	SO1476							
6			75%	NA				
7	SO1477							
8								BACKFILLED w/ BENTONITE GROUT
9	SO1478							
10			80%	NA		SM/ ML	Silty fine SAND/sandy SILT, dark yellow-brown (10YR 4/4), wet.	
11	SO1479					SM	Slightly silty, fine to medium SAND (silt: 5-15 %), dark yellow-brown (10YR 4/4), damp to moist.	
12								
13	SO1480						Becomes wet @ 13.5' BGS.	
14			90%	NA			Silty fine SAND, 6" thick lens, (silt: 20-30%).	
15	SO1481							
16								
17	SO1482							
18			---	NA				
19	SO1483						Silty fine SAND (silt: 5-15%), dark yellow-brown (10YR 4/4), wet.	
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 5 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.68'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.004 0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: B-90

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20									
21							SM	Silty fine SAND (silt 5-15%), dark yellow-brown (10YR 4/4), wet. Increased silt w/ depth.	
22	SO1484			100					
23							ML/ SM	Silty find SAND/sandy SILT, dark gray (10YR 4/1), moist to wet, some zones more silty or more sandy, some orange mottling, wet w/ depth.	
24									
25									BACKFILLED w/ BENTONITE GROUT
26	SO1485			90					
27									
28									
29							ML	Sandy SILT, very fine sand (< 10%), dark gray (10YR 4/1), moist to wet, some orange mottling (most notable at 29' BGS.	
30	SO1486			90					
31									
32								Bottom of boring at 32' BGS.	
33									
34									
35									
36									
37									
38									
39									
40									

Drilled By: Cascade Drilling, Inc.

Drill Method: Geoprobe®

Drill Date: 5 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.68

Borehole Diameter: 2"

Datum: NA

Sheet: 2 of 2

EX™

Project No: 8601192.001.0728
Project: Acid Plant RI
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Borehole : B-91

Ground surface: Concrete
Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
0							CONCRETE	BACKFILLED w/ BENTONITE
1	SO1434		100%	NA		SM	Silty fine to medium SAND (silt: 5-15%), dark yellow-brown (10YR 4/4), damp.	
1	SO1435							
2	SO1436							
2							Silty fine SAND (silt: 10-20%), pale brown (10YR 6/3), damp, faint laminae.	
3								
4	SO1437*						Total depth 4.0' BGS	
5								
6							* Sample SO1437 is a composite of the 0.5-1.5' interval below the base of the concrete.	
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Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 2 November 2001

Well Casing Elevation: NA
Ground Surface Elevation: 34.93'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-92

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
							CONCRETE	BACKFILLED w/ BENTONITE GROUT
1	SO1430		100%	NA		SM	Silty fine to medium SAND (silt 5-15%), dark yellow-brown (10YR 4/4), damp.	
	SO1431							
2	SO1432							
3							Silty fine SAND pale brown (10YR 8/3), (silt: 5-15%), damp.	
4	SO1433*						Total depth 4.0' BGS	
5							* Sample SO1433 is a composite of the 0.5-1.5' interval below the base of the concrete.	
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Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.94'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-93

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							CONCRETE	BACKFILLED w/ BENTONITE GROUT
1	SO1442		100%	NA		SM	Silty fine to medium SAND (silt: 5-15%), dark yellow-brown (10YR 4/4), damp.	
2	SO1443							
3	SO1444						Silty fine SAND (silt: 10-20%), pale brown (10YR 6/3), damp, faint laminae.	
4	SO1445*						Total depth 4.0' BGS	
5								
6							* Sample SO1455 is a composite of the 0.5-1.5' interval below the base of the concrete.	
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Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.87'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-94

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
0							CONCRETE	BACKFILLED w/ BENTONITE GROUT
1	SO1438					SM	Silty fine to medium SAND (silt: 5-15%), dark yellow-brown (10YR 4/4), damp.	
2	SO1439							
2	SO1440		100%	NA			Silty fine SAND (silt: 10-20%), pale brown (10YR 6/3), damp.	
3						ML	SILT, pale brown (10YR 6/3), trace fine sand, moderately hard, damp.	
4	SO1441*						Total depth 4.0' BGS	
5							* Sample SO1441 is a composite of the 0.5-1.5' interval below the base of the concrete.	
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Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.91'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-95

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
							CONCRETE	
1						GP	Gravel subbase.	
	SO1422					SM	Silty fine SAND (silt: 5-15%), pale brown (10YR 6/3), faint laminae, damp.	BACKFILLED w/ BENTONITE GROUT
2	SO1423							
	SO1424		100%	NA				
3								
4	SO1425*						Total depth 4.0' BGS	
5								
6							* Sample SO1425 is a composite of the 0.5-1.5' interval below the base of the concrete.	
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Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.49'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728
Project: Acid Plant RI
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Borehole : B-96
Ground surface: Concrete
Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
0							CONCRETE	BACKFILLED w/ BENTONITE GROUT
1						GP	Gravel subbase, angular.	
1	SO1426					SM	Silty SAND, yellow-brown (10YR 5/8), some gravel, moist. (Fill)	
2	SO1427							
2	SO1428		100%	NA			At 1.5' BGS silty fine SAND (silt 10-20%), pale brown (10YR 6/3), faint laminae, hard, damp.	
3								
4								
4	SO1429*						Total depth 4.0' BGS	
5								
6							* Sample SO1429 is a composite of the 0.5-1.5' interval below the base of the concrete.	
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Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 2 November 2001

Well Casing Elevation: NA
Ground Surface Elevation: 34.49'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0726

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-97

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
0							CONCRETE	BACKFILLED w/ BENTONITE GROUT
1						SW	Fine to coarse SAND, yellow-brown (10YR 5/4), few pebbles, slight variation in dominant grain size, damp. (Fill)	
2			100%	NA				
3								
4	SO1410							
4	SO1411							
5	SO1412							
6			100%	NA				
7								
8	SO1413*						Total depth 7.5' BGS	
9							* Sample SO1413 is a composite of the 0.5-1.5' interval below the estimated base of the Warehouse No. 3 fill (approximately 3.5' BGS).	
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19								
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Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 38.04'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728
Project: Acid Plant RI
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Borehole : B-98

Ground surface: Concrete
Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1							CONCRETE	BACKFILLED w/ BENTONITE GROUT
2								
3			100%	NA		SW	Fine to coarse SAND, predominantly fine to medium grained, yellow-brown (10YR 5/4), slight variation in dominant grain size, damp. (Fill)	
4	SO1414							
5	SO1415							
6	SO1416		100%	NA		SM	Silty fine to medium SAND (Silt: 10-20%), yellow-brown (10YR 5/4) w/ orange mottling, damp. (Fill)	
7								
8	SO1417*						Total depth 7.5' BGS	
9								
10							* Sample SO1417 is a composite of the 0.5-1.5' interval below the estimated base of the Warehouse No. 3 fill (approximately 4.5' BGS), concrete.	
11								
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Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 2 November 2001

Well Casing Elevation: NA
Ground Surface Elevation: 38.18'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc

Location: Portland, OR

Borehole : B-99

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							CONCRETE	BACKFILLED w/ BENTONITE GROUT
1–3			100%	NA		SW	Fine to coarse SAND, predominantly fine to medium grained, yellow-brown (10YR 5/4), few pebbles, slight variation in dominant grain size, damp. (Fill)	
4	SO1418							
4	SO1419							
5	SO1420							
5–7			100%	NA				
8	SO1421*						Total depth 7.5' BGS	
9–20							* Sample SO1421 is a composite of the 0.5-1.5' interval below the estimated base of the Warehouse No.3 fill approximately 3.5' BGS).	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 2 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 38.12'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-100

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
							Concrete	
1	SO1448	40				SM	White crystalline material @ 0.5-0.8' BGS, mixed w/ soil below. Slightly silty, fine to medium SAND (silt 5 -15%), dark yellow-brown (10YR 4/4), damp.	
	SO1449	240						
2	SO1450	190	100%	NA				
3	SO1452	2.0					Silty fine SAND (silt: 10-20%), pale brown (10YR 6/3), damp.	
4								
5	SO1453	12						
6			70%	NA				
7	SO1454	470						
8						SM/ ML	Silty fine SAND/sandy SILT, olive-brown (2.5Y 4/3), moist.	BACKFILLED w/ BENTONITE GROUT
9	SO1455	380					As above, grading to sandy SILT, moist to wet.	
10			90%	NA				
11	SO1456	210						
12								
13	SO1457	520						
14			90%	NA			As above, grading to silty fine SAND/sandy SILT, moist to wet.	
15	SO1458	410						
16								
17								
18			50%	NA			As above, wet.	
19	SO1460	370					* Sample SO1451 is a composite of the 0.5-1.5' interval below the base of the concrete.	
20	SO1451*						Total depth 20.0' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 5 November 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.77'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728
Project: Acid Plant RI
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Borehole : B-101
Ground surface: Concrete
Geologist: D. Lamadrid

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
							Concrete	
1	SO1461	2.0				SW	Fine to medium SAND, dark yellow-brown (10YR 4/4), trace silt, trace white crystalline grains in upper 6", damp, faint odor.	
	SO1462	2.0						
2	SO1463	2.0	100%	NA				
3	SO1465	2.0						
4						SM	Silty fine SAND (silt: 20-30%), pale brown (10YR 6/3), damp.	
5	SO1466	2.0						
6			80%	NA			Increased moisture w/ depth.	
7	SO1467	2.0						
8								BACKFILLED w/ BENTONITE GROUT
9	SO1468	2.0						
10			80%	NA		ML	SILT, light olive-brown (2.5Y 5/3), wet.	
11	SO1469	2.0					Grading to fine, sandy silt, rare lenses w/ organics.	
12								
13	SO1470	69				ML/ SM	Silty fine SAND/sandy SILT, olive-brown (2.5Y 5/3), very moist to wet.	
14			100%	NA				
15	SO1471	12						
16								
17	SO1472	55						
18			100%	NA			As above, wet.	
19	SO1473	8.0				ML	SILT, dark gray (2.5Y 4/1), wet.	
							* Sample SO1464 is a composite of the 0.5-1.5' interval below the base of the concrete.	
20	SO1464*						Total depth 20.0' BGS	

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 5 November 2001

Well Casing Elevation: NA
Ground Surface Elevation: 34.77'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929
Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-102

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							Concrete	BACKFILLED w/ BENTONITE GROUT
1	SO1591					SM	Silty, very fine SAND, dark yellow-brown (10YR 4/4), silt 10-20%, damp.	
	SO1592							
2	SO1593		36%	NA		ML	SILT, brown (10YR 5/3), trace very fine sand, damp.	
3								
4	SO1594*						Total depth 4.0' BGS	
5							* Sample SO1594 is a composite of the 0.5-1.5' interval below the base of the concrete.	
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Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.86'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-103

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							Concrete	BACKFILLED w/ BENTONITE GROUT
1	SO1595		75%	NA		SM	Silty, very fine SAND, dark yellow-brown (10YR 4/4), silt 10-20%, damp.	
2	SO1596							
3	SO1597					ML	SILT, brown (10YR 5/3), trace very fine sand, damp.	
4	SO1598*						Total depth 4.0' BGS	
5							* Sample SO1598 is a composite of the 0.5-1.5' interval below the base of the concrete.	
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Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.96'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-104

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0							Concrete
1	SO1538					SW	Very fine to fine SAND, yellow-brown (10YR 5/6), trace silt, damp.
2	SO1539						
3	SO1540		75%	NA			
4	SO1542					SM	Silty, very fine SAND, very pale brown (10YR 6/3), silt 5-15%, damp.
5	SO1543						
6			100%	NA			As above, color change to yellow-brown (10YR 5/6), silt 20-30%, some orange mottling and some laminae, moist.
7	SO1544						
8							
9	SO1545					SM/ ML	As above, grading to silty sand/sandy silt.
10			100%	NA			
11	SO1546					ML	Clayey SILT, light olive-brown (2.5YR 5/3) grading to dark gray (2.5YR 4/1) SILT, moist to wet.
12						ML/ SM	Interbedded clayey SILT, dark gray (2.5YR 4/1) and silty very fine SAND, yellow-brown (2.5YR 5/6), moist to wet.
13	SO1547						
14			75%	NA			
15	SO1548					SM/ ML	Silty fine SAND/sandy SILT, olive-brown (2.5YR 4/3), moist to wet.
16	SO1541*						Total depth 16.0' BGS
17							
18							* Sample SO1541 is a composite of the 0.5-1.5' interval below the base of the concrete.
19							
20							

WELL CONSTRUCTION DETAIL (not applicable)

BACKFILLED w/ BENTONITE GROUT

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 18 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.91'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-105

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							Asphalt	BACKFILLED w/ BENTONITE GROUT
1	SO1583		85%	NA		ML	Sandy SILT w/ gravel, brown (10YR 3/3), gravel 30-40%, damp.	
2	SO1584						@ 10" SILT, brown (10YR 5/3), trace very fine sand, damp.	
3	SO1585							
4	SO1586*						Total depth 4.0' BGS	
5							* Sample SO1586 is a composite of the 0.5-1.5' interval below the base of the asphalt.	
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Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.55'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-106

Ground surface: Level asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
0	SO1587		85%	NA		ML	Asphalt	
1	SO1588						Sandy SILT w/ gravel, brown (10YR 3/3), gravel 30-40%, damp.	
2	SO1589						@ 10" SILT, brown (10YR 5/3), trace very fine sand, damp.	BACKFILLED w/ BENTONITE GROUT
3								
4	SO1590*						Total depth 4.0' BGS	
5							* Sample SO1590 is a composite of the 0.5-1.5' interval below the base of the asphalt.	
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20								

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.86'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-107

Ground surface: Concrete

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							Concrete	
1	SO1579		50%	NA		ML	Sandy SILT w/ gravel, brown (10YR 4/3), gravel 10-20%, damp.	BACKFILLED w/ BENTONITE GROUT
2	SO1580						SILT, brown (10YR 5/3) @ 8" BGS, trace very fine sand, damp to moist.	
3	SO1581							
4	SO1582*						Total depth 4.0' BGS	
5							* Sample SO1582 is a composite of the 0.5-1.5' interval below the base of the concrete.	
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Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.59'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-108

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0	SO1494		50%	NA		ML	Asphalt Gravelly SAND (from 2-6"), yellow-brown (10 YR 5/6), gravel 30-40%, few white flecks, damp. Slightly silty, fine SAND (from 6-18"), light yellow-brown (2.5Y 6/3), silt ~ 5-15%, few white flecks, moist. Color change to gray (5Y 6/1) @ 18", abundant white flecks and nodules at contact, no white substance below contact. (Fill)	BACKFILLED w/ BENTONITE GROUT
1	SO1495							
2	SO1496							
3								
4	SO1497*						Total depth 4.0' BGS * Sample SO1497 is a composite of the 0.5-1.5' interval below the base of the asphalt.	
5								
6								
7								
8								
9								
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15								
16								
17								
18								
19								
20								

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 17 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.76'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 6601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-109

Ground surface: Gravel

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0	SO1490		50%	NA		SM	Gravel Silty fine to medium SAND (2-14" BGS), dark yellow-brown (10YR 4/4), silt ~10-20%, moist, white flakes from 0-10" BGS. (Fill) Silty fine SAND (from 14" BGS), dark yellow-brown (10YR 5/6), moist, silt ~ 5-15%.	BACKFILLED w/ BENTONITE GROUT
1	SO1491							
2	SO1492							
3								
4	SO1493*						Total depth 4.0' BGS * Sample SO1493 is a composite of the 0.5-1.5' interval below the base of the gravel.	
5								
6								
7								
8								
9								
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12								
13								
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16								
17								
18								
19								
20								

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 17 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.43'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-110

Ground surface: Concrete

Geologist: D. Lamadrid

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0							Concrete	BACKFILLED w/ BENTONITE CHIPS
1	SO1599	2.0				SM	Silty, very fine to fine SAND, yellow-brown (10YR 4/4), silt 10-20%, predom. very fine grained.	
2	SO1600	2.0						
3	SO1601	2.0					As above, silt increased to 20-30%, increased moisture w/ depth.	
4	SO1602	2.0					As above, wet.	
5	SO1603	2.0						
6	SO1604	2.0				ML	Clayey SILT, dark gray (10YR 4/1), slight orange-brown mottling, wet.	
7	SO1605	2.0				SM/ ML	Silty sand/sandy SILT, yellow-brown (10YR 4/4), moist to wet.	
8	SO1606	2.0						
9	SO1607	2.0						
10	SO1608	2.0				ML	SILT, black (10YR 2/1), moist to wet.	
11							Total depth 10.5' BGS	
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Hollinger Construction

Drill Method: Hand auger

Drill Date: 20 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.20'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-111

Ground surface: Gravel

Geologist: D. Lamadrid

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0	SO1609					SW	Gravelly fine to medium SAND, dark yellow-brown (10YR 3/4), moist to wet, gravel to 1.5" dia. (Fill)	BACKFILLED w/ BENTONITE CHIPS
1	SO1610							
2	SO1611							
3	SO1612					SM	Silty very fine to fine SAND, yellow-brown (10YR 4/4), moist to wet, silt 20-30%, increased silt and moisture with depth.	
4	SO1613							
5	SO1614						Wet @ 5.5' BGS.	
6	SO1615					ML	Clayey SILT, dark gray (10YR 4/1).	
7	SO1616					SM/ ML	Silty SAND/sandy SILT, yellow-brown (10YR 4/4), wet.	
8	SO1617							
9	SO1618						Grading to SILT with orange mottling.	
10						CL	CLAY, dark gray (10YR 5/1), wet, some silt.	
11							Total depth 10.0' BGS	
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Hollinger Construction

Drill Method: Hand Auger

Drill Date: 20 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.97'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-112

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
	SO1572					GW	Asphalt	
1	SO1573						Silty, fine to coarse GRAVEL, dark olive-brown (2.5Y 3/3), silt 5-15%, damp to moist.	
	SO1574					SM	Silty, very fine to fine SAND, yellow-brown (10YR 5/6), silt 10-20%, damp to moist.	BACKFILLED w/ BENTONITE GROUT
2			75%	NA				
3	SO1576							
4							Silty, very fine SAND, mottled gray (5Y 6/1) and yellow (5Y 7/6), silt 10-20%, damp to moist.	
5	SO1577							
6			100%	NA		ML/ SM	Silty fine SAND/sandy SILT, gray (5Y 6/1), moist.	
7	SO1578							
8						ML	Clayey SILT, pale yellow (5Y 7/4), moist to wet.	
	SO1575*						Total depth 8.0' BGS	
9							* Sample SO1575 is a composite of the 0.5-1.5' interval below the base of the asphalt.	
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 18 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.03'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-113

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1	SO1564					GW	Asphalt	
	SO1565						Silty, fine to coarse GRAVEL, dark olive-brown (2.5Y 3/3), damp to moist.	
2	SO1566		75%	NA		ML/SM	Silty, very fine SAND/sandy SILT, yellow-brown (10YR 5/6), moist.	BACKFILLED w/ BENTONITE GROUT
3	SO1568							
4								
5	SO1569							
6			75%	NA			Color change to gray (5Y 6/1).	
7	SO1570 SO1571**					ML	Clayey SILT, gray (5Y 6/1), moist to wet.	
8	SO1567*					SP	Very fine to fine SAND, yellow-brown (10YR 5/6), moist.	
9							Total depth 8.0' BGS	
10							* Sample SO1567 is a composite of the 0.5-1.5' interval below the base of the asphalt.	
11							** Duplicate sample for interval specified.	
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 18 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.00'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-114

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	DVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1	SO1556					GW	Asphalt	
	SO1557						Silty, fine to coarse GRAVEL, dark olive-brown (2.5Y 3/3), damp.	
	SO1558					ML/ SM	Silty fine SAND/sandy SILT, yellow-brown (10YR 5/4), silt 10-20%, moist to wet.	BACKFILLED w/ BENTONITE GROUT
2			75%	NA			Silt lens (2" thick).	
3	SO1560						Color change to gray (2.5Y 6/1) w/ yellow laminae.	
4								
5	SO1561							
6			75%	NA		ML	SILT, gray (2.5Y 6/1) w/ yellow laminae, moist to wet.	
7	SO1562 SO1563**					ML/ SM	Fine sandy SILT (sand 10-20%), pale olive (5Y 7/3), moist.	
8	SO1559*						Total depth 8.0' BGS	
9							* Sample SO1559 is a composite of the 0.5-1.5' interval below the base of the asphalt.	
10							**Duplicate sample for interval specified.	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 18 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.10'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.001.0728

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-115

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL (not applicable)
0								
1	SO1549					GW	Asphalt	
	SO1550						Silty, fine GRAVEL, brown (10YR 4/3), moist.	
	SO1551					ML	Sandy SILT, dark yellow-brown (10YR 4/6), fine sand 10-20%, moist to wet. Brick layer (1" thick), wet.	BACKFILLED w/ BENTONITE GROUT
2			40%	NA		ML/ SM	Silty very fine SAND/sandy SILT, gray (2.5Y 6/1), some orange brown mottling, moist to wet.	
3								
4								
5	SO1553							
6			100%	NA		ML	Grading fine with depth to SILT, (2.5Y 6/1), wet.	
7	SO1554 SO1555**					ML/ SM	Silty very fine SAND/sandy SILT, gray (2.5Y 6/1), some orange brown mottling, moist to wet.	
8	SO1552*						Total depth 6.0' BGS	
9							* Sample SO1552 is a composite of the 0.5-1.5' interval below the base of the asphalt.	
10							** Duplicate sample for the interval specified.	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 18 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.03'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.004.0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-116

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							AS	Asphalt (0-3").	
1							SW	Subbase (3-6").	
2				70%				Very fine to fine SAND, dark yellow-brown (10YR 3/4), trace silt, damp to moist, predominantly fine grained.	
3									
4									
5									
6				75%					BACKFILLED w/ BENTONITE GROUT
7									
8								Becomes moist.	
9									
10				100%					
11								Gravelly SAND lens, 1.5" thick (rounded fine gravel) @ 10.9' BGS.	
12									
13									
14				100%			ML	Clayey SILT, very dark gray (2.5Y 3/1), very moist, some organic material in thin layers.	
15									
16							SW	Very fine to fine SAND, dark yellow-brown (10YR 3/4), trace silt, moist, predominantly fine grained, rare scattered pebbles.	
17									
18				100%					
19									
20									

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.66'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

EX™

Project No: 8601192.004.0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-116

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20–24				75%			SW	Very fine to fine SAND, dark yellow-brown (10YR 3/4), trace silt, moist, predominantly fine grained, rare scattered pebbles. Moist to wet.	BACKFILLED w/ BENTONITE GROUT
24–28				100%				Wet.	
28–32				100%					
32–40								Total depth 32.0' BGS. Groundwater sample GW12120101 collected from 28' to 32' BGS.	

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 35.66'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

EX™

Project No: 8601192.004.0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-117

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							AS	Asphalt (0-3").	
1							SW	Subbase (3-7").	
2				75%				Very fine to fine SAND, dark yellow-brown (10YR 3/4), trace silt, damp to moist, predominantly fine grained.	
3									
4									
5									BACKFILLED w/ BENTONITE GROUT
6				100%					
7									
8									
9									
10				100%					
11									
12									
13									
14				100%					
15									
16							ML/ SW	Interbedded very fine to fine SAND, dark yellow-brown (10YR 3/4) and clayey SILT, very dark gray (2.5Y 3/1), beds to 1" thick moist.	
17									
18				100%					
19									
20									

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.61'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 2

Project No: 8601192.004.0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-117

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20–24				100%			SW	Very fine to fine SAND, dark yellow-brown (10YR 3/4), predominantly fine grained.	BACKFILLED w/ BENTONITE GROUT
25–28				100%			ML	Very fine sandy SILT, yellow-brown (10YR 5/4), wet, sand 5-15%, orange-brown mottling throughout.	
29–32				100%			SW	Grading to SILT. Very fine to fine SAND, dark yellow-brown (10YR 3/4), predominantly fine grained.	
33–40								Total depth 32.0' BGS. Groundwater sample GW12190102 collected from 26' to 30' BGS.	

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 34.61'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 2 of 2

EX™

Project No: 8601192.004.0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-118

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0							AS	Asphalt (0-3"). Subbase (3-10").
1							SW	Very fine to fine SAND, dark yellow-brown (10YR 5/4), damp to moist, predominantly fine grained.
2				75%				
3								
4								
5								
6				75%				
7								
8								
9								
10				75%				
11								
12								
13								
14				100%				
15								
16							ML	Very fine sandy SILT, brown (7.5YR 4/4), moist, sand 10-20%, some gray mottling, minor organic material at top.
17								
18				100%			SW	Very fine to fine SAND, brown (7.5YR 4/4), moist, trace silt.
19								
20								

WELL CONSTRUCTION DETAIL

BACKFILLED w/ BENTONITE GROUT

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.85'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Project No: 8601192.004.0201

Project: Chlorate Plant Investigation

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-118

Ground surface: Asphalt

Geologist: D. Lamadrid / L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	SHEEN	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
20–21–22				100%			SW	Very fine to fine SAND, brown (7.5YR 4/4), moist, trace silt.	
23–24							SM	As above, grading to silty, very fine to fine SAND, brown (7.5YR 4/4), silt 20-30%. Color change to gray (N 3/) @23.5' BGS.	
25–26				100%			ML	SILT, very dark gray (N 3/), wet.	BACKFILLED w/ BENTONITE GROUT
27–28							SM	Very fine to fine SAND, very dark gray (N 3/), wet, trace silt increasing with depth (~10-20%).	
29–30				100%				Sandy, asphalt-like layer (3" thick) @ 30.0' BGS, sheen.	
31–32								Total depth 32.0' BGS.	
33–34								Groundwater samples GW12190104 and GW12190105 collected from adjacent borehole (3ft from B-118) and screened from 28' to 32' BGS.	
35–36–37–38–39–40									

Drilled By: Geo-Tech Explorations

Drill Method: Geoprobe

Drill Date: 19 December 2001

Well Casing Elevation: NA

Ground Surface Elevation: 36.85'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 2 of 2

Project No: 8601192.001.0634

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole : B-119

Ground surface: Gravel

Geologist: D. Lamadrid

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							No soil sampling. Groundwater sample collection only.	BACKFILLED w/ BENTONITE GROUT
30							Total depth 30' Water screen @ 26-30' Groundwater sample GW06120204 Duplicate GW06120205	

Drilled By: Cascade drilling

Drill Method: Direct push probe

Drill Date: 12 June 2002

Well Casing Elevation: NA

Ground Surface Elevation: 32.42'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Ex™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-1

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0536	0	75%	NA		GM	Silty, sandy GRAVEL, greyish brown (2.5Y 5/2), slightly moist, (fill).	
1						SM	Silty SAND, light brown-grey (2.5Y 6/2), white crystaline material @ 1.5'.	
2	SO0537	0	100%	NA				
3							Black staining from 3.5' to 4' w/ pinkish white (7.5YR 8/2) color, moist.	
4	SO0538	0				SW	Fine to coarse SAND, pinkish white (7.5R 8/2), slightly moist.	BACKFILLED w/BENTONITE GROUT
5	SO0539	0	100%	NA				
6								
7	SO0540	0	80%	NA				
8	SO0541	0						
9	SO0542	0	100%	NA				
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.38'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-2

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0543	0	100%	NA		GM	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
2	SO0544					SM	Silty SAND, brown (7.5YR 5/3), slightly moist	
3	SO0545	0	100%	NA			White crystalline material, 1" diameter @ 2.7' grading to SILT w/ black staining (2" band), silty fine to coarse SAND, some black staining from 3.5', color change to pinkish white sand (7.5YR 6/2), slighty moist, slight odor.	
4	SO0546							
5	SO0547	0	90%	NA				BACKFILLED W/BENTONITE GROUT
6	SO0548							
7	SO0549	0	90%	NA				
8	SO0550							
9	SO0551	0	85%	NA				
10	SO0552						Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.42'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-3

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0553	0	55%	NA		GM	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
2	SO0554	0	100%	NA		SP	Fine to coarse SAND, weak red (7.5R 4/2) w/ trace gravel, slightly moist.	
3	SO0555					ML	3-4" SILT lens.	
4						SP	Fine to coarse SAND, weak red (7.5R 4/2) w/ trace gravel, slightly moist.	
5	SO0556	0	90%	NA				BACKFILLED w/BENTONITE GROUT
6	SO0557						Color change to pinkish white (2.5YR 8/2), slightly moist, slight odor.	
7	SO0558	0	80%	NA				
8	SO0559	0	90%	NA			Slight odor.	
9	SO0560							
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.27'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-4

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0561	0	70%	NA		GM	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist. (fill).	
2								
3	SO0562	0	65%	NA		SW	Gravelly, medium to coarse SAND, brown (7.5YR 4/3), slightly moist.	
4								
5	SO0563	0	50%	NA				BACKFILLED w/BENTONITE GROUT
6						SM	Silty, gravelly SAND, brown (7.5YR 4/3), slightly moist.	
7	SO0564	0	90%	NA		SP	Fine to coarse SAND, verk dark gray (10YR 3/1), moist.	
8	SO0565						Wood debris @ 7.5'.	
9	SO0566	0	65%	NA			Wood debris @ 9.5'.	
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.27'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301
Project: Acid Plant IRM
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Boring Number: IB-5
Ground surface: Gravel
Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
0	SO0567	0	100%	NA		GM	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
1	SO0568					SM	Silty SAND, brown (10YR 4/3), slightly moist.	
2	SO0569	0	100%	NA				
3	SO0570					ML	SILT, dark red-grey (5YR 4/2) w/ abundant white crystalline material, slightly moist.	
4	SO0571	0	100%	NA		SP	Fine to medium SAND, moist, slight odor.	BACKFILLED w/BENTONITE GROUT
5	SO0572					SM	Silty sand lens.	
6	SO0573	0	90%	NA				
7	SO0574							
8	SO0575	0	90%	NA				
9	SO0576							
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 15 May 2000

Well Casing Elevation: NA
Ground Surface Elevation: 34.13'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929
Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-6

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
0	SO0577	0	90%	NA		GM	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
4	SO0578					SP	Fine to medium SAND, brown (7.5YR 5/4) slightly moist.	
2	SO0579	0	100%	NA				
3	SO0580							
4	SO0581	0	85%	NA			wood debris @ 4' BGS	BACKFILLED W/BENTONITE GROUT
5	SO0582							
6	SO0583	0	100%	NA				
7	SO0584						Color change to very dark gray (10YR 3/1).	
8	SO0585	0	95%	NA			Color change dark gray (10YR 4/1).	
9	SO0586							
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.14'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-7

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0587	0	100%	NA		GM	Sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
1	SO0588					SP	Fine to medium SAND, brown (7.5YR 4/3). SILT lens.	
2	SO0589	0	100%	NA		ML	Color change to weak red (10R 4/4).	
3	SO0590					SM	Sandy SILT, pinkish white (2.5YR 8/2) crystalline material intermittent from 3.5' to 4.5', weak red (7.5R 4/2), shiny black viscous material.	
4	SO0591	0	100%	NA		SP	Fine to medium SAND, weak red (7.5R 4/2), slightly moist, slight odor.	BACKFILLED w/BENTONITE GROUT
5	SO0592							
6	SO0593	0	100%	NA				
7	SO0594							
8	SO0595	0	90%	NA				
9	SO0596						Gradational color change to pale red (7.5R 6/2).	
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.08'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-8

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0597	0	90%	NA		GM	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
1	SO0598							
2						SP	Fine to medium SAND, brown (7.5YR 4/3), slightly moist.	
3	SO0599	3	100%	NA			Abundant black stained material and white crystalline material.	
4	SO0600					SM	Silty SAND, brown (7.5YR 4/3), slightly moist.	
5	SO0601	7	100%	NA		SP	Fine to medium SAND, weak red (5R 4/3) w/ white crystalline material. Gradational color change to light red-brown (2.5YR 6/3) slight odor.	BACKFILLED w/BENTONITE GROUT
6	SO0602							
7	SO0603	2	75%	NA				
8	SO0604							
9	SO0605	0	80%	NA				
10							Total depth of borehole 10' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.12'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-9

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0606	0	75%	NA		GM	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
2	SO0607							
3	SO0608	0	85%	NA		SP	Medium to coarse SAND, reddish brown (2.5YR 4/3), moist. Color change to dark gray-brown (10YR 4/2) at 2' BGS. Wood debris at 3.5' BGS.	
4	SO0609							
5	SO0610	0	80%	NA				BACKFILLED W/BENTONITE GROUT
6	SO0611							
7	SO0612	0	70%	NA				
8								
9	SO0613	0	75%	NA			Color change to dark yellow-brown.	
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.16'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-10

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0614	0	50%	NA		GM	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
2								
3	SO0615	0	80%	NA		SP	Fine to medium SAND, grayish brown (10YR 4/2), slightly moist, trace wood debris.	
4	SO0616							
5	SO0617	0	90%	NA				BACKFILLED w/BENTONITE GROUT
6	SO0618							
7	SO0619	0	85%	NA			Color change to brown (10YR 5/3).	
8	SO0620							
9	SO0621	0	80%	NA			Color change to lt. red-brown (2.5YR 6/3), slight odor.	
10	SO0622							
11							Total depth of borehole 10' BGS	
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.18'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-11

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0623	0	100%	NA		GM	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
2	SO0624					SM	Silty SAND, brown (7.5YR 4/3) w/ pink crystalline material, slightly moist.	
3	SO0625	0	90%	NA		SP	Fine to medium SAND, pale red (2.5YR 7/2), slightly moist, slight odor.	
4	SO0626							
5	SO0627	0	30%	NA			As above with wood debris.	BACKFILLED w/BENTONITE GROUT
6								
7	SO0628	0	75%	NA				
8								
9	SO0629	0	75%	NA				
10	SO0630						Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.14'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-12

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0631	0	100%	NA		GP	Sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
2	SO0632					SP	Fine to medium SAND, dark brown (7.5YR 3/3), grading to pale red (2.5YR 7/2), slight odor.	
3	SO0633	0	100%	NA				
4	SO0634							
5	SO0635	0	90%	NA				BACKFILLED w/BENTONITE GROUT
6	SO0636							
7	SO0637	0	85%	NA				
8	SO0638							
9	SO0639	0	90%	NA				
10	SO0640						Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 16 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.18'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-13

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0641	0	100%	NA		GM	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
2	SO0642					SP	Fine to medium SAND, brown (7.5YR 4/3) w/ trace white crystalline material, slightly moist. Black staining observed at 1.75'-2.0' BGS.	
3	SO0643	0	90%	NA				
4	SO0644							
5	SO0645	0	85%	NA				BACKFILLED w/BENTONITE GROUT
6	SO0646							
7	SO0647	0	85%	NA			Dark yellow-brown (10YR 4/4) horizon (~ 4" thick).	
8	SO0648							
9	SO0649	0	--	NA			Grading to pale red (2.5YR 6/2), slight odor.	
10	SO0650						Total depth of borehole 10' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 16 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.07'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-14

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0651	0	100%	NA		GP	Sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
2	SO0652					SM	Fine to medium silty SAND, brown (7.5YR 4/4), slightly moist.	
3	SO0653/ SO0654	0	95%	NA				
4	SO0655						As above w/ trace well rounded gravel from 3.5' to 4.0' BGS.	
5	SO0656	0	90%	NA				BACKFILLED w/BENTONITE GROUT
6	SO0657							
7	SO0658	0	100%	NA				
8	SO0659							
9	SO0660	0	90%	NA				
10	SO0661						Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 16 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.09'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-15

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0662	0	100%	NA		GP	Sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
2	SO0663					SP	Fine to medium SAND, brown (7.5YR 4/4), slightly moist.	
3	SO0664	0	100%	NA		ML	SILT lens, black.	
	SO0665					SM	Silty SAND, reddish gray (2.5YR 5/1) w/ abundant white crystalline material, odor.	
4	SO0666	0	100%	NA		SP	Fine to medium SAND, pale red (2.5YR 6/2), odor.	BACKFILLED w/BENTONITE GROUT
5	SO0667							
6	SO0668	0	85%	NA				
7	SO0669							
8	SO0670	0	90%	NA				
9	SO0671							
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 16 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.16'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-16

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0672	0	85%	NA		GP	Sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	
1	SO0673					SM	Silty SAND, weak red (10R 4/3), grading to pale red (2.5YR 6/3), slightly moist, slight odor.	
2	SO0674	0	85%	NA				
3	SO0675							
4	SO0676	0	95%	NA				BACKFILLED w/BENTONITE GROUT
5	SO0677							
6	SO0678	0	70%	NA				
7								
8	SO0679	0	90%	NA				
9	SO0680							
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 16 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.11'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-17

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0681	0	90%	NA		GM	Sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist, (fill).	BACKFILLED w/BENTONITE GROUT
2	SO0682					SM	Silty SAND, brown (7.5YR 4/4), slightly moist.	
3	SO0683	0	95%	NA		SP	Fine to medium SAND, dark brown (7.5YR 3/2), slightly moist.	
4	SO0684							
5	SO0685	0	100%	NA				
6	SO0686							
7	SO0687	0	90%	NA				
8	SO0688							
9	SO0689	0	90%	NA				
10	SO0690						Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 16 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.19'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-18

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0410	718	85%	NA		SW	Asphalt Fine to medium, gravelly SAND, dark gray-brown (10YR 4/2), subangular gravel (fill).	
2						SM/ ML	Silty fine SAND to SILT, dark gray-brown (10YR 4/2) to gray (2.5Y 6/1) w/ trace mottling, slightly moist.	
3	SO0411	0	100%	NA				
4	SO0412							
5	SO0413	0	85%	NA				BACKFILLED w/BENTONITE GROUT
6	SO0414							
7	SO0415	0	100%	NA		SP ML	Very fine SAND lens (~2" thick). Color change to pale yellow (5Y 7/3) from 7-8' BGS, grading to gray (2.5 6/1), moist.	
8	SO0416							
9	SO0417	344	100%	NA			As above w/ trace CLAY, slightly plastic, pale yellow (5Y 7/3), moist.	
10	SO0418						Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 16 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 35.14'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-19

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0419	0	85%	NA		SP/GP	Asphalt Gravelly, fine to medium SAND, dark gray (10YR 4/1), slightly moist, (fill).	
2						SP	Fine to medium SAND, dark gray (10YR 4/1).	
3	SO0420 SO0421	0	100%	NA		SP/GM	Gravelly, silty SAND, dark gray-brown (10YR 4/2) w/ orange mottling.	
4								
5	SO0422 SO0423	9	100%	NA		ML	SILT, grayish brown (2.5Y 5/2) trace pale yellow (2.5Y 7/3) w/ trace white crystalline material. Fine sand lens.	BACKFILLED W/BENTONITE GROUT
6								
7		76	10%	NA		SM	Silty SAND, abundant wood debris, slightly moist.	
8								
9	SO0424 SO0425	68	100%	NA		ML	SILT, gray (5YR 5/1), slightly moist. Very fine sand lens, brown (10YR 5/3).	
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 16 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.99'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-20

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0426	0	75%	NA		SP/GP	Gravelly SAND, very dark gray (2.5Y 3/1) w/ dark orange mottling @ 1.5 -2.0', moist.	
2							Trace white crystalline material @ 2' BGS. Fine to coarse SAND lenses, dark yellow-brown (10YR 3/4) @ 2.3 and 2.5' BGS.	
3	SO0427 / SO0428	0	100%	NA		ML	SILT, gray (10YR 5/1) w/ white crystalline material.	
4								
5	SO0429 / SO0430	212	100%	NA			Dark gray (10YR 4/1) horizon 5.3-5.5' BGS.	BACKFILLED w/BENTONITE GROUT
6								
7	SO0431	125	40%	NA				
8								
9	SO0432 / SO0433	136	90%	NA			Color change to alternating horizons of very dark gray (10YR 3/1), yellow and brown.	
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 16 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.69'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-21

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0434	0	70%	NA		SM	Silty, gravelly SAND, brown (10YR 4/3), slightly moist.	
2								
3	SO0435	0	100%	NA				
	SO0436					ML	SILT, light gray (2.5Y 7/1) w/ pale yellow (5Y 7/4) horizon @ 3.5-6' BGS.	
4	SO0437							
5		9	100%	NA				BACKFILLED w/BENTONITE GROUT
	SO0438						Black horizon (~ 1" thick).	
6	SO0439							
7		483	90%	NA				
	SO0440							
8	SO0441							
9		591	100%	NA			Residual NAPL observed @ 8.5'. Lustrous silt from 8.5 to 9.0' BGS.	
	SO0442							
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 17 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.82'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-22

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0443	0	75%	NA		SW	Asphalt Gravelly fine to med. SAND, gray (2.5Y 6/1) grading to dark brown (7.5YR 3/4) w/ 1/2" dia. white crystalline material @ 1.5'.	BACKFILLED w/BENTONITE GROUT
2	SO0444	0	100%	NA		SM	Silty very fine to fine SAND, dark brown (7.5YR 3/4).	
3	SO0445							
4	SO0446	0	90%	NA		ML	SILT, yellow brown (10YR 5/4), w/ trace black staining, micaceous, moist.	
5	SO0447							
6								
7	SO0448	336	70%	NA		SP ML	Very fine to fine SAND lens.	
8								
9	SO0449	190	60%	NA			Color change to dark yellow-brown (10YR 3/4), lustrous, very moist, residual NAPL observed from 9.5 -10' BGS.	
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 17 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 35.09'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301
Project: Acid Plant IRM
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Boring Number: IB-23
Ground surface: Asphalt
Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
0	SO0450	28	80%	NA		SW	Asphalt	
1	SO0451						Gravelly fine to med. SAND, dark yellow-brown (10YR 3/6), slightly moist.	
2						SP	Fine SAND w/ trace silt, dark gray-brown (10YR 4/2).	
2	SO0452	19	80%	NA		ML	SILT, grayish brown (10YR 5/2), slightly moist, micaceous.	
3	SO0453						SAND lens, dark yellow-brown (10YR 4/6).	
4	SO0454	6	90%	NA		CL	Clayey SILT lens.	BACKFILLED w/BENTONITE GROUT
5	SO0455					ML		
6						CL	Clayey SILT lens.	
6	SO0456	34	80%	NA		ML	Orange mottling from 6-8'.	
7	SO0457							
8						CL	Clay lens.	
8	SO0458	9	100%	NA		ML	Residual NAPL observed from 8 - 10'.	
9	SO0459							
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 17 May 2000

Well Casing Elevation: NA
Ground Surface Elevation: 34.73'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-24

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							Asphalt	
1	SO0460	0	65%	NA		ML	SILT, dark yellow-brown (10YR 4/4) w/ pinkish trace crystalline material.	
2						SP	SAND, gray (10YR 5/1), slightly moist.	
3	SO0461	0	95%	NA		ML	SILT, dk yellow-brown (10YR 4/4), micaceous	
4						SP	Fine to very fine SAND w/ black staining, moist.	
						ML	SILT, dark yellow-brown (10YR 4/4).	
5	SO0462	0		NA		CL	Clayey SILT lens (~20 -25%).	BACKFILLED w/BENTONITE GROUT
	SO0463					ML		
6	SO0464	92		NA			As above, lusterous sheen.	
7	SO0465						Gradational color change to gray (10YR 5/1).	
8	SO0466	25		NA			As above, grading from moist to very moist. Lusterous sheen, residual NAPL observed @ 8.5'.	
9	SO0467							
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 17 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.68'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301
Project: Acid Plant IRM
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Boring Number: IB-25
Ground surface: Asphalt
Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							Asphalt	
1	SO0468	0	85%	NA		SW	Gravelly SAND, dark yellow-brown (10YR 3/4), slightly moist.	
	SO0469					SP	Fine to medium SAND, black.	
2	SO0470	0	85%	NA		SM	Very fine SAND w/ trace silt, dark yellow-brown (10YR 4/4), slightly moist.	
3	SO0471					ML	SILT, dark yellow-brown (10YR 4/4), moist, micaceous .	
4								BACKFILLED w/BENTONITE GROUT
5	SO0472	0	55%	NA		CL	Clayey SILT lens.	
						ML	Black staining @ 5.25'.	
6	SO0473	0	100%	NA		CL	Clayey silt lens, trace orange mottling.	
7	SO0474					ML	Orange colored horizon (1/2").	
8	SO0475	0	100%	NA			As above, increasing moisture content from very moist to wet.	
9	SO0476					ML/ CL	Clayey SILT, yellow-brown (10YR 4/4), moist.	
10							Total depth of borehole 10' BGS	
11								
12								
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15								
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17								
18								
19								
20								

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 17 May 2000

Well Casing Elevation: NA
Ground Surface Elevation: 34.16'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929
Sheet: 1 of 1

EX™

Project No: 8601192.002.0301
Project: Acid Plant IRM
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Boring Number: IB-26
Ground surface: Asphalt
Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0							Asphalt
1	SO0477	0	80%	NA		SW	Gravelly SAND, brown (10YR 4/3), slightly moist (fill).
2	SO0478					SP	Fine to medium SAND, brown (10YR 4/3).
3	SO0479	0	100%	NA		CL	Clayey silt lens
	SO0480					ML	SILT
4						SP	Fine to medium SAND lens.
5	SO0481	20		NA		ML	SILT w/ trace black staining (4-5' BGS).
6	SO0482					CL/ML	Clayey silt lens.
7	SO0483	170	85%	NA			Black staining from 6-7' BGS.
8	SO0484						As above, becoming wet.
9	SO0485	77	100%	NA			Residual NAPL present from 7' - 10'
10	SO0486						Total depth of borehole 10' BGS

WELL CONSTRUCTION DETAIL: BACKFILLED w/BENTONITE GROUT

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 17 May 2000

Well Casing Elevation: NA
Ground Surface Elevation: 34.89'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301
Project: Acid Plant IRM
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Boring Number: IB-27
Ground surface: Asphalt
Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0487	5	70%	NA		SW	Asphalt	
						SP	Gravelly SAND, dark gray (7.5YR 4/1) w/ white crystalline material.	
2							Fine to medium SAND, dark brown (7.5YR 3/3).	
3	SO0488	0	100%	NA				
	SO0489					ML	SILT, gray (7.5YR 5/1) grading to grayish brown (10YR 5/2), slightly moist, micaceous.	
4								
5	SO0490	0	85%	NA		ML/CL	Clayey SILT, gray (7.5YR 5/1), very moist.	BACKFILLED w/BENTONITE GROUT
	SO0491							
6								
7	SO0492	209	80%	NA			Residual NAPL present from 7' - 10'	
	SO0493							
8						ML/CL	Clayey SILT, lt. olive-gray (5Y 6/2), very moist. Finely bedded from 8.4-8.7' BGS.	
9	SO0494	26	100%	NA		ML	SILT lens, yellow-brown.	
	SO0495							
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
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17								
18								
19								
20								

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 17 May 2000

Well Casing Elevation: NA
Ground Surface Elevation: 34.94'
Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-28

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
0	SO0496	0	80%	NA		SW	Aphalt	
1	SO0497					SP	Gravelly SAND, brown (10YR 4/3) w/ trace white crystalline material (fill).	
2							Fine to medium SAND, white (2.5Y 8/1), slightly moist.	
3	SO0498	0	100%	NA		ML	SILT, gray (7.5YR 5/1) w/ brown horizons @ 3' and 3.5' BGS, slightly moist.	
4	SO0499							
5	SO0500	0	90%	NA		ML/CL	Clayey SILT, dark brown (7.5YR 3/3), slightly moist.	BACKFILLED w/BENTONITE GROUT
6	SO0501						Color change to light olive-gray (5Y 6/2).	
7	SO0502	0	75%	NA		ML	SILT, grayish brown (10YR 5/2) grading to light olive gray (5Y 6/2) and gray (7.5YR 5/1).	
8	SO0503	92	100%	NA		ML/CL	Clayey SILT, light olive gray (5Y 6/2). Finely bedded from 8-10' BGS.	
9	SO0504							
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 17 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.72'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-29

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0						SW	Gravelly SAND, brown (10YR 4/3) (fill).	
1	SO0691	0	100%	NA		SP	Fine to medium SAND, dark yellow-brown (10YR 4/6), slightly moist. Clayey silt lens.	
2	SO0692							BACKFILLED w/BENTONITE GROUT
3	SO0693	0	100%	NA		SP	SILT, dark yellow-brown (10YR 4/4) w/ trace orange mottling, slightly moist, micaceous.	
4	SO0694						As above, increased clay content from 4 to 4.25' BGS.	
5	SO0695	0		NA			Total depth of borehole 5' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.54'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-30

Ground surface: Gravel

Geologist: T. Speracio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0696	0	100%	NA		SW	Gravelly SAND, brown (10Y 4/3) (fill).	
2	SO0697					SP	Very fine to fine SAND, olive brown (2.5Y 4/3), very slightly moist.	BACKFILLED w/BENTONITE GROUT
3	SO0698	0	85%	NA		SM	Silty very fine to fine SAND, olive brown (2.5Y 4/3), slightly moist, micaceous.	
4	SO0699							
5	SO0700	0	75%	NA			Total depth of borehole 5' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.66'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-31

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0701	0	100%	NA		SW	Gravelly fine to coarse SAND, brown. (fill)	BACKFILLED w/BENTONITE GROUT
1	SO0702					SP	Very fine to fine SAND w/ trace of silt, olive brown (2.5Y 4/3), slightly moist.	
2								
3	SO0703	0	70%	NA			As above w/ trace fine gravel.	
4						ML	SILT, olive brown (2.5Y 4/3), slightly moist, micaceous.	
5	SO0704	0	100%	NA		SM	Silty, very fine SAND, olive brown (2.5Y 4/3), slightly moist.	
							Total depth of borehole 5' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.54'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-32

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0705	0	100%	NA		SW	Gravelly fine to coarse SAND w/ white powdery material (fill).	
2	SO0706					SP	Very fine to fine SAND, olive brown (2.5Y 4/3), slightly moist.	BACKFILLED W/BENTONITE GROUT
3	SO0707	0	80%	NA				
4	SO0708					SM	Silty fine SAND, olive brown (2.5Y 4/3), slightly moist.	
5	SO0709	0	65%	NA			Total depth of borehole 5' BGS	
6								
7								
8								
9								
10								
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13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.52'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-33

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0710	0	95%	NA		SW	Gravelly SAND, (fill)	BACKFILLED w/BENTONITE GROUT
1	SO0711					SP	Very fine to fine SAND, dark olive brown (2.5Y 3/3), moist.	
2	SO0712	0	100%	NA		ML	Clayey SILT lens, moist.	
3	SO0713					SM	Silty fine SAND, light olive brown (2.5Y 5/3), slightly moist.	
4	SO0714	0	75%	NA				
5							Total depth of borehole 5' BGS	
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.36'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-34

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0715	0	95%	NA		SM	Very fine to fine SAND w/ trace gravel, olive brown (2.5Y 4/3).	
2	SO0716						As above, w/o gravel.	
3	SO0717	0	95%	NA		SM	Silty very fine SAND, light olive brown (2.5Y 5/3).	BACKFILLED w/BENTONITE GROUT
4	SO0718					ML	SILT lens (~2" thick)	
5	SO0719	0	100%	NA		SM ML SM	SILT lens (~2" thick)	
6							Total depth of borehole 5' BGS	
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.41'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-35

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							2" Asphalt	
1	SO0720	0	80%	NA		SW	Gravelly SAND, olive brown (2.5Y 4/3), (fill)	
	SO0721					SP	Fine SAND, olive brown (2.5Y 4/3), slightly moist.	
2	SO0722					ML	SILT, olive-brown (2.5Y 4/3), slightly moist, micaceous.	BACKFILLED w/BENTONITE GROUT
3	SO0723	0	90%	NA				
4	SO0724	0	100%	NA		SM	Silty, very fine SAND, olive-brown (2.5Y 4/3), slightly moist.	
5							Total depth of borehole 5' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.09'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-36

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0725	0	100%	NA		SW	Gravelly SAND, olive brown (2.5Y 4/3), (fill)	BACKFILLED w/BENTONITE GROUT
1	SO0726					SP	Fine SAND, olive brown (2.5Y 4/3), slightly moist.	
2	SO0727	0	80%	NA		ML	SILT, olive brown (2.5Y 4/3), slightly moist.	
3	SO0728					ML/CL	Clayey SILT lens moist.	
4	SO0729	0						
5							Total depth of borehole 5' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.28'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-37

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
0	SO0730	0	85%	NA		GM	Aphalt	
1	SO0731						Silty, sandy GRAVEL, olive brown (2.5Y 4/3), (fill)	
2	SO0732	0	85%	NA		SP	Very fine to fine SAND, olive brown (2.5Y 4/3), slightly moist.	
3	SO0733						As above, grading to fine SAND.	
4	SO0734	0	40%	NA			wood debris w/ white crystalline material, pinkish hue from 4 -5'.	BACKFILLED W/BENTONITE GROUT
5	SO0517					ML	SILT, olive brown (2.5Y 4/3).	
6								
7	SO0518	0	65%	NA		SM	Silty SAND, dark brown (10YR 3/3).	
8								
9	SO0519	0	60%	NA		ML/CL	Clayey SILT, dk brown (10YR 3/3).	
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18-19 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.33'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-38

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0735	0	90%	NA		SP	Fine SAND with trace fine gravel, brown (10YR 4/3), slightly moist.	
2	SO0736					GM	Sandy GRAVEL lens.	
						SP	Fine SAND with trace fine gravel, brown (10YR 4/3), slightly moist.	BACKFILLED w/BENTONITE GROUT
3	SO0737	0	80%	NA				
4	SO0738							
5	SO0739	0	70%	NA			Trace pinkish-white crystalline material observed at 4'.	
							Total depth of borehole 5' BGS	
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 33.95'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-39

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0740	0	80%	NA		SM/SW	Gravelly, silty SAND grading from gray to brown (10YR 4/3). (fill).	
1	SO0741							
2						SP	Fine SAND, brown (10YR 4/3).	BACKFILLED W/BENTONITE GROUT
3	SO0742	0	100%	NA			1" SILT lens.	
4	SO0743							
5	SO0744	0	70%	NA			Total depth of borehole 5' BGS	
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.20'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-40

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0745	0	90%	NA		SM/SW	Silty, gravelly SAND, gray(10YR 5/1). (fill)	BACKFILLED w/BENTONITE GROUT
2	SO0746							
3	SO0747	0	80%	NA				
4	SO0748					ML	SILT, dark yellow-brown (10YR 4/4) w/ dark orange mottling (4.5-5' BGS), grading to gray (10YR 5/1).	
5	SO0749	0						
6							Total depth of borehole 5' BGS	
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 33.55'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-41

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0750	0	100%	NA		SM/SW	Silty, gravelly SAND gray (10YR 5/1), very weathered grains. (fill)	
	SO0751					ML	SILT, olive brown (2.5Y 4/3) w/ orange mottling.	
2	SO0752	0	100%	NA		ML/SM	Sandy SILT, gray (2.5Y 5/1) with abundant dark orange mottling and trace fine to coarse gravel (weathered) at 3.5'.	BACKFILLED w/BENTONITE GROUT
3	SO0753							
4	SO0754	0	70%	NA				
5							Total depth of borehole 5' BGS	
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 33.73'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-42

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0755	0	80%	NA		GM	Silty, sandy GRAVEL, gray (10YR 5/1), slightly moist.	
2	SO0756							
3	SO0757	0	40%	NA			Grading to sandy silty GRAVEL.	BACKFILLED w/BENTONITE GROUT
4								
5	SO0758	0					Fibrous black material at 4.75'	
							Total depth of borehole 5' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 33.79'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-43

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0759	0	90%	NA		GM	Sandy, silty GRAVEL, gray (2.5Y 5/1) w/ some construction debris (concrete, brick). (fill)	BACKFILLED w/BENTONITE GROUT
2	SO0760						White crystalline material @ 2.0'.	
3	SO0761	0	85%	NA			As above, increasing sand fraction.	
4	SO0762						Pinkish-white crystalline material (1" thick).	
5	SO0763	0	100%	NA			As above, traces of crystalline material.	
							Total depth of borehole 5' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.16'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-44

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0764	0	90%	NA		GM	Sandy, silty GRAVEL (fill).	BACKFILLED w/BENTONITE GROUT
2	SO0765					ML	SILT, olive-brown (2.5Y 4/3) w/ black staining from 1.5 -2.0'.	
3	SO0766	0	100%	NA			As above w/ trace gravel.	
4	SO0767							
5	SO0768	0	70%	NA			Total depth of borehole 5' BGS	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 33.43'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-45

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0769	0	90%	NA		SM/SW	Silty, gravelly SAND, gray (2.5Y 5/1), slightly moist.	
2	SO0770						As above w/ wood debris.	
3	SO0771	0	85%	NA				
4	SO0772							
5	SO0773	--	--	NA				BACKFILLED W/BENTONITE GROUT
6	SO0807	0	20%	NA			As above w/ wood debris and slag, very dark gray-brown (2.5 3/2), moist.	
7	SO0808	0	20%	NA				
8	SO0809	0	100%	NA				
9							Total depth of original borehole 5' BGS. Resumed sampling 22 May 2000 @ 5-8'.	
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 May 2000/22 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 33.93'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-46

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0774	0	100%	NA		GM	Sandy, silty GRAVEL. (fill)	BACKFILLED w/BENTONITE GROUT
2	SO0775						Trace white crystalline material @ 2'.	
3	SO0776	0	80%	NA				
4	SO0777						Fibrous material @ 4'.	
5	SO0778	0	40%	NA			Trace white crystalline material @ 5.5'.	
6								
7	SO0779	0	30%	NA				
8							Fibrous material @ 8'.	
9	SO0780	0	50%	NA		SM	Silty SAND, brown (10YR 4/3). Red brick fragments @ 9.0' BGS.	
10	SO0804	0	50%	NA		SP	Fine to medium SAND, very dark gray-brown (2.5Y 3/2).	
11	SO0805	0	50%	NA				
12	SO0806	--	100%	NA				
13							Total depth of original borehole @ 10' BGS. Borehole resumed 22 May 2000 from 10-13'.	
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 19 May 2000/22 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 33.78'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-47

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0512	0	100%	NA		GM	Sandy, silty GRAVEL, (fill)	
	SO0513					SM	Fine silty SAND, brown (10YR 4/3), slightly moist.	
2						ML	SILT, brown (10YR 4/3), moist.	BACKFILLED w/BENTONITE GROUT
3	SO0514	0	90%	NA				
	SO0515							
4								
5	SO0516	0	40%	NA			Total depth of borehole 5' BGS	
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 19 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.11'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-48

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0781	0	100%	NA		GM	Silty, sandy GRAVEL, gray (2.5Y 5/1), slightly moist.	
1	SO0782					SM	Fine silty SAND, brown (10YR 4/3), slightly moist.	
2	SO0783	0		NA		ML	SILT, brown (10YR 4/3), slightly moist.	BACKFILLED W/BENTONITE GROUT
3	SO0510						Trace black staining from 3-4'.	
4	SO0511	0		NA				
5							Total depth of borehole 5' BGS	
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 19 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.67'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-49

Ground surface: Gravel

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0520	0	100%	NA		GM	Silty, sandy GRAVEL. (fill)	
1	SO0521							
2						SP	Fine to medium SAND, pink, slightly moist.	
	SO0522	0	90%	NA		ML	SILT, pink, moist.	
3	SO0523							
4						SP	Fine to medium SAND, pink.	BACKFILLED w/BENTONITE GROUT
	SO0524	0	90%	NA				
5	SO0525							
6								
7	SO0526	0	70%	NA				
8								
9	SO0527	0	75%	NA				
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 19 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.11'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-50

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0528	0	80%	NA		GM	Sandy, silty GRAVEL. (fill)	
	SO0529							
2						SP	Fine SAND, dark gray-brown (10YR 4/2).	
3	SO0530	0	80%	NA		ML	SILT, gray (2.5Y 6/1) and pale yellow (5Y 7/3).	BACKFILLED w/BENTONITE GROUT
	SO0531							
4						SP	Fine to medium SAND lens, pink.	
5	SO0532	0	85%	NA		ML		
	SO0533							
6						SP	Fine to medium SAND, pale yellow (5Y 7/3), grading to olive (5Y 5/3) w/ depth, moist.	
7	SO0534	0	80%	NA				
	SO0535							
8						SP	2" SILT lens, gray (5Y 5/1).	
9	SOX0536	0	100%	NA				
	SOX0537							
10							Bottom of Boring @ 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 19 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.24'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8501192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemical, Inc.

Location: Portland, OR

Boring Number: IB-51

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0811	0	60%	NA		SM/SW	Silty, gravelly SAND, dark brown (10YR 3/3), moist.	
2	SO0812	0	90%	NA				BACKFILLED w/BENTONITE GROUT
3	SO0813	0				ML/CL	SILT, brown (10YR 4/3), increasing clay content w/ depth.	
4	SO0814	0	85%	NA				
5	SO0815	0					Wet.	
6	SO0816	0	75%	NA			Red viscous material observed from 8 -9.5'.	
8	SO0817	0	100%	NA				
9	SO0818	0						
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 19 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 35.10'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-52

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0505	0	100%	NA		GW	GRAVEL (5/8" minus).	
2						SP	Fine to medium SAND w/ trace silt ~2 -5%, very dark gray-brown (10YR 3/2), slightly moist.	BACKFILLED w/BENTONITE GROUT
3	SO0506	0	100%	NA				
4	SO0507	0	100%	NA			Color change to brown (10YR 4/3), moist to wet.	
5	SO0508	0	100%	NA				
6	SO0509	0	100%	NA		ML	SILT, dark gray-brown (2.5Y 4/2), wet.	
7	SO0819	0	100%	NA			Color change to very dark, gray-brown (2.5Y 3/2).	
8	SO0820	53	100%	NA		ML/ SM	Fine to medium sandy SILT, very dark gray-brown (2.5Y 3/2) w/ rust red mottling, wet.	
9	SO0821	0	100%	NA				
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 22 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.42'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-53

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0784	0	50%	NA		GW	Silty, sandy GRAVEL, grayish brown (2.5Y 5/2), slightly moist.	
1	SO0785	0	100%	NA				
2	SO0786	0	80%	NA		SP	Fine to medium SAND, dark gray-brown (10YR 4/2), slightly moist. 1" silt lens @ 2'.	BACKFILLED W/BENTONITE GROUT
3	SO0787	0	100%	NA		SM	Silty fine SAND, olive-brown (2.5Y 4/3), moist.	
4	SO0788	0	100%	NA				
5	SO0789	699	100%	NA			As above, wet, slight sheen, moderate odor.	
6	SO0790	1928	100%	NA				
7	SO0791	1928	100%	NA				
8	SO0792	404	100%	NA				
9	SO0793	904	100%	NA		ML	SILT, grayish brown (2.5Y 5/2) wet, moderate odor, slight sheen.	
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 22 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.68'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-54

Ground surface: Asphalt

Geologist: T. Sparacio

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
0	SO0794	0	60%	NA		GW	Silty, sandy GRAVEL, olive-brown (2.5Y 4/3), slightly moist.	
1	SO0795	0	100%	NA		SP	Fine to medium SAND, olive-brown (2.5Y 4/3), slightly moist.	
2	SO0796	0	100%	NA				BACKFILLED w/BENTONITE GROUT
3	SO0797	0	100%	NA		SM	Silty fine SAND, olive-brown (2.5Y 4/3), slightly moist.	
4	SO0798	0	50%	NA				
5	SO0799	0	50%	NA			Color change to dark gray-brown (2.5Y 4/2) wet.	
6	SO0800	0	50%	NA		SM/ ML	Silty, fine SAND to sandy SILT, wet.	
7	SO0801	0	50%	NA				
8	SO0802	613	100%	613			As above w/ slight odor, slight sheen.	
9	SO0803	200	100%	200				
10							Total depth of borehole 10' BGS	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 22 May 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.38'

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Ex™

Project No: 8601192.002.0301
Project: Acid Plant IRM
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Boring Number: IB-65
Ground surface: Asphalt
Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0930	0	100%	NA		SP	Slightly silty, fine to medium SAND w/ trace fine gravel , olive-brown (2.5Y 4/3), slightly moist, reddish staining at 1.5' w/ white crystalline material and construction debris.	
1	SO0931	0	100%	NA				
2	SO0932	0	100%	NA		SM/ ML	Silty, fine SAND to fine sandy SILT, lt. brown-gray (2.5Y 6/2), micaceous, slightly moist.	BACKFILLED w/BENTONITE GROUT
3	SO0933	0	100%	NA				
4	SO0934	0	100%	NA			Color change to gray (10YR 5/1), slightly moist. Gravelly based on Geoprobe action.	
5		--	0%	NA				
6	SO0936	0	100%	NA				
7	SO0937	0	100%	NA		ML	SILT, gray (10YR 5/1), moist.	
8	SO0938	5.4	100%	NA			Color change to grayish brown (10YR 5/2), wet.	
9	SO0939	0	100%	NA				
10							Total depth of borehole 10' BGS.	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 18 July 2000

Well Casing Elevation: NA
Ground Surface Elevation: 34.38'
Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929
Sheet: 1 of 1

EX™

Project No: 8601192.002.0301
Project: Acid Plant IRM
Client: ATOFINA Chemicals, Inc.
Location: Portland, OR

Boring Number: IB-66
Ground surface: Asphalt
Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO0940	3.6	100%	NA		SP	Fine to medium SAND, very dark gray-brown (10YR 3/2), slightly moist.	BACKFILLED w/BENTONITE GROUT
2	SO0941 SO0942	0	100%	NA				
3	SO0943	0	100%	NA			Silt lens.	
4	SO0944	3.6	100%	NA		SM/ ML	Silty, fine SAND to fine, sandy SILT, very dark brown (10YR 3/2), micaceous, slightly moist.	
5	SO0945	0	100%	NA				
6	SO0946	0	100%	NA			SILT, very dark brown (10YR 3/2) slightly moist.	
7	SO0947	136	100%	NA				
8	SO0948	698	100%	NA			As above, strong odor.	
9	SO0949	309	100%	NA				
10	SO0950	1979	100%	NA			As above with residual NAPL observed @ 9.5' BGS.	
11							Total depth of borehole 10' BGS.	
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling
Drill Method: Geoprobe
Drill Date: 18 July 2000

Well Casing Elevation: NA
Ground Surface Elevation: 34.38'
Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0301

Project: Acid Plant IRM

Client: ATOFINA Chemical, Inc.

Location: Portland, OR

Boring Number: IB-67

Ground surface: Asphalt

Geologist: Jeffrey S. Paul

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0	SO0951	0	100%	NA		SP	Fine to medium SAND, very dark gray-brown (10YR 3/2), slightly moist.	BACKFILLED w/BENTONITE GROUT
1	SO0952	0	100%	NA			Silt lens.	
2	SO0953	0	100%	NA			Silt lens.	
3	SO0954	0	100%	NA		SM/ ML	Silty, fine SAND to fine, sandy SILT, very dark brown (10YR 3/2), micaceous, slightly moist.	
4	SO0955	0	100%	NA				
5	SO0956	0	100%	NA				
6	SO0957	0	100%	NA		ML	SILT, very dark brown (10YR 3/2), slightly moist.	
7	SO0958	90	100%	NA				
8	SO0959	1752	100%	NA			As above, strong odor.	
9	SO0960	1735	100%	NA			As above with residual NAPL observed.	
10							Total depth of borehole 10' BGS.	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 18 July 2000

Well Casing Elevation: NA

Ground Surface Elevation: 34.38'

Borehole Diameter: 1.5"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-73

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO1121*	4.4	100%	NA		SP	SAND, dark yellow-brown (10YR 4/4),	BACKFILLED w/BENTONITE GROUT
	SO1122	2.6						
2	SO1123	2.6					Total depth of borehole 2' BGS.	

* Sample submitted for laboratory analysis.

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

EX™

Project No: 8601192.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-74

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0						SP	SAND, yellow-brown (10YR 5/6).	BACKFILLED W/BENTONITE GROUT
1	SO1115*	2.6	100%	NA			Color change to dark yellow-brown (10YR 3/6).	
	SO1116	2.6						
2	SO1117	4.4					Total depth of borehole 2' BGS.	

* Sample submitted for laboratory analysis.

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

EX™

Project No: 8601192.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

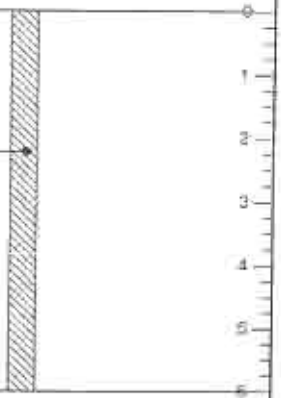
Boring Number: IB-75

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0						GP	GRAVEL.
1						SP/SM	SAND, yellow-brown (10YR 5/6).
2			80%	NA			Becoming silty with depth.
3						SM/ML	Sandy SILT, yellow-brown (10YR 5/6).
4						SM	Silty SAND, yellow-brown (10YR 5/6).
5	SO1112	2.6	100%	NA		SP	SAND, yellow-brown (10YR 5/6).
6							Total depth of borehole 6' BGS.

WELL CONSTRUCTION DETAIL



Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

EX™

Project No: 8601192.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-76

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1						GP	Sandy GRAVEL.	
2			90%	NA		SF	SAND, yellow-brown (10YR 5/6).	BACKFILLED w/BENTONITE GROUT
3						SM/ ML	Sandy SILT, yellow-brown (10YR 5/6).	
4								
5	SO1114	2.6	100%	NA		GW	GRAVEL and wood chips.	
6							Total depth of borehole 6' BGS.	
7								
8								
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10								
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12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

Project No: 8601192.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

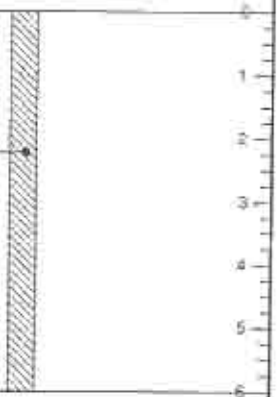
Boring Number: IB-77

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0						SP	SAND, yellow-brown (10YR 5/6).
1							
2			90%	NA			
3						SM/ ML	Sandy SILT, yellow-brown (10YR 5/6).
4							
5	SO1110*	0.0	100%	NA			As above, grading to silty SAND.
6						ML	SILT, dark gray-brown (2.5Y 4/2). Total depth of borehole 6' BGS.
7							
8							
9							* Sample submitted for laboratory analysis.
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

WELL CONSTRUCTION DETAIL



Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

EX™

Project No: 8601192.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-78

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0						SP	SAND, yellow-brown (10YR 5/6).	BACKFILLED w/BENTONITE GROUT
1								
2			90%	NA				
3						SM/ ML	Sandy SILT, yellow-brown (10YR 5/6).	
4								
5	SO1111	2.6	100%	NA		SM	Silty SAND, light olive-brown (2.5Y 5/4). Wood debris and charcoal fragments.	
6							Total depth of borehole 6' BGS.	
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

Project No: 8501192.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-79

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0						GP	GRAVEL	BACKFILLED w/BENTONITE GROUT
1	SO1118*	4.4	100%	NA		SP	SAND, dark olive-brown (2.5Y 3/3).	
	SO1119*	4.4						
2	SO1120	4.4					Grading to moist @ 18" BGS.	
							Total depth of borehole 2' BGS.	

* Sample submitted for laboratory analysis.

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

Project No: 8601192.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-80

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0						SP	SAND, light olive-brown (2.5Y 5/4) with some gravel.	
1	SO1130*	2.6	90%	NA			As above with wood chips.	
	SO1131	0.8						
2	SO1132	0.8						BACKFILLED w/BENTONITE GROUT
3	SO1133	0.8	80%	NA		SM/ ML	Sandy SILT, light olive-brown (2.5Y 5/4).	
4						SM	SAND, light olive-brown (2.5Y 5/4).	
5	SO1134	0.8	90%	NA		SM	Silty SAND, light olive-brown (2.5Y 5/4).	
						ML	SILT, light olive-brown (2.5Y 5/4).	
6						SM/ ML	Silty SAND, yellow brown (10YR 5/6).	
7	SO1135	0.8	100%	NA		ML	SILT, olive-brown (2.5Y 4/3).	
						SM/ ML	Silty SAND, light olive-brown (2.5Y 5/4).	
8							Total depth of borehole 8' BGS.	
9								
10							* Sample submitted for laboratory analysis.	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

Project No: 8601192.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-81

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1	SO1124*	2.6	100%	NA		GP	Sandy GRAVEL.	
1	SO1125	4.4				SP	SAND, yellow-brown (10YR 5/4).	
2	SO1126	4.4						BACKFILLED w/BENTONITE GROUT
3	SO1127	2.6	100%	NA		ML/SM	Sandy SILT, yellow-brown (10YR 5/4).	
4						SM	Silty SAND, yellow-brown (10YR 5/4).	
5	SO1128	4.4	90%	NA		SP	SAND, light olive-brown (2.5Y 5/3).	
6						SM/ML/SM	Sandy SILT, light olive-brown (2.5Y 5/3). Silty SAND, light olive-brown (2.5Y 5/3).	
7	SO1129	4.4	75%	NA		ML	SILT, light olive-brown (2.5Y 4/3), wet w/ narrow bands, strong brown (7.5YR 5/8).	
8						SM	SAND, light olive-brown (2.5Y 5/4)	
9							Total depth of borehole 8' BGS.	
10							* Sample submitted for laboratory analysis.	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

EX™

Project No: 5601152.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-82

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0						SM/	SAND and GRAVEL.	
1						GW/ SM	SAND, light olive-brown, (2.5Y 5/3).	
2			100%	NA				BACKFILLED w/BENTONITE GROUT
3						ML/	Sandy SILT, light olive-brown, (2.5Y 5/3).	
4						SM/ SM	Silty SAND, light olive-brown (2.5Y 5/3).	
5			100%	NA				
6	SO1136*	0.8				ML/ SM	Sandy SILT, olive-gray (5Y 4/2).	
							Total depth of borehole 6' BGS.	
							* Sample submitted for laboratory analysis.	

Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

Project No: 8601192.002.0502

Project: Acid Plant IRM

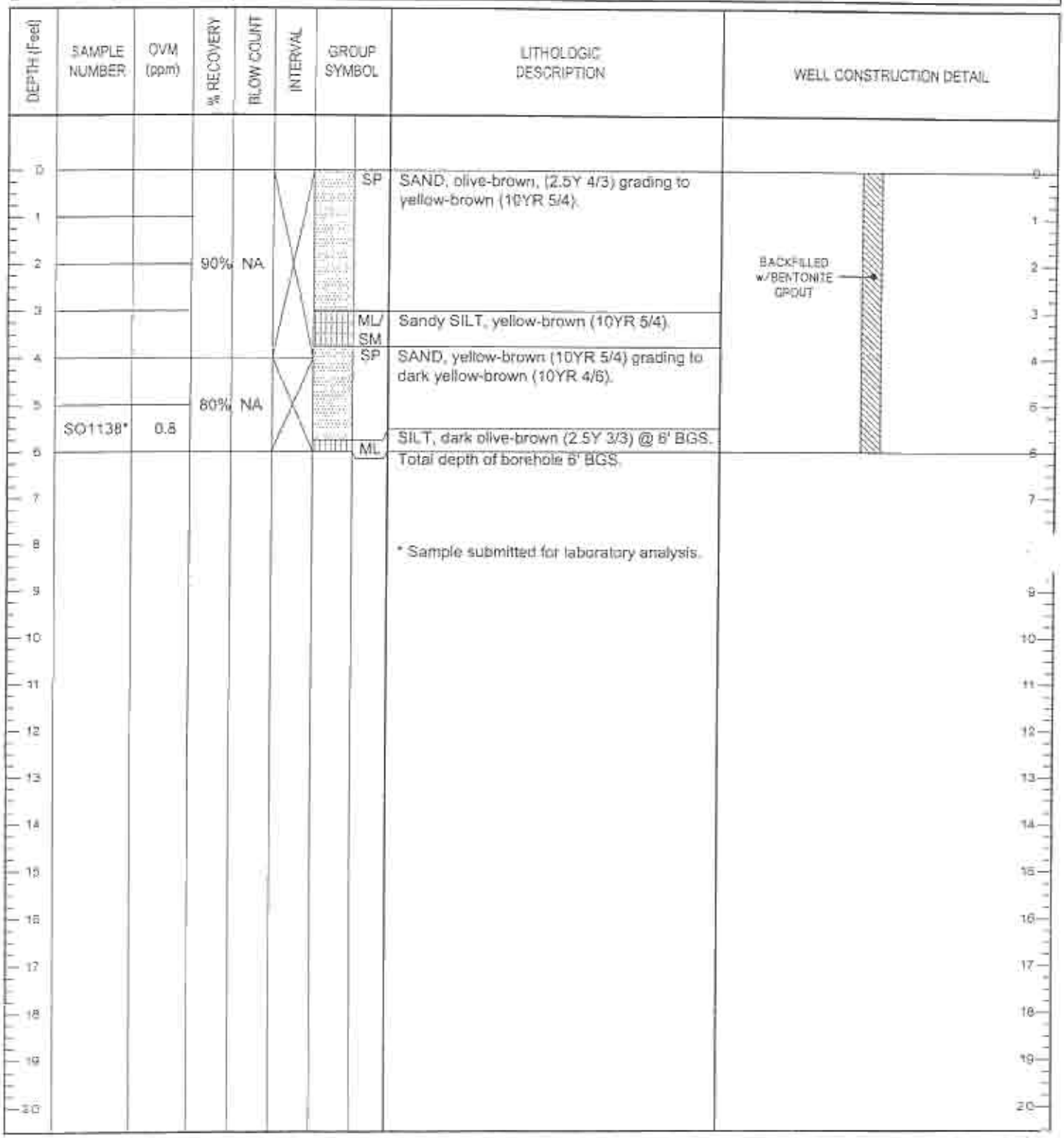
Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-83

Ground surface: Gravel

Field staff: Laura McWilliams



Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

EX™

Project No: 8601192.002.0502

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-84

Ground surface: Gravel

Field staff: Laura McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0						SP	SAND, olive-brown, (2.5Y 4/3).
1							
2			100%	NA			
3							
4						ML	Sandy SILT, olive-brown, (2.5Y 4/3).
5			100%	NA		SP	SAND, light olive-brown, (2.5Y 5/3).
6	SO1139*	0.8				ML	SILT, dark olive-brown (2.5Y 3/3) w/ charcoal fragments.
7							Total depth of borehole 6' BGS.
8							* Sample submitted for laboratory analysis.
9							
10							
11							
12							
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15							
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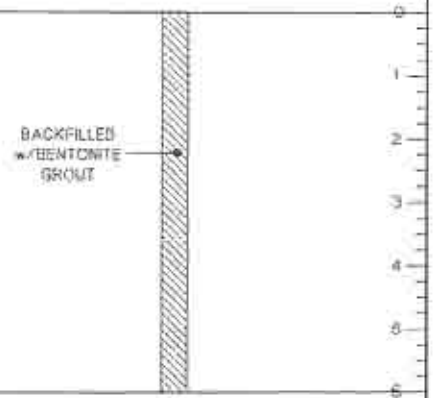
17							
18							
19							
20							

WELL CONSTRUCTION DETAIL



Drilled By: Cascade Drilling

Drill Method: Geoprobe

Drill Date: 15 August 2001

Well Casing Elevation: NA

Ground Surface Elevation: NA

Borehole Diameter: 2.0"

Datum: NA

Sheet: 1 of 1

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-85

Ground surface: Asphalt

Field staff: E. Dodak, L. McWilliams

DEPTH (feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							Asphalt and sub base	
1	SO1664	2.4	75%	NA		SP	Fine to medium SAND, grayish brown (10YR 5/2), trace silt (~5%), micaceous, moist. Silt lamination @ 1.5' BGS.	
3	SO1665	0.8	75%	NA			Silty, very fine SAND, grayish brown (10YR 5/2), micaceous, ~25-35% silt, moist.	
4							Grades to ~20-25% silt.	
5	SO1666	0.8	100%	NA		ML	Sandy SILT, dark gray-brown (2.5Y 4/2), very fine sand ~5-25%, wet.	BACKFILLED w/BENTONITE GROUT
7	SO1667	0.8	100%	NA		ML/SM	Silty, very fine SAND/very fine sandy SILT, grayish brown (2.5Y 5/2), micaceous, wet.	
8						ML	SILT, grayish brown (2.5Y 5/2).	
9	SO1668 SO1669*	2.4	100%	NA		ML/SM	Silty, very fine SAND/very fine sandy SILT, grayish brown (2.5Y 5/2), some fine sand, very moist.	
10						ML	SILT, dark gray-brown (2.5Y 4/2), moderately stiff, very moist to wet.	
							Total depth of borehole 10' BGS.	
							* Duplicate sample at interval specified	

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 34.32

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-86

Ground surface: Asphalt

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0							Asphalt and sub base
1	SO1670	0.8	75%	NA		SM	Silty SAND, grayish brown (2.5Y 5/2), fine sand, ~20-30% silt, moist.
2							
3	SO1671	0.0	75%	NA		SP	Fine SAND, lt. olive-brown (2.5Y 5/3), micaceous, moist.
4						SM	Silty, very fine SAND, lt. yellow-brown (2.5Y 6/3), micaceous, ~25-35% silt, moist. Carbonized wood lamination (0.5" thick) @ 3.9' BGS.
5	SO1672	0.8	75%	NA		ML	As above, color change to grayish brown (2.5Y 5/2), wet @ 4.5' BGS.
6						SM	SILT, dark grayish brown (2.5Y 5/2), wet.
7	SO1673	0.8	75%	NA			Silty, very fine SAND, lt. yellow-brown (2.5Y 6/3), micaceous, ~25-35% silt, moist, trace organics (carbonized wood).
8						ML	SILT, grayish brown (2.5Y 5/2), moderate odor.
9	SO1674	0.8	100%	NA		ML/SM	Silty, very fine SAND/very fine sandy SILT, dark gray-brown (2.5Y 4/2), wet.
10						ML	SILT, grayish brown (2.5Y 5/2), weak odor, wet.
							Total depth of borehole 10' BGS.

WELL CONSTRUCTION DETAIL

BACKFILLED W/BENTONITE GROUT

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 34.08

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-87

Ground surface: Concrete

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							Concrete	
1							Void beneath concrete.	
2								
3	SO1650	0.0	50%	NA		SP/SM	Fine silty SAND, dark gray-brown (10YR 4/2), micaceous, ~10-15% silt, silt laminations @ 2.2', 2.4' and 2.8', moist.	
4						SM	Silty, very fine SAND, grayish-brown (10YR 5/2), 25-30% silt, moist. Rock fragment 1" dia. @ 4' BGS.	
5	SO1651	0.0	100%	NA			As above, micaceous, wet @ 4.5' BGS.	BACKFILLED w/BENTONITE GROUT
6							Silt lamination (~0.1" thick) @ 6' BGS.	
7	SO1652	0.0	100%	NA			Increased silt content (~30-40%).	
8						ML	Very fine, sandy SILT, dark gray-brown (10YR 4/2), ~25% very fine micaceous sand, wet.	
9	SO1653	0.0	100%	NA				
10								
11	SO1654	0.0	100%	NA		SM	Very fine silty SAND, gray (10YR 5/1), ~25-35% silt, very moist to wet, micaceous.	
12							Total depth of borehole 12' BGS.	
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 34.74

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-88

Ground surface: Concrete

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							Concrete	
1							Void beneath concrete.	
2	SO1655	2.4	75%	NA		SM	Silty fine SAND, brown (10YR 4/3), micaceous, ~10-15% silt, moist. Silt laminations (0.5-1.0" thick) @ 1.8 and 2.2' BGS.	
3	SO1656	2.4	75%	NA			Silty very fine SAND, lt. brown-gray (10YR 6/2), micaceous, ~30-35% silt, very moist to wet.	
4								
5	SO1657	17.3				ML	SILT, gray (10YR 5/1), ~5-10% organics, wet.	BACKFILLED w/BENTONITE GROUT
6						SM	Silty very fine SAND, grayish brown (10YR 5/2), ~20-30% silt, micaceous, very moist to wet, moderate odor.	
7	SO1658	>2,000	65%	NA			As above, color change to brown (10YR 4/3) and silt lamination (~1" thick) @ 7' BGS.	
8								
9	SO1659	482	100%	NA			As above, color change to gray (10YR 5/1), local areas of increased silt content (~45-50%).	
10							Grading to silty fine SAND, gray (10YR 5/1), ~15-20% silt, wet.	
11							Total depth of borehole 10' BGS.	
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 34.89

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-89

Ground surface: Asphalt

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							Asphalt and sub base	BACKFILLED W/BENTONITE GROUT
2			0%	NA				
3	SO1660	4.1	60%	NA		SM	Silty, very fine to fine SAND, grayish brown (10YR 5/2), micaceous, ~25-35% silt, moist.	
4						SP	Fine SAND, lt. brown-gray (10YR 6/2), trace silt (~5-10%), micaceous, moist. Silt lamination @ 3.5' BGS, wood (carbonized) lamination @ 3.8' BGS.	
5	SO1661	9.1	75%	NA		SM	Silty, very fine SAND, lt. brown-gray (10YR 6/2), ~25-35% silt, micaceous, very moist. Color change to gray (10YR 6/1). Change to silty fine to very fine SAND.	
7	SO1662	4.1	75%	NA		ML	SILT, grayish brown (10YR 5/2), very moist to wet.	
8						SM	Silty, very fine SAND, grayish brown (10YR 5/2), ~35-40% silt, micaceous, wet.	
9	SO1663	14.0	100%	NA		ML	SILT, grayish brown (10YR 5/2), very moist to wet. Trace wood fragments @ 10'BGS.	
10							Total depth of borehole 10' BGS.	

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 34.55

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-90

Ground surface: Asphalt

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							Asphalt and sub base	
1						SM	Silty SAND, lt. brown-gray (10YR 6/2), fine to very fine sand, micaceous, ~25-35% silt, dry.	
2								
3	SO1675	0.8	50%	NA			Asphalt ~2" @ 3' BGS.	
4						SM	Grading to fine SAND, lt. olive-brown, trace silt, moist. Color change to gray (5Y 6/1).	
5	SO1676	2.4	80%	NA				BACKFILLED w/BENTONITE GROUT
6						ML	Sandy SILT, lt. olive-gray (5Y 6/2), ~30% very fine micaceous sand, wet.	
7	SO1677	0.8	80%	NA		SP	Fine SAND, lt. olive-brown (2.5Y 5/3), trace silt (~5-10%), moist.	
8								
9	SO1678	0.8	75%	NA			Color change to olive (5Y 3/3).	
10							Total depth of borehole 10' BGS.	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 34.63

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-91

Ground surface: Gravel

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							Gravel	
1	SO1679 SO1684*	2.4	75%	NA		SM	Silty very fine SAND, brown (10YR 5/3), ~25-30% silt, trace red brick, moist.	
2							As above, color change to lt. gray (10YR 7/1).	
3	SO1680	2.4	75%	NA			Silt lamination (1" thick) underlain by carbonized wood @ 3.0' BGS.	
4							Color change to lt. olive-gray (5Y 6/2) @ 3.5' BGS.	
5	SO1681	7.1	75%	NA			Color change to pale olive (5Y 6/3) @ 4.5' BGS.	BACKFILLED w/BENTONITE GROUT
6						ML	SILT, brown (10YR 5/3), trace orange mottling, moist.	
						SM/ML	Silty, very fine SAND/very fine sandy SILT, lt. olive gray(5Y 6/2), micaceous, wet.	
7	SO1682	4.1	75%	NA		ML	Grading to SILT @ 6.7' BGS, brown (10YR 5/5).	
8						SP	Fine SAND, dark gray-brown (2.5Y 4/2), micaceous, moist.	
9	SO1683	5.7	80%	NA				
10							Total depth of borehole 10' BGS.	
11							* Duplicate sample at interval specified. Duplicate sample analyzed for pesticides.	
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 34.66

Borehole Diameter: 2.0"

Datum: City of Portland - 1929

Sheet: 1 of 1

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-92

Ground surface: Concrete

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0							Concrete	
1			45%	NA		SM	Silty SAND, grayish brown (2.5Y 5/2), ~25 silt, wet (fill).	
3						SP	Fine to medium SAND, lt. olive-brown (2.5Y 5/3), trace (5%) coarse sand, trace fine gravel, moist.	
4	SO1706	2.4	75%	NA				
5						SM	Silty, very fine SAND, lt. gray (10YR 7/1), ~25-30% silt, very moist to moist.	
6	SO1707	2.4	75%	NA		ML	Lamination of fine to medium SAND (0.5" thick) @ 6' BGS.	BACKFILLED w/BENTONITE GROUT
7						SP	Very fine, sandy SILT, gray (10YR 6/1), 15-25% very fine sand.	
8	SO1708	7.1	75%	NA			Fine to med. SAND, gray (10YR 5/1), trace (5%) coarse sand, loose, moist. Color change to olive gray (5Y 5/2) @ 9.1' BGS. Color change to gray (10YR 5/1) @ 10.4' BGS. Color change to grayish brown (10YR 5/2), trace silt, wet @ 10.8' BGS. Color change to gray (2.5Y 5/1), no silt @ 12.5' BGS.	
9								
10	SO1709	4.1						
11								
12	SO1710	5.7	80%	NA				
13							Total depth of borehole 13' BGS.	
14							Note: Soil sampling begun 3' BGS due to fill soils directly below concrete. The following sample depths are noted in the analytical table:	
15							SO1706 0'-2'	
16							SO1707 2'-4'	
17							SO1708 4'-6'	
18							SO1709 6'-8'	
19							SO1710 8'-10'	
20								

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 38.10

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-93

Ground surface: Asphalt

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0							Asphalt and sub base
1	SO1690	22.3	65%	NA		SP	Fine SAND, brown (10YR 4/3), micaceous, trace silt (5-10%), moist.
2							Silt lamination (~0.02" thick) @ 2.0' BGS.
3	SO1691	50.4	75%	NA			Silty SAND, 2.5-2.7' BGS.
4						SM	Silty very fine SAND, grayish brown (2.5Y 3/2), micaceous, ~25-35% silt, moist.
5	SO1692	2.4	75%	NA			Color change to lt. olive-brown (2.5Y 5/3).
6							Asphalt lamination (0.02" thick) @ 5.3' BGS. Increased silt content (~40-50%) from 5.7-5.9' BGS.
7	SO1693	2.4				ML	Very fine, sandy SILT, brown (10YR 5/3), some red banding, wet.
8						SM	Silty very fine SAND, brown (10YR 4/3), micaceous, ~25-35% silt, very moist.
9	SO1694 SO1695*	4364	80%	NA			Color change to grayish brown (2.5Y 5/2). Strong odor, sheen, residual NAPL @ ~9.4' BGS.
10						ML	SILT, grayish brown (2.5Y 5/2), strong odor, residual NAPL.
11							Total depth of borehole 10' BGS.
12							* Duplicate sample at interval specified.
13							
14							
15							
16							
17							
18							
19							
20							

WELL CONSTRUCTION DETAIL

BACKFILLED w/BENTONITE GROUT

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 35.35

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-94

Ground surface: Asphalt

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
1							Asphalt and sub base	
2	SO1685	4.1	65%	NA		SM	Silty fine SAND, brown (10YR 5/3), ~35-40% silt, moist.	
3	SO1686	5.7	65%	NA		ML	Very fine, sandy SILT, brown (10YR 5/3), trace carbonized organics, micaceous ~25-35% very fine sand, moist.	
4						SM	Silty, very fine SAND, lt. olive-brown (2.5Y 5/3), ~20-25 silt, moist. Silt laminations (~0.15" thick), light olive-brown (2.5Y 5/3) @ 3.3' BGS underlain by fine sand, grayish brown (2.5Y 5/2), moist.	
5	SO1687	7.4	100%	NA		ML	SILT, grayish brown (2.5Y 5/2), very moist.	BACKFILLED W/BENTONITE GROUT
6						SM/ ML	Silty, very fine SAND/very fine sandy SILT, olive-gray (5Y 5/2), micaceous, wet.	
7	SO1688	4.1	100%	NA		ML	SILT, lt. olive-gray (5Y 6/2), very moist.	
8						SP	Fine SAND, dark brown (10YR 3/3), very moist.	
9	SO1689	4.1	100%	NA			As above, slightly micaceous.	
10							Total depth of borehole 10' BGS.	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 34.22

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-95

Ground surface: Gravel

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION
0							Gravel
1	SO1696	25.6	70%	NA		GW	Sandy GRAVEL, grayish brown (2.5Y 5/2), ~30% sand, some red brick and asphalt, moist.
2						SM	Fine to very fine, sandy SILT, lt. brown-gray (2.5Y 6/2), ~15-25% silt, moist. V. fine sand only (no fine sand) below 2.6', increased silt content (~25-35%), some orange banding, micaceous, moist. lt. olive-brown (2.5Y 5/3).
3	SO1697	4.1	70%	NA			
4							
5	SO1698	5.7	100%	NA			Grading to silty fine SAND, gray (2.5Y 5/1), micaceous, ~15-20% silt, wet.
6						ML SM	SILT, lt. olive-brown (2.5Y 5/1) from 5.4-5.6' BGS.
7	SO1699	4.1	100%	NA		ML	Silty, very fine SAND, gray (7.5Y 5/1), ~30-40% silt, very moist.
8							SILT, gray (2.5Y 6/1), wet. Sandy SILT, lt. brown-gray (2.5Y 6/2), ~15-25% very fine sand, moist @ 7.2' BGS.
9	SO1700	5.7	100%	NA		SM/ ML ML	Very fine sandy SILT/silty SAND, lt. brown-gray (2.5Y 6/2). Color change to pale olive (5Y 6/3) @ 8.7' BGS.
10							SILT, dark gray-brown (2.5Y 4/2), some very fine sand (~15-25%) below 9.6' BGS. Total depth of borehole 10' BGS.

WELL CONSTRUCTION DETAIL: BACKFILLED w/BENTONITE GROUT

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 34.56

Borehole Diameter: 2.0"

Datum: City of Portland Datum -1929

Sheet: 1 of 1

EX™

Project No: 8601192.002.0501

Project: Acid Plant IRM

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Boring Number: IB-96

Ground surface: Asphalt

Field staff: E. Dodak, L. McWilliams

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
0								
0							Asphalt and sub base	
1	SO1701	0.8	75%	NA		SM	Silty, gravelly SAND, brown (10YR 5/3), ~10 % gravel (0.3" dia.), trace red brick, ~30% silt, moist.	
2								
3	SO1702	5.7	75%	NA			Silty, very fine SAND, brown (10YR 5/3), ~20-30% silt, micaceous, moist @ 2' BGS.	
4								
5	SO1703	4.1	100%	NA			Asphalt layer ~0.3" thick @ 4.5' BGS, wet. Increased silt content @ 4.6'. Silt laminations @ 5' and 5.6' BGS, grayish brown (2.5Y 5/2).	BACKFILLED w/BENTONITE GROUT
6						ML/ SM	Silty, very fine SAND/very fine, sandy SILT, grayish brown (2.5Y 5/2), micaceous, trace organics, wet.	
7	SO1704	2.4	100%	NA				
8						ML	Slightly sandy SILT, color as above, ~5-15% very fine sand, wet.	
9	SO1705	2.4	100%	NA			Trace carbonized wood @9' BGS. Increased sand content, 20-30%.	
10							Total depth of borehole 10' BGS.analysis.	
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Drilled By: Cascade Drilling

Drill Method: Direct push probe

Drill Date: 20 May 2002

Well Casing Elevation: NA

Ground Surface Elevation: 34.19

Borehole Diameter: 2.0"

Datum: City of Portland Datum - 1929

Sheet: 1 of 1

ERM
1777 Botelho Drive
Suite 262
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

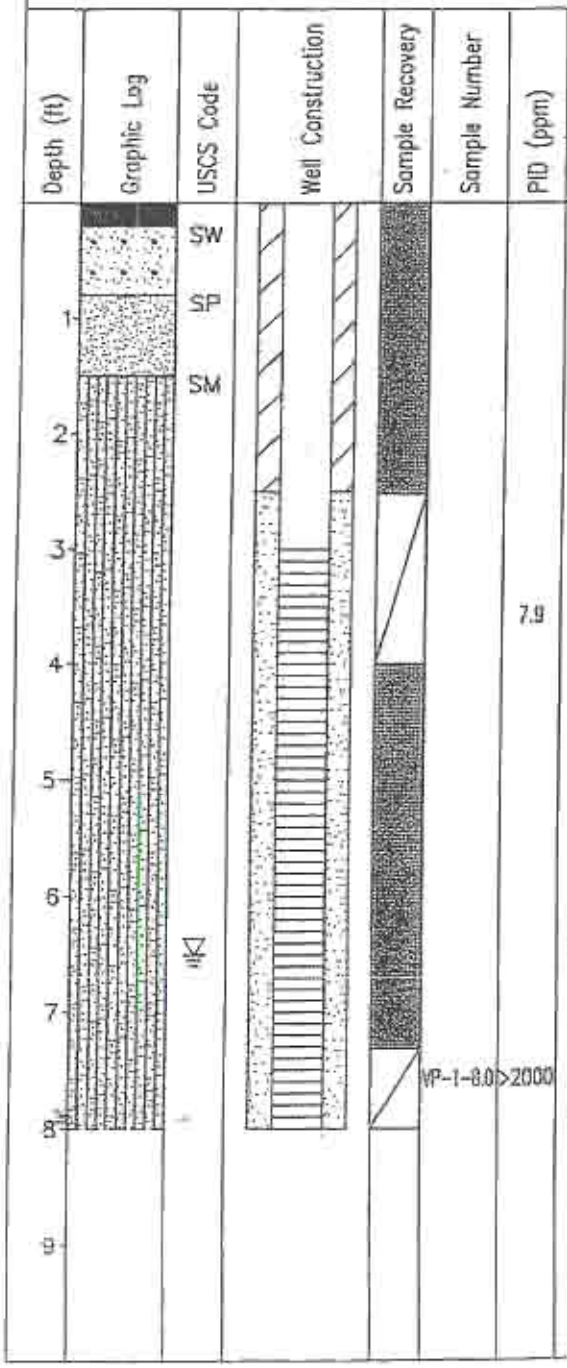
Site Id: VP-1

Project Number: 4251.00
Project Name: ATOFINA, VES Pilot Test
Location: Portland, Oregon
Contractor: Geotech Exploration Inc.
Drilling Method: Direct-Push
Logged By: M. Arnold
Date(s): 06/26/00

Total Depth: 8.00'
Borehole Dia.: 2.00in
Initial Water Level: 6.50'

Probe Construction Details

Blank Casing: type: PVC		dia: 0.75in	fm: 0.0'	to: 3.00'
Screens: type: Slotted	size: 0.010in	dia: 0.75in	fm: 3.00'	to: 8.00'
Annular Fill: type: Grout (Bentonite Cement)			fm: 0.00'	to: 2.50'
type: 10/20 Sand Filter Pack			fm: 2.50'	to: 8.00'



Soil Description/Classification

0-0.2' Asphaltic concrete.

0.2-0.8' SAND (SW): brown, fine to medium grained, trace to little silt, some gravel, loose, moist, (fill).

0.8-1.5' SAND (SP): gray, fine to medium grained, no to little silt, medium dense, moist.

1.5-8.0' SILTY SAND (SM): gray, fine grained sand, scattered layers (<1.0") fine sand, medium dense, moist.

Wet below 6.5' bgs.

Bottom of Boring at 8.0'.

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

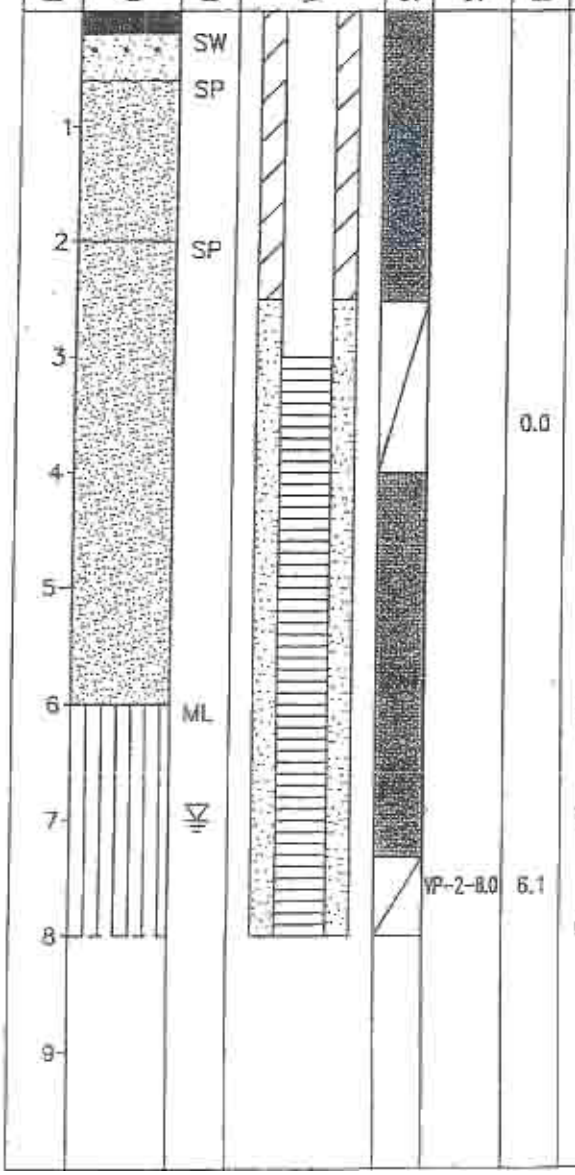
Site Id: VP-2

Project Number: 4251.00
Project Name: ATOFINA, VES Pilot Test
Location: Portland, Oregon
Contractor: Geotech Exploration Inc.
Drilling Method: Direct-Push
Logged By: M. Arnold
Date(s): 06/26/00

Total Depth: 8.00'
Borehole Dia.: 2.00in
Initial Water Level: 7.00'

Probe Construction Details

Blank Casing: type: PVC		dia: 0.75in	fm: 0.0'	to: 3.00'
Screens: type: Slotted	size: 0.010in	dia: 0.75in	fm: 3.00'	to: 8.00'
Annular Fill: type: Grout (Bentanite Cement)			fm: 0.00'	to: 2.50'
type: 10/20 Sand Filter Pack			fm: 2.50'	to: 8.00'



Soil Description/Classification

0-0.2' Asphaltic concrete.
0.2-06' SAND (SW): brown, fine to coarse grained, with gravel, trace silt, (fill).
0.6-2.0' SAND (SP): brown, fine to medium grained, no to some silt, medium dense, moist.

2.0-6.0' SAND (SP): brown, fine to medium grained, no to little gravel, moist.

6.0-8.0' SILT (ML): gray, no to some fine grained sand, interbedded (<1/2") silty fine sand layer.

Wet below 7.0' bgs.

Bottom of Boring at 8.0'.

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

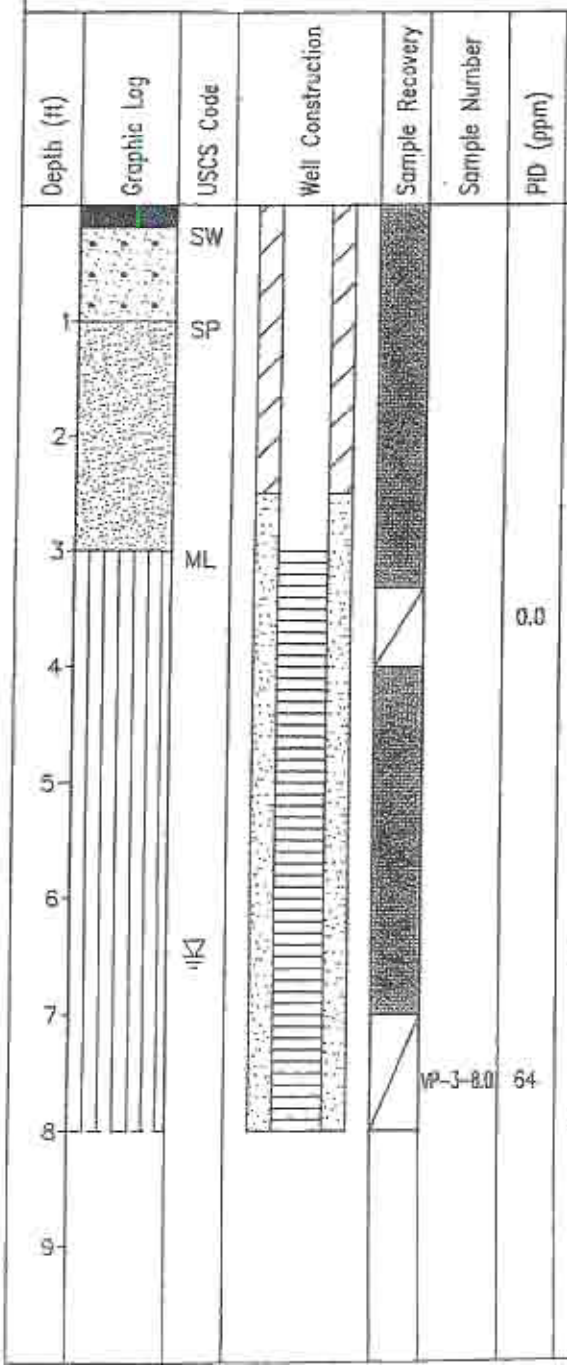
Site Id: VP-3

Project Number: 4251.00
Project Name: ATOFINA, VES Pilot Test
Location: Portland, Oregon
Contractor: Geotech Exploration Inc.
Drilling Method: Direct-Push
Logged By: M. Arnold
Date(s): 06/26/00

Total Depth: 8.00'
Borehole Dia.: 2.00in
Initial Water Level: 6.50'

Probe Construction Details

Blank Casing: type: PVC	dia: 0.75in	fm: 0.0'	to: 3.00'	
Screens: type: Slotted	size: 0.010in	dia: 0.75in	fm: 3.00'	to: 8.00'
Annular Fill: type: Grout (Bentonite Cement)			fm: 0.00'	to: 2.50'
type: 10/20 Sand Filter Pack			fm: 2.50'	to: 8.00'



Soil Description/Classification

0-0.2' Asphaltic concrete.

0.2-1.0' SAND (SW): brown, fine to medium grained, little silt and gravel, loose, moist, (fill).

1.0-2.3' SAND (SP): brown, fine grained, loose, moist, (fill).

2.3-3.0' SAND (SP): as above, but gray.

3.0-8.0' SILT (ML): gray, no to some fine sand, scattered layers (<1/2") silty sand to fine sand, medium dense, moist.

Wet below 6.5' bgs.

Bottom of Boring at 8.0'.

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

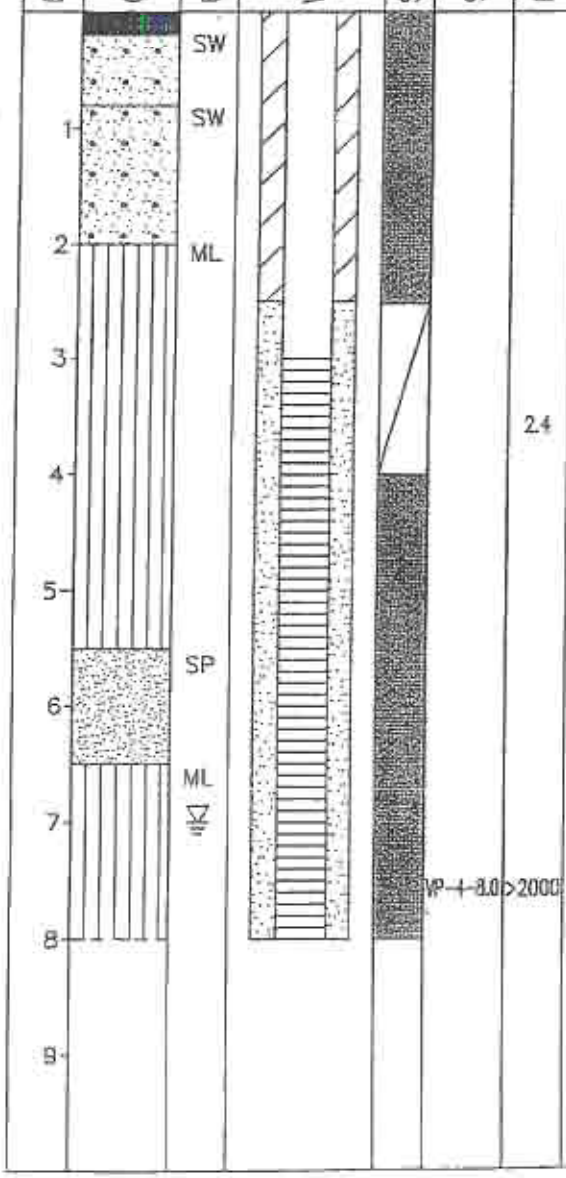
Site Id: VP-4

Project Number: 4251.00
Project Name: ATOFINA, VES Pilot Test
Location: Portland, Oregon
Contractor: Geotech Exploration Inc.
Drilling Method: Direct-Push
Logged By: M. Arnold
Date(s): 06/26/00

Total Depth: 8.00'
Borehole Dia.: 2.00in
Initial Water Level: 7.00'

Probe Construction Details

Blank Casing: type: PVC	dia: 0.75in	fm: 0.0'	to: 3.00'	
Screens: type: Slotted	size: 0.010in	dia: 0.75in	fm: 3.00'	to: 8.00'
Annular Fill: type: Grout (Bentonite Cement)			fm: 0.00'	to: 2.50'
type: 10/20 Sand Filter Pack			fm: 2.50'	to: 8.00'



Soil Description/Classification

0-0.2' Asphaltic concrete.

0.2-0.8' GRAVELLY SAND (SW): brown, fine to medium grained, trace silt, moist, (fill).

0.8-2.0' SAND (SW): brown to gray, fine to medium grained, trace silt, no to little gravel, loose, moist, (fill).

2.0-5.5' SILT (ML): gray, no to little sand, scattered sand layers.

5.5-6.5' SAND (SP): gray, very fine to fine grained.

6.5-8.0' SILT (ML): gray, no to little sand, scattered sand layers.

Wet below 7.0' bgs.

Bottom of Boring at 8.00'.

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Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

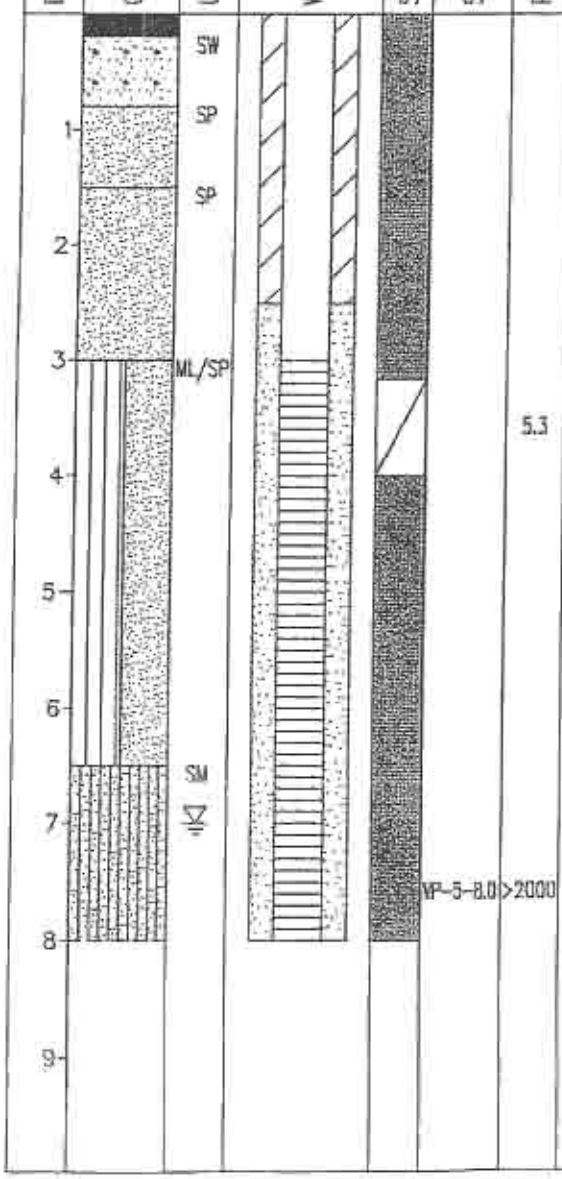
Site Id: VP-5

Project Number: 4251.00
Project Name: ATOFINA, VES Pilot Test
Location: Portland, Oregon
Contractor: Geotech Exploration Inc.
Drilling Method: Direct-Push
Logged By: M. Arnold
Date(s): 06/26/00

Total Depth: 8.00'
Borehole Dia.: 2.00in
Initial Water Level: 7.00'

Probe Construction Details

Blank Casing: type: PVC		dia: 0.75in	fm: 0.0'	to: 3.00'
Screens: type: Slotted	size: 0.010in	dia: 0.75in	fm: 3.00'	to: 8.00'
Annular Fill: type: Grout (Bentonite Cement)			fm: 0.00'	to: 2.50'
type: 10/20 Sand Filter Pack			fm: 2.50'	to: 8.00'



Soil Description/Classification

0-0.2' Asphaltic concrete.

0.2-0.8' GRAVELLY SAND (SW): brown, fine to coarse grained sand, trace silt, loose, moist, (fill).

0.8-1.5' SAND (SP): gray, fine grained, trace silt and gravel, white crystalline chunk of material at 1.2' (approximately 1/2" in diameter). Pinkish staining at 1.0-1.2'.

1.5-3.0' SAND (SP): gray, fine grained, no to little silt, medium dense, moist. Pinkish staining at 2.0-3.0'.

3.0-6.5' INTERBEDDED SILT/SAND (ML/SP): gray, interbedded (3-6"), no to some fine sand, and silty sand to fine sand.

6.5-8.0' SILTY SAND (SM): gray, very fine to fine sand, medium dense, wet below 7.0' bgs.

Bottom of Boring at 8.0'.

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BOREHOLE LOG

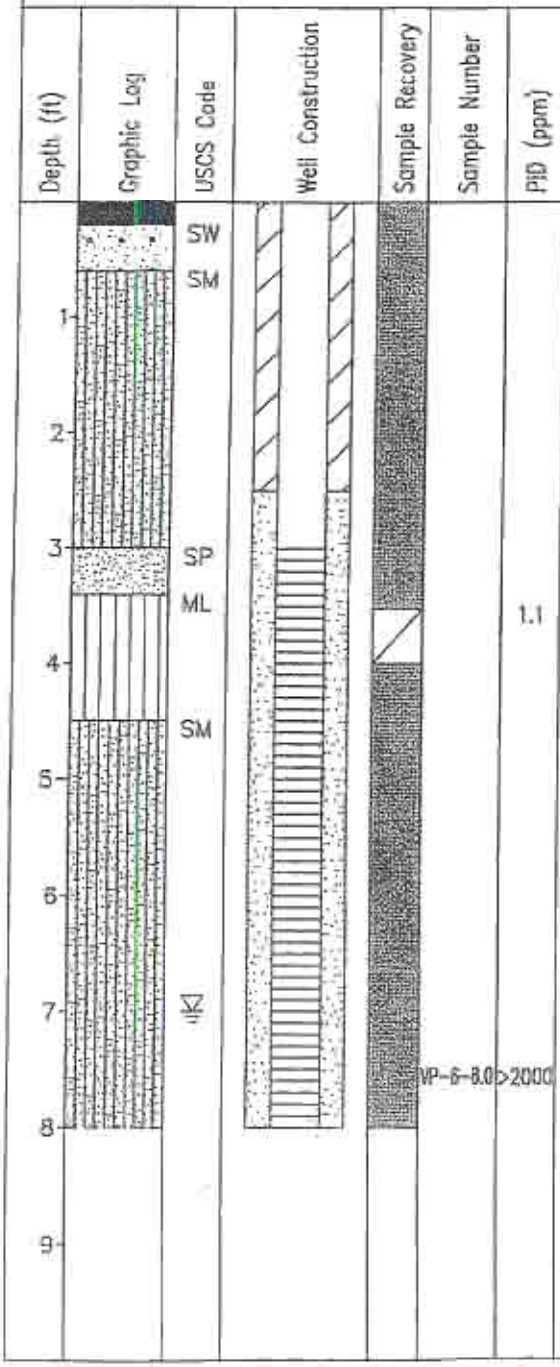
Site Id: VP-6

Project Number: 4251.00
Project Name: ATOFINA, VES Pilot Test
Location: Portland, Oregon
Contractor: Geotech Exploration Inc.
Drilling Method: Direct-Push
Logged By: M. Arnold
Date(s): 06/26/00

Total Depth: 8.00'
Borehole Dia.: 2.00in
Initial Water Level: 7.00'

Probe Construction Details

Blank Casing: type: PVC		dia: 0.75in	fm: 0.0'	to: 3.00'
Screens: type: Slotted	size: 0.010in	dia: 0.75in	fm: 3.00'	to: 8.00'
Annular Fill: type: Grout (Bentonite Cement)			fm: 0.00'	to: 2.50'
type: 10/20 Sand Filter Pack			fm: 2.50'	to: 8.00'



Soil Description/Classification

0-0.2' Asphaltic concrete.
0.2-0.6' SAND (SW): brown, fine to medium grained, little silt and gravel, loose, moist, (fill).
0.6-3.0' SILTY SAND (SM): brown, fine grained, medium dense, moist.

3.0-3.4' SAND (SP): brown to gray, fine grained, medium dense, moist.
3.4-4.5' SILT (ML): gray, no to little fine sand, medium stiff, moist.

4.5-8.0' SILTY SAND (SM): gray, fine grained, scattered layers (<2.0") silt or fine sand, medium dense, moist.

Wet below 7.0' bgs.

Bottom of Boring at 8.0'.

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BOREHOLE LOG

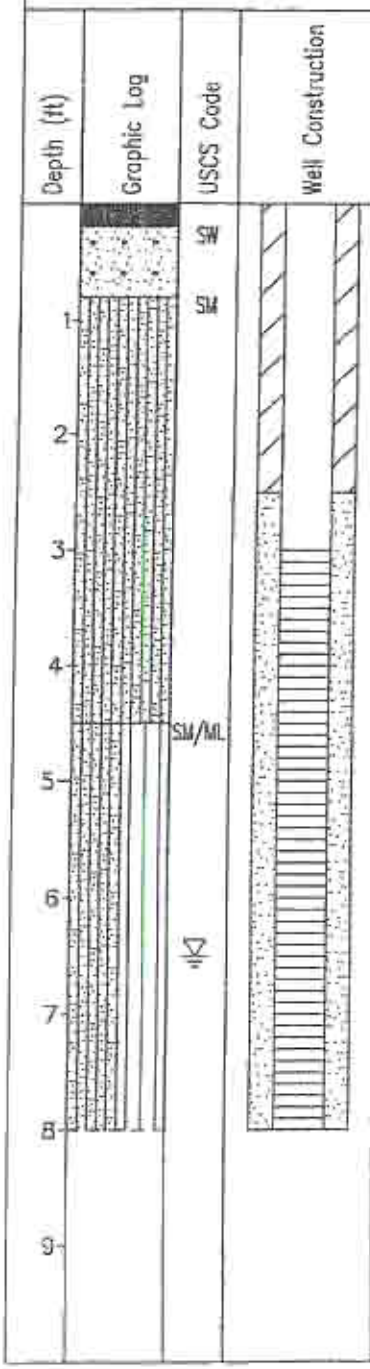
Site Id: VP-7

Project Number: 4251.00
Project Name: ATOFINA, VES Pilot Test
Location: Portland, Oregon
Contractor: Geotech Exploration Inc.
Drilling Method: Direct-Push
Logged By: M. Arnold
Date(s): 06/26/00

Total Depth: 8.00'
Borehole Dia.: 2.00in
Initial Water Level: 6.50'

Probe Construction Details

Blank Casing: type: PVC		dia: 0.75in	fm: 0.0'	to: 3.00'
Screens: type: Slotted	size: 0.010in	dia: 0.75in	fm: 3.00'	to: 8.00'
Annular Fill: type: Grout (Bentonite Cement)			fm: 0.00'	to: 2.50'
type: 10/20 Sand Filter Pack			fm: 2.50'	to: 8.00'



Soil Description/Classification

0-0.2' Asphaltic concrete.

0.2-0.8' SAND (SW): brown, fine to medium grained, little silt and gravel, loose, moist, (fill).

0.8-4.5' SILTY SAND (SM): brown, fine grained, <1.0" interbeds of fine sand, loose, moist.

4.5-8.0' SILTY SAND/SANDY SILT (SM/ML): brown, fine grained sand, ~1.0-2.0" interbeds of SILT, medium dense/stiff, moist and wet below 6.5' bgs.

Bottom of Boring at 8.0'.

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BOREHOLE LOG

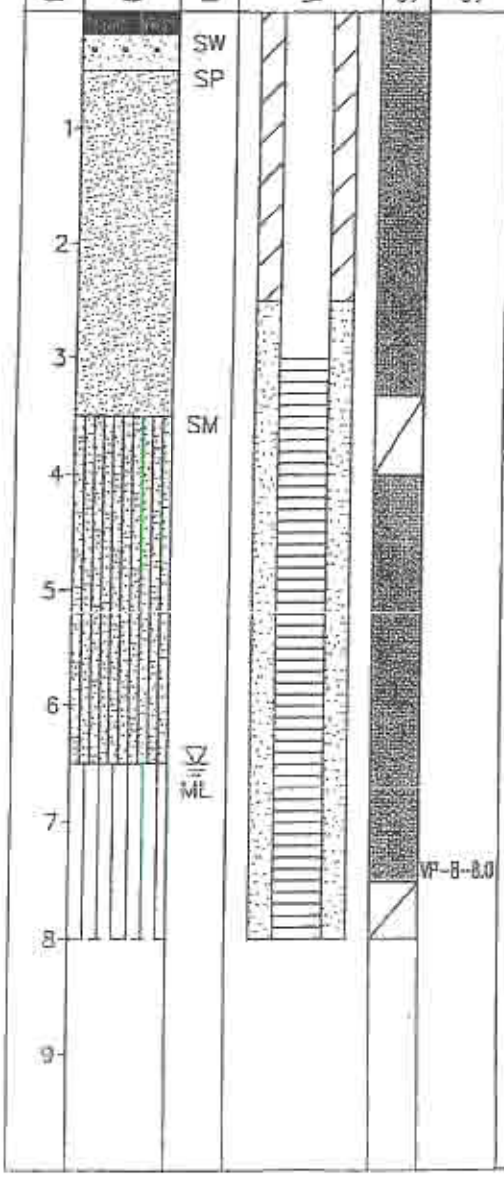
Site Id: VP-8

Project Number: 4251.00
Project Name: ATOFINA, VES Pilot Test
Location: Portland, Oregon
Contractor: Geotech Exploration Inc.
Drilling Method: Direct-Push
Logged By: M. Arnold
Date(s): 06/26/00

Total Depth: 8.00'
Borehole Dia.: 2.00in
Initial Water Level: 6.50'

Probe Construction Details

Blank Casing: type: PVC	dia: 0.75in	fm: 0.0'	to: 3.00'	
Screens: type: Slotted	size: 0.010in	dia: 0.75in	fm: 3.00'	to: 8.00'
Annular Fill: type: Grout (Bentonite Cement)			fm: 0.00'	to: 2.50'
type: 10/20 Sand Filter Pack			fm: 2.50'	to: 8.00'



PID (ppm)	Soil Description/Classification
	0-0.2' Asphaltic concrete.
	0.2-0.5' GRAVELLY SAND (SW): brown, fine to medium grained, trace silt, loose, moist, (fill).
	0.5-3.5' SAND (SP): brown, fine grained, no to some silt, medium dense, moist.
0.0	3.5-6.5' SILTY SAND (SM): brown to gray, fine grained, medium dense, moist.
	6.5-8.0' SILT (ML): brown, no to some fine sand, medium stiff, wet. Wet below 6.5' bgs.
	Bottom of Boring at 8.0'.