

FINAL

AS-
RPT
File copy

ENVIRONMENTAL RESOURCES MANAGEMENT

ATOFINA Chemicals, Inc.

Environmental Summary Report
Lots 1 and 2
ATOFINA Chemicals, Inc.
Portland, Oregon

23 July 2003

5204.00

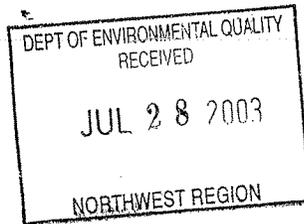
Environmental Resources Management
915 118th Avenue SE, Suite 130
Bellevue, Washington 90005
(425) 462-8591
www.erm.com





ATOFINA Chemicals, Inc.

July 25, 2003



Mr. Matt McClincy
Department of Environmental Quality
2020 S.W. Fourth Ave., Suite 400
Portland, Oregon 97201-4987

Dear Mr. McClincy:

Enclosed are three copies of the final Environmental Summary Report and the associated Soil and Groundwater Management Plan for Lots 1 and 2 of ATOFINA Chemicals, Inc. property in Portland, Oregon. These reports incorporate comments included in DEQ's letters dated March 13, 2003. They are submitted in support of a No Further Action decision by DEQ for these specific lots.

If you have any questions, please feel free to contact me at 503-225-7210.

Sincerely,
ATOFINA Chemicals, Inc.

A handwritten signature in cursive script, appearing to read 'Larry D. Patterson'.

Larry D. Patterson
Environmental Manager

Response to ODEQ Comments

Site: ATOFINA Chemicals, Inc., Portland, Oregon
 Document: Draft Environmental Summary Report - Lots 1 and 2
 (ERM, 27 February 2003)
 Comments Received: 13 March 2003
 Responses Prepared by: Erik Ipsen, ERM



Page No.	Comment/Response
General	<p>Comment: The Environmental Summary Report needs to provide a more complete summary of past environmental investigations on the properties and incorporate this data into the report evaluations. For example, DEQ is generally aware of earlier work done on the subject lots as part of the Doane Lake Hydrogeologic Investigation and the Rhone-Poulenc Remedial Investigation.</p> <p>Response: The revised Environmental Summary Report (ESR) will provide additional information regarding previous investigations at the ATOFINA and off-site properties.</p>
General	<p>Comment: Two soils samples were collected from the beach area north of Lot 2 as part of the Acid Plant Remedial Investigation. DDT concentrations in these samples exceed DEQ sediment screening level values. Consequently, it is possible that remedial measures may eventually be required for the bank/beach area abutting Lots 1 and 2. It is our understanding that ATOFINA subdivided a river front lot adjacent to Lots 1 and 2. The report needs to clarify the subject lot boundaries and the potential for the presence of DDT detected along the adjacent beach to be present in Lot 1 and 2 soils.</p> <p>Response: The bank area along the river is not included in Lots 1 and 2. The eastern boundary of Lots 1 and 2 extends along the top of the bank. This will be clarified in the text of the revised ESR.</p> <p>The confirmation soil sampling results from the DDT trench excavation revealed that soils outside of the former DDT trench do not contain DDT at any concentrations.</p>

<p>General</p>	<p>Comment: The draft report notes the presence of a groundwater contaminant plume (i.e., Rhone-Poulenc) originating off-site beneath Lots 1 and 2. The report needs to present information necessary for DEQ to apply its Contaminated Aquifer Policy to Lots 1 and 2. The policy can be found at http://www.deq.state.or.us/wmc/documents/contamaq.pdf. Please note that this policy requires information regarding the relationship between the party who caused the release of hazardous substances and the impacted property owner in addition to the necessary technical demonstrations.</p> <p>Response: The revised ESR will provide additional information regarding the Rhone Poulenc plume which will allow DEQ to apply the Contaminated Aquifer Policy to Lots 1 and 2. There is no relationship between Rhone Poulenc and ATOFINA Chemicals, Inc.</p>
<p>Section 1.1</p>	<p>Comment: Change the first bullet to read: To identify hazardous substance source areas.</p> <p>Response: The text will be revised as noted.</p>
<p>Section 2.3</p>	<p>Comment: This section needs to include a more complete summary of the environmental regulatory history for the ATOFINA facility. For example, summaries of Water Quality permits and status, RCRA status, Air Quality permits and status, etc. should be provided.</p> <p>Response: The text of the revised ESR will be modified to include a more complete summary of the regulatory history of the facility.</p>
<p>Section 3.3.2</p>	<p>Comment: The source of the fill referenced in this section should be identified if known. The fill history of the site should also be presented via a review and summary of historic maps and aerial photos.</p> <p>Response: The source(s), or suspected source(s), of the fill will be discussed in the revised ESR. Limited aerial photographs and historical maps were available for review. The identification of possible fill sources will be based on these limited resources, and interviews with site personnel.</p>

<p>Section 4.0</p>	<p>Comment: The report should document what resources were reviewed to identify the areas of concern (e.g., historic maps, site drawings, aerial photographs, employee interviews, city and state files).</p> <p>Response: The revised ESR will document what resources were reviewed. The majority of the information regarding the Areas of Concern was obtained from previous reports. These reports are internally documented in the ESR and Section 6.0 (References).</p>
<p>Section 4.1.1</p>	<p>Comment: What was the period of operation of the substation located on Lot 2?</p> <p>Response: The annex was operational from the late 1970s or early 1980s until it was shut down in Spring 2001. This information will be included in the revised ESR.</p>
<p>Section 4.2.1</p>	<p>Comment: A brief description of the chlorine manufacturing process should be provided to put the asbestos waste in context. This section should also clarify the makeup of the waste discharged to the ponds and specifically the basis for determining other hazardous substances were not part of this waste stream.</p> <p>Additional information in the second paragraph should be provided to support the statement that the scrubber water did not contain hazardous substances.</p> <p>Response: A discussion of the chlorine manufacturing process, including the use of hazardous substances, will be provided in the revised ESR as requested.</p>
<p>Section 4.2.2 to 4.2.4</p>	<p>Comment: Other than asbestos, were any other hazardous substances associated with the pond and trench areas? What was the basis for concluding that the pond trench excavations were complete (e.g., visual inspection, confirmation sampling)? The referenced ODEQ 1991 technical paper does not discuss this issue.</p> <p>Response: No hazardous substances, other than asbestos, were associated with the pond and trench areas. The cleanup was conducted under a work plan approved by ODEQ and under agency oversight. The procedure called for removal of all visible asbestos</p>

	<p>material plus several additional inches of the surrounding soil. This information will be included in the revised ESR.</p>
Section 4.3.1	<p>Comment: This section should provide a brief description of the DDT production process and other hazardous substances associated with the process.</p> <p>Both this section and Section 4.3.2 indicate that the hazardous substances present in the trench were limited to chlorobenzene and DDT and its metabolites. This section needs to identify the testing regiment performed to reach this conclusion.</p> <p>Response: The revised ESR will include a brief description of the DDT production process and other hazardous substances associated with the process. The revised ESR will also identify the testing regiment to reach the stated conclusions.</p>
Section 4.4.1	<p>Comment: The statement that the brine residue did not contain any hazardous materials should be supported in this section.</p> <p>Response: The requested information will be added to the revised ESR.</p>
Section 4.5	<p>Comment: This section does not present sufficient information and discussion to demonstrate that the groundwater contaminants present in Lots 1 and 2 groundwater are associated with releases from the Rhone-Poulenc facility (e.g., contaminant plume map, piezometric map, etc.). The section should also present a table of the contaminants detected in groundwater.</p> <p>Response: The revised ESR will include a more complete discussion of the constituents detected in groundwater, as well as evidence to demonstrate that these constituents did not originate from the ATOFINA property.</p>
Section 4.5.4	<p>Comment: The COIs listed for groundwater is only a subset of the hazardous substances detected in groundwater. The basis for the COI list is not presented. Why were contaminants such as dioxin/furan, chlorobenzene and others detected left off the COI list.</p>

	<p>Response: The revised ESR will include a more complete discussion of the rationale behind selection of the COIs. Dioxins were not originally included because the figures in the 2002 AMEC report (erroneously) showed non-detect results for tetrochlorodibenzo-p-dioxin (TCDD; the main dioxin constituent of concern) at the ATOFINA wells. The list of COIs will be revised based on historical groundwater data presented in the revised ESR.</p>
<p>Section 5.1.1</p>	<p>Comment: A more complete presentation on this topic in earlier sections is necessary to support the COI list in this section. If a limited list of COIs will be carried through the risk assessment, the screening process for identifying contaminants of potential concern and contaminants of concern need to follow DEQ guidance.</p> <p>Response: The revised ESR will include a more complete discussion of the rationale behind selection of the COIs.</p>
<p>Section 5.1.2</p>	<p>Comment: It is not clear in the report why the upper 3 feet of the site in the vicinity of the DDT-trench is assumed to be clean.</p> <p>The report up to this point has not clearly demonstrated that the contaminants detected in groundwater are from an off-site source as stated in the last paragraph of this section.</p> <p>Response: The DDT trench was originally located 3 feet below ground surface. Following excavation, the trench was backfilled with clean fill to the ground surface. This resulted in 3 feet of clean fill over the former trench area. This information will be more clearly discussed in Section 4.3.3 and Section 5.1.2.</p> <p>The revised ESR will clearly demonstrate that the contaminants detected in groundwater are from an off-site source.</p>

Section 7.2.2

Comment: This section identifies two complete groundwater exposure pathways for future on-site workers: 1) inhalation of indoor air and 2) a deep excavation construction scenario which considers both volatilization and dermal adsorption. However, the risk evaluation only practically evaluates the volatilization component of the excavation scenario. It is anticipated that dermal exposure to silvex, and the dioxin not mentioned in this evaluation, would be a potential concern.

The risk evaluation only considers a partial list of the hazardous substances present in site groundwater. For the two relevant exposure scenarios, the risk evaluation only needs to consider the contaminants and concentrations present in the shallow groundwater zone.

Response: The "Groundwater in Excavation" exposure pathway for an excavation worker listed in the Risk-Based Concentrations table in Appendix E takes into account both the volatilization and dermal contact exposure pathways. This is documented in *Risk-Based Decision Making for the Remediation of Petroleum Contaminated Sites* (ODEQ 1999). However, per discussions with ODEQ, direct contact with groundwater is not a complete exposure pathway for the Site based on the depth to groundwater (25 to 30 feet). Therefore, this exposure pathway is not assessed in the revised ESR. The only complete exposure pathway for groundwater at the Site is volatilization to indoor air.

The revised ESR considers the complete list of constituents historically detected at the Site. For the complete groundwater exposure pathway (i.e., volatilization to indoor air), only constituents present in the shallow zone are considered. It should be noted that the detection of dichlorobenzene reported on Table 4-2 in the draft ESR is not accurate, and is the result of a typo on several tables in the 2002 AMEC report. Those tables indicated the detection of dichlorobenzene in two shallow wells on Lots 1 and 2, however the laboratory data included in the report does not confirm the detection of any VOCs above the laboratory quantitation limits. The revised ESR will correct this error. Low concentrations of VOCs were only detected in one direct push sample on Lot 2 (similar or higher concentrations of these constituents were also detected upgradient of the Site). These detections will be discussed in the revised ESR and considered in the risk evaluation.

Section 7.4	<p>Comment: The groundwater pathway exists, but should be addressed by Rhone-Poulenc.</p> <p>Response: The text will be revised as noted.</p>
Section 8.2	<p>Comment: Presuming a successful demonstration of an off-site source for groundwater contamination on Lots 1 and 2, the evaluation of groundwater hot spots is not necessary in this report.</p> <p>Response: The groundwater hot spot evaluation will be eliminated from the revised ESR.</p>
Section 8.2.2	<p>Comment: See above comment. Please note that in this instance, DEQ would require a comparison of contaminant levels in groundwater to standards protective of aquatic environments.</p> <p>Response: The comment is noted.</p>
Section 9.2.4	<p>Comment: Excavation depth does not seem like a reasonable issue here given the previous successful removal.</p> <p>Response: The text will be modified to state that Alternative 4 (Excavation) has a high degree of implementability.</p>
Figures	<p>Comment: Figures should be provided that locate all other referenced points (e.g., BPA soil samples, boring logs, cone penetrometer borings, etc.).</p> <p>Response: These figures will added as requested. The locations of the boring logs presented in Appendix A are presented on a figure within that appendix.</p>
Table 4-2	<p>Comment: The list of contaminants in groundwater is incomplete. DEQ disagrees with the notation indicating that the excavation worker exposure to groundwater containing silvex is not applicable.</p> <p>Response: Risk-based screening levels for silvex are not applicable because silvex has not been detected in shallow groundwater on Lots 1 and 2. The revised ESR will clearly demonstrate this fact. As noted in</p>

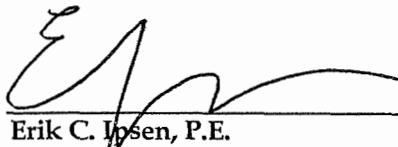
	<p>ODEQ's comments, the "risk evaluation only needs to consider the contaminants and concentrations present in the shallow groundwater zone."</p> <p>However, as noted above, direct contact with groundwater is not a complete exposure pathway for the Site based on the depth to groundwater (25 to 30 feet). Therefore, this exposure pathway is not assessed in the revised ESR.</p>
Appendix A	<p>Comment: Appendix A should include all available boring logs for the subject lots (e.g., monitoring wells, piezometers, cone penetrometer, etc.).</p> <p>Response: Boring logs for the Rhone Poulenc monitoring wells and cone penetrometer borings were not available from reviews of ODEQ and ATOFINA Chemicals files.</p>

ATOFINA Chemicals, Inc.

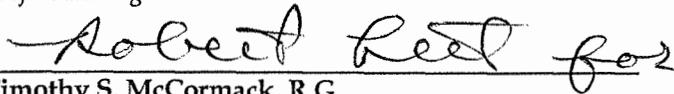
Environmental Summary Report
Lots 1 and 2
ATOFINA Chemicals, Inc.
Portland, Oregon

23 July 2003

5204.00



Erik C. Ipsen, P.E.
Project Manager



Timothy S. McCormack, R.G.
Principal

Environmental Resources Management
915 118th Avenue SE, Suite 130
Bellevue, Washington 98005
(425) 462-8591
www.erm.com



1.0	INTRODUCTION	1
1.1	OBJECTIVES	1
2.0	SITE BACKGROUND	2
2.1	SITE DESCRIPTION	2
2.2	SITE HISTORY AND FACILITY OPERATIONS	2
2.2.1	<i>Ownership History</i>	2
2.2.2	<i>Operational History</i>	3
2.3	REGULATORY HISTORY	3
2.3.1	<i>Voluntary Cleanup Agreement</i>	3
2.3.2	<i>Permits</i>	3
2.3.2.1	<i>NPDES Permit</i>	3
2.3.2.2	<i>Air Permit</i>	4
2.3.2.3	<i>RCRA Generator Status</i>	4
2.3.3	<i>Portland Harbor</i>	4
3.0	PHYSICAL SETTING	6
3.1	CLIMATE	6
3.2	SURFACE WATER	6
3.3	GEOLOGY, SOILS, AND HYDROGEOLOGY	7
3.3.1	<i>Regional</i>	7
3.3.2	<i>Lots 1 and 2</i>	9
4.0	AREAS OF CONCERN	11
4.1	BONNEVILLE POWER SUBSTATION ANNEX	11
4.1.1	<i>Operational History</i>	11
4.1.2	<i>Previous Investigations</i>	12
4.1.3	<i>Previous Cleanup</i>	12
4.1.4	<i>Constituents of Interest</i>	12
4.2	ASBESTOS TRENCHES AND POND	12
4.2.1	<i>Operational History</i>	12
4.2.2	<i>Previous Investigations</i>	13
4.2.3	<i>Previous Cleanup</i>	13
4.2.4	<i>Constituents of Interest</i>	13

4.3	DDT TRENCH	13
4.3.1	<i>Operational History</i>	13
4.3.2	<i>Previous Investigations</i>	14
4.3.3	<i>Previous Cleanup</i>	14
4.3.4	<i>Constituents of Interest</i>	15
4.4	BRINE RESIDUE PILE AND POND	15
4.4.1	<i>Operational History</i>	15
4.4.2	<i>Previous Investigations</i>	15
4.4.3	<i>Previous Cleanup</i>	16
4.4.4	<i>Constituents of Interest</i>	16
4.5	RHONE-POULENC GROUNDWATER PLUME	16
4.5.1	<i>Operational History</i>	16
4.5.2	<i>Previous Investigations</i>	17
4.5.2.1	<i>Volatile Organic Compounds</i>	18
4.5.2.2	<i>Dioxins/Furans</i>	18
4.5.2.3	<i>Pesticides/Herbicides</i>	19
4.5.3	<i>Previous Cleanup</i>	19
4.5.4	<i>Contaminated Aquifer Policy</i>	19
4.5.5	<i>Constituents of Interest</i>	20
5.0	CONTAMINANT FATE AND TRANSPORT	21
5.1	CONCEPTUAL SITE MODEL	21
5.1.1	<i>Constituents of Interest</i>	21
5.1.2	<i>Potential Source Areas</i>	22
5.2	LOCALITY OF THE FACILITY	22
6.0	LAND AND WATER USE DETERMINATIONS	24
6.1	CURRENT AND FUTURE LAND USE	24
6.2	BENEFICIAL WATER USE	25
7.0	RISK ASSESSMENT	26
7.1	EXPOSURE PATHWAY SUMMARY	26
7.1.1	<i>Groundwater Pathways of Exposure</i>	26
7.1.1.1	<i>Ingestion of Groundwater</i>	26
7.1.1.2	<i>Dermal Adsorption</i>	26
7.1.1.3	<i>Volatilization to Indoor Air</i>	26
7.1.1.4	<i>Recharge to Willamette River</i>	27
7.1.2	<i>Soil Pathways of Exposure</i>	27

	7.1.2.1	<i>Dermal Adsorption</i>	27
	7.1.2.2	<i>Ingestion of Soil</i>	27
7.1.3		<i>Surface Water and Sediment Pathways of Exposure</i>	27
	7.1.3.1	<i>Overland Storm Water Flow to River</i>	27
7.2		SCREENING HUMAN HEALTH RISK EVALUATION	28
	7.2.1	<i>Soil</i>	28
	7.2.2	<i>Groundwater</i>	28
7.3		BASELINE ECOLOGICAL RISK ASSESSMENT	30
	7.3.1	<i>Upland Ecological Receptors</i>	30
	7.3.2	<i>Aquatic Ecological Receptors</i>	30
7.4		SOURCES AND PATHWAYS TO THE RIVER	31
8.0		CLEANUP STANDARDS AND HOT SPOTS	32
	8.1	SELECTION OF CLEANUP STANDARDS	32
	8.2	HOT SPOT DETERMINATION	32
9.0		FEASIBILITY STUDY	34
	9.1	DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES	34
	9.1.1	<i>Alternative 1 – No Further Action</i>	34
	9.1.2	<i>Alternative 2 – Soil Management and Institutional Controls</i>	34
	9.1.3	<i>Alternative 3 – Soil Capping and Institutional Controls</i>	35
	9.1.4	<i>Alternative 4 – Excavation And Disposal</i>	35
	9.2	EVALUATION OF REMEDIAL ACTION ALTERNATIVES	35
	9.2.1	<i>Evaluation Criteria</i>	35
	9.2.2	<i>Effectiveness</i>	36
	9.2.3	<i>Long-Term Reliability</i>	36
	9.2.4	<i>Implementability</i>	37
	9.2.5	<i>Implementation Risk</i>	37
	9.2.6	<i>Reasonableness of Cost</i>	38
	9.2.7	<i>Protectiveness</i>	39
	9.3	RECOMMENDED REMEDIAL ALTERNATIVE	39
10.0		RESIDUAL RISK	40
	10.1	RESIDUAL RISK ASSESSMENT	40
	10.2	PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	40

10.3	RESIDUALS MANAGEMENT PLAN	40
11.0	REFERENCES	41

LIST OF FIGURES

FIGURE 2-1	SITE LOCATION MAP
FIGURE 2-2	SITE LAYOUT MAP
FIGURE 4-1	AREAS OF CONCERN
FIGURE 4-2	SHALLOW AQUIFER POTENTIOMETRIC SURFACE MAP
FIGURE 4-3	INTERMEDIATE AQUIFER POTENTIOMETRIC SURFACE MAP
FIGURE 4-4	DEEP AQUIFER POTENTIOMETRIC SURFACE MAP
FIGURE 4-5	BASALT AQUIFER POTENTIOMETRIC SURFACE MAP
FIGURE 4-6	SELECT HISTORICAL VOC DETECTIONS - SHALLOW AQUIFER

LIST OF TABLES

TABLE 4-1	SUMMARY OF SOIL VERIFICATION DATA
TABLE 4-2A	HISTORICAL SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - SHALLOW AQUIFER - VOCs, SVOCs, AND PETROLEUM HYDROCARBONS
TABLE 4-2B	HISTORICAL SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - SHALLOW AQUIFER - DIOXINS/FURANS AND HERBICIDES/PESTICIDES
TABLE 4-3A	HISTORICAL SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - INTERMEDIATE AQUIFER - VOCs AND PETROLEUM HYDROCARBONS

- TABLE 4-3B** **HISTORICAL SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - INTERMEDIATE AQUIFER - DIOXINS/FURANS AND HERBICIDES/PESTICIDES**
- TABLE 4-4A** **HISTORICAL SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - DEEP AQUIFER - VOCs AND PETROLEUM HYDROCARBONS**
- TABLE 4-4B** **HISTORICAL SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - DEEP AQUIFER - DIOXINS/FURANS AND HERBICIDES/PESTICIDES**
- TABLE 4-5A** **HISTORICAL SUMMARY OF GROUNDWATER ANALYTICAL RESULTS- BASALT AQUIFER - VOCs AND PETROLEUM HYDROCARBONS**
- TABLE 4-5B** **HISTORICAL SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - BASALT AQUIFER - DIOXINS/FURANS AND HERBICIDES/PESTICIDES**
- TABLE 4-6** **SUMMARY OF GROUNDWATER DETECTIONS ABOVE LABORATORY QUANTITATION LIMITS**
- TABLE 4-7** **COMPARISON OF SHALLOW GROUNDWATER DETECTIONS AND SCREENING VALUES**

LIST OF APPENDICES

APPENDIX A - BORING LOGS

APPENDIX B - BPA SUBSTATION ANNEX ANALYTICAL RESULTS

APPENDIX C - BRINE RESIDUE TCLP RESULTS

APPENDIX D - ODEQ RISK-BASED CONCENTRATION CALCULATIONS

APPENDIX E - SOIL MANAGEMENT PLAN

THIS PAGE INTENTIONALLY LEFT BLANK

1.0

INTRODUCTION

The purpose of this Environmental Summary Report (ESR) is to support a "No Further Action" (NFA) decision by the Oregon Department of Environmental Quality (ODEQ) for Lots 1 and 2 of the ATOFINA Chemicals, Inc. (ATOFINA Chemicals), facility in Portland, Oregon (the "Site"). This report constitutes a focused Remedial Investigation/ Feasibility Study (RI/FS) summary in support of an ODEQ staff report and an NFA decision based upon available data.

1.1

OBJECTIVES

Specifically, the objectives of this ESR are:

- To identify hazardous substance source areas;
- Evaluate contaminant migration pathways;
- Define the nature and extent of constituents of concern;
- Evaluate potential risk to human health and the environment;
- Evaluate Hot Spots;
- Determine if the Site is a current contaminant source;
- Evaluate potential remedial alternatives; and
- If necessary, recommend a remedy using appropriate evaluation criteria.

2.0 *SITE BACKGROUND*

The following paragraphs provide background information regarding the ATOFINA Chemicals facility. The Site represents the two northernmost lots (i.e., Lots 1 and 2) of the property currently owned by ATOFINA Chemicals. The summary of operations described below is applicable to the ATOFINA Chemicals facility in general. It is included for completeness and to provide general background information regarding the historical use of the Site. The majority of this background information was obtained from the *Preliminary Assessment* dated 31 August 1999 (Elf Atochem 1999), and the *Phase II Preliminary Assessment* dated 17 April 2000 (Elf Atochem 2000).

2.1 *SITE DESCRIPTION*

The ATOFINA Chemicals facility is a former inorganic chemical manufacturing plant located at 6400 N.W. Front Avenue in Portland, Oregon, along the west bank of the Willamette River, at approximately River Mile (RM) 7.5. A site location map is included as Figure 2-1. The Site comprises approximately 55 acres in the Guild's Lake Industrial Sanctuary, zoned and designated "IH" for heavy industrial use. The ATOFINA Chemicals facility is bordered on the east by the Willamette River, on the south by CertainTeed Roofing Group, and on the north and west by N.W. Front Avenue. The nearest residential structures are located approximately 0.3 miles southwest and upgradient of the facility. The facility's northern most acreage (i.e., Lots 1 and 2) is currently undeveloped. Lots 1 and 2 account for approximately 15 acres of the ATOFINA Chemicals property (Figure 2-2). The Site is located near the Portland Harbor Superfund Site (discussed in Section 2.3.3), although the exact boundaries of the Superfund Site are not currently defined. The western border of Lots 1 and 2 extends along the top of the river bank (no bank soils are included in Lots 1 and 2).

2.2 *SITE HISTORY AND FACILITY OPERATIONS*

2.2.1 *Ownership History*

The ATOFINA Chemicals facility started operations in 1941 to meet wartime needs for chlorate production in the western United States (U.S.). It was built by Pennsylvania Salt Manufacturing, which later became known as Pennwalt Corporation (Pennwalt). In 1989, Societe Nationale Elf Aquitaine, an international manufacturer and distributor of petroleum, health care, and chemical products, purchased Pennwalt. Pennwalt's

operations were combined with those of two other companies to form Elf Atochem North America, Inc., in 1990. In 2000, Elf Atochem merged with TOTALFINA to form the company, ATOFINA Chemicals, Inc..

2.2.2 *Operational History*

Various chemicals have been historically produced at the facility since 1941, including sodium chlorate, potassium chlorate, chlorine, sodium hydroxide, DDT, sodium orthosilicate, sodium hydroxide, magnesium chloride hexahydrate, ammonia, ammonium perchlorate, and hydrochloric acid. Most recently, the facility was an operating chloro-alkali plant until 2001 when the entire facility was shut down due to escalating electricity costs. No manufacturing operations have historically taken place on Lots 1 and 2.

Additional information regarding waste products produced at the Site is provided in Section 4.0.

2.3 **REGULATORY HISTORY**

2.3.1 *Voluntary Cleanup Agreement*

In June 1995, Elf Atochem requested a meeting with the ODEQ to discuss the DDT investigations and to submit an "Intent to Participate Form" for the ODEQ Voluntary Cleanup Program. Under the terms of the Voluntary Cleanup Agreement which was signed by ODEQ in August 1998, investigation and remediation activities have focused on the Acid Plant area, located in the southern portion of the ATOFINA Chemicals facility. This area has historically contained the majority of chemical manufacturing and processing activities (Elf Atochem 1999).

2.3.2 *Permits*

2.3.2.1 *NPDES Permit*

ATOFINA Chemicals was issued a major National Pollutant Discharge Elimination System (NPDES) permit in 1993 for the discharge of process water, cooling water, and storm water from its chlor-alkali plant operations. The permit remained in effect until the plant was shut down in 2001. In September 2001, a Mutual Agreement and Order (MAO) was executed by the Department to reduce monitoring requirements because of the plant shutdown. As of this date, the MAO is still in effect, but ATOFINA Chemicals will be submitting a renewal application for a permit to discharge storm water runoff. The plant is currently being demolished.

2.3.2.2 *Air Permit*

ATOFINA Chemicals operated its chlor-alkali operations under a Synthetic Minor Air Contaminant Discharge Permit. By letter dated 4 October 2002, ATOFINA Chemicals notified ODEQ that it did not intend to restart any of the production operations and requested the Department to terminate the air permit. This permit is no longer in effect.

2.3.2.3 *RCRA Generator Status*

Throughout 2001 and 2002, ATOFINA Chemicals generated sufficient hazardous waste to be considered a Large Quantity Generator. Most of these wastes were the result of a one time housekeeping event due to the plant shutdown. To date in 2003, the plant is a Small Quantity Generator. Most of the waste during 2003 is the result of remediation activities.

2.3.3 *Portland Harbor*

The Willamette River's Portland Harbor stretches from the mouth of the river at RM 0 upstream to about RM 11.6. Based on the United States Environmental Protection Agency's (USEPA's) review of data from a 1997 study of sediment quality in the river, a portion of the Portland Harbor from RM 3.5 to 9.2, was added to National Priorities List (NPL - also known as "Superfund") under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and National Oil and Hazardous Substances Pollution Contingency Plan (NCP) on 1 December 2000.

Subsequent to adding Portland Harbor to the NPL, a Memorandum of Understanding (MOU) was developed which established the relationship between the USEPA, the ODEQ, state and federal Natural Resource Trustee agencies (U.S. Fish and Wildlife, National Marine Fisheries Service, and Oregon Department of Fish and Wildlife) and six Tribal governments (Siletz, Grand Ronde, Yakama, Umatilla, Warm Springs, and Nez Perce).

The MOU was based on CERCLA, the NCP, and the Portland Harbor Cleanup Statement of General Principles developed jointly by USEPA and ODEQ and attached to Governor John Kitzhaber's NPL listing concurrence letter. The MOU specifies USEPA as the lead agency for the in-water work (sediments) and ODEQ as the lead agency for the upland source identification and control work. Under the MOU, ODEQ is responsible for the identification and control of sources of contamination to Portland Harbor. USEPA is responsible for investigating the nature and extent of in-water contamination, estimating the risks to human

health and the environment resulting from in-water contamination, identifying and evaluating remedial action alternatives, and selecting a remedial action to address in-water contamination.

The MOU also requires ODEQ and USEPA to jointly develop a Source Control Strategy. The Source Control Strategy will not only address hazardous substance releases from upland sites being investigated under ORS 465, but will also address waste management activities, permitted and unpermitted storm water discharges, overland run-off and other non-point sources, permitted discharges, direct discharges resulting from spills or other over or in-water releases, and upstream contributions.

The objectives of the Source Control Strategy are:

- To identify the universe of sources requiring control;
- To develop the regulatory and technical framework necessary for effective source control decisions and implementation;
- To define minimum data requirements for source control measures; and
- To establish milestone and reporting requirements for source control activities.

USEPA has entered into an Administrative Order on Consent with a group of responsible parties known as the Lower Willamette Group (LWG) for the performance of a RI/FS that addresses the in-water portion of the Site. Under the terms of the Administrative Order on Consent, the LWG is required to develop a RI/FS Work Plan; ATOFINA Chemicals is a member of the LWG. The Source Control Strategy is intended to provide guidance for ODEQ, USEPA, and upland property owners regarding the level of source control necessary in the Harbor area. Together, the Portland Harbor RI/FS Work Plan and Source Control Strategy describe an overall framework for addressing threats to human health and the environment within Portland Harbor.

3.0 *PHYSICAL SETTING*

This section summarizes the physical setting of the Site, including the climate, surface water features, and regional and site-specific geology and hydrogeology.

3.1 *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 degrees Fahrenheit (°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.

3.2 *SURFACE WATER*

The ATOFINA Chemicals facility is located along the west bank of the Willamette River at approximately RM 7.5. The daily mean Willamette River discharge in Portland ranges from 8,300 cubic feet per second (cfs) in the summer (August) to 63,000 cfs in the winter (December). The mean daily flow is 31,000 cfs for the period 1972-1994. The confluence of the Willamette and Columbia rivers is approximately 7.5 miles northwest 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 (MSB) at RM 12.8, approximately 5 miles upstream from the ATOFINA Chemicals facility. The datum at the MSB is 1.55 feet (ft) NGVD (U.S. Army Corps of Engineers 1991). Thus, Willamette River stage data from the MSB is converted to NGVD by adding 1.55 ft.

The minimum monthly river stage along the Willamette River in the Portland Harbor area typically occurs between July and October. Maximum monthly stages usually occur in the winter (December through

February) and the spring (March through June) coincident with flood peaks on the Willamette and Columbia rivers (U.S. Army Corps of Engineers 1991). Two extreme daily stage levels were recorded on 9 February 1996, when the river stage reached more than 28 ft and on 2 January 1997, when the river stage reached almost 23 ft. For water years 1973–1990, the minimum daily stage of 1.1 ft was recorded in November 1979 and the maximum daily stage of 23.8 ft was recorded in January 1974.

The Willamette River stage is influenced by upstream reservoir regulation on both the Willamette and Columbia rivers (up to Bonneville Dam) and by tidal effects from the Pacific Ocean. Tidal effects are most pronounced, typically ranging between 2 to 3 ft amplitude per tidal cycle, when the river stage is less than about 8 ft (MSB gauge). Tidal influences are more moderate (i.e., less than 2 ft in amplitude) between river stage elevations of 8 to 14 ft (MSB gauge). Above about 14 ft, tidal fluctuations are generally absent in the Portland Harbor. Tidal influences are most pronounced during the summer and fall when river flow and river stage are typically at their lowest (U.S. Army Corps of Engineers 1991).

3.3 ***GEOLOGY, SOILS, AND HYDROGEOLOGY***

3.3.1 ***Regional***

The geology of the Portland area is characterized generally by a broad structural depression or basin bordered by the Cascade Mountains on the west and the Coast Range Mountains on the west. Geologic formations in the basin are also folded and dissected by a number of northwest-trending faults. The Tualatin Mountains form a northwest-trending anticlinal ridge that is faulted along its eastern flank by the Portland Hills Fault. The Willamette River flows along the base of the eastern side of the Tualatin Mountains, and the ATOFINA Chemicals facility is located on the west bank of the river. A number of additional faults are located approximately parallel or perpendicular to the Portland Hills Fault and are mapped along or near the Tualatin Mountains (Beeson et al. 1991).

A description of the geologic formations of regional significance that are most likely to be present at or near the site is presented below (from oldest to youngest):

Columbia River Basalt Group (Tcr) — The Portland basin is underlain by the Columbia River Basalt Group, which consists of flood basalt erupted 17 to 6 million years ago. These Miocene-age flood basalts are characterized by a thick sequence of dense basalt flows separated by permeable interflow zones. These interflow zones may be characterized

by productive aquifers. This unit has been folded and faulted and forms the Tualatin Mountain uplands southwest of the Site. The Columbia River Basalt Group dips steeply to the northeast near the Site. The top of the Columbia River Basalt Group is at the ground surface west of St. Helens Road about 0.5 miles west of the Site and is estimated to be at a depth of 65 to greater than 100 ft below the Site (Geraghty & Miller 1991). On the east bank of the river, basalt depths are estimated to be between 300 to 450 ft below ground surface (bgs) (Madin 1990). The Columbia River Basalt flows are overlain by fluvial sediments of the Troutdale Formation; near the Tualatin Mountains these deposits may be absent.

Troutdale Formation (Tf) – The Troutdale Formation is of Miocene to Pliocene age and, in this area, consists of interbedded conglomerates and finer-grained deposits (Beeson et al. 1991). The Troutdale Formation is characterized by pebbly to cobbly conglomerates consisting primarily of Columbia River Basalt clasts with allocthonous clasts of volcanic, plutonic, and metamorphic rocks, and interbedded with micaceous arkosic and vitric sandstone (Tolan and Beeson 1984; Beeson et al. 1991). Major regional aquifers in the Troutdale Formation underlie east Portland. The thickness of the Troutdale Formation ranges from 900 ft near Troutdale to 200 to 300 ft in the western parts of the basin east of the Willamette River (Beeson et al. 1991). The Troutdale Formation is expected to be thin or locally absent at the ATOFINA Chemicals Site and is not a significant aquifer in the vicinity of the Site.

Catastrophic Flood Deposits (Qff and Qfc) – During the Pleistocene, thick deposits of boulders, gravels, sands, and silts accumulated throughout the Portland basin as a result of the repeated failures of glacial ice dams that impounded the ancient glacial Lake Missoula (Waitt 1985). These catastrophic flood deposits form the terrace surfaces in the eastern Portland area and are composed of three different facies. Coarse-grained pebble to boulder gravels and sand make up the core of these terraces, with fine-grained sand and silt deposits mantling the coarser-grained facies. A finer-grained, interlayered silt, sand, and gravel facies is found adjacent to the Columbia and Willamette river channels. The coarse-grained facies reaches a maximum thickness of 60 to 100 ft, whereas the fine-grained facies reaches a maximum thickness of 100 to 130 ft. The channel facies typically ranges in thickness from 15 to 45 ft (Beeson et al. 1991). Catastrophic Flood Deposits are not anticipated west of the Willamette River in the vicinity of the Site. These deposits are regionally significant, however, east of the Willamette River.

Recent Alluvium (Qal) – Recent alluvium consists of Quaternary deposits of sands, silts, and gravels deposited by the Willamette and Columbia rivers. These deposits include the channel bottoms and

floodplains of the rivers, and range in thickness up to 150 ft (Beeson et al. 1991).

In addition to geologic formations, anthropomorphic fill (Qaf) is common along many of the floodplain terraces adjacent to the Willamette and Columbia rivers. The primary source of this fill is dredged material from the shipping channels. Other sources of fill have also been documented at specific sites.

3.3.2

Lots 1 and 2

The surficial geology at the Site is characterized by fill and alluvial deposits of the Willamette River. The fill material occurs from the surface to depths of approximately 5 to 10 ft and consists of brown clayey silt to silty sand with occasional wood, brick, and asphalt fragments. The nature of the fill for Lots 1 and 2 is generally unknown, but it is believed the lots were filled with dredge spoils. This was standard practice for the near shore areas of Harbor properties. The City of Portland was reportedly allowed to dispose of used asphalt from roadways on the upper surfaces of the fill. The shallow, fine-grained soils are the result of dredged material from the Willamette River being placed in the upland portions of the Site.

Based on boring logs recently completed as part of the pre-development geotechnical investigation (included as Appendix A), the native soil profile is characterized by laterally discontinuous, alternating layers of fine-grained silt to clayey silt, with interbedded layers of more permeable sand and silty sand. The sands and silts are massive to finely laminated and laterally discontinuous, and the contacts between sand and silt may be gradational (Geraghty & Miller 1991). This alluvial profile is present to depths of approximately 80 ft.

Below the unconsolidated fill and alluvium, the Troutdale Formation, composed of sandstone and conglomerate, is inferred to be present to a limited extent and is likely to be laterally discontinuous throughout the area (Geraghty & Miller 1991). The presence of the Troutdale Formation beneath the Site has not been confirmed by previous investigations.

Columbia River Basalt is inferred at depth below the fill and alluvium throughout the area. The basalt surface dips regionally to the east; however, a trough or basin has been identified by other investigators in the upper basalt surface near the ATOFINA Chemicals facility (Geraghty & Miller 1991). 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. Although not encountered in

Boring B-5 (recently drilled to approximately 80 ft), the depth to the top of the basalt was identified in monitoring well W-19 at a depth of approximately 65 ft. This well is located at the north end of the ATOFINA Chemicals facility, approximately 1/3 of a mile northwest of the Acid Plant (Geraghty & Miller 1991). About 1,000 ft southwest of the Acid Plant (i.e., toward the Tualatin Mountains), the top of the basalt has been identified at depths of 90 to 100 ft bgs (W-3 and W-16; Geraghty & Miller 1991).

Groundwater occurs in the shallow fill and alluvial deposits on the Site. Previous investigations at the ATOFINA Chemicals facility have shown that shallow groundwater occurs as an unconfined water flow system at depths of about 15 to 30 ft bgs (Exponent 1998). Groundwater flow directions are toward the Willamette River to the northeast. The shallow groundwater surface fluctuates seasonally, rising during periods of high rainfall and infiltration and decreasing during mid-late summer and low rainfall periods. Shallow groundwater in close proximity to the Willamette River will rise in direct response to large increases in Willamette River stage (e.g., during a flood). In general, these short-term perturbations do not affect shallow groundwater flow directions with the exception of short-term groundwater flow reversals in close proximity to the river.

Hydraulic conductivities for the shallow groundwater flow system near the central portion of the ATOFINA Chemicals facility are variable. The values have been reported to range from about 6 to 44 ft per day (CH2M Hill 1997). Regionally and upgradient of the facility, hydraulic conductivities have been reported in the range from 0.2 to 2.5 ft per day (Geraghty & Miller 1991).

4.0

AREAS OF CONCERN

The following sections provide a summary of the operational history, investigation, cleanup, and Constituents of Interest (CoIs) of the Areas Of Concern (AOCs) on the northern property. The following sources of information were reviewed in preparing this section:

- Previous reports on file with ODEQ and ATOFINA Chemicals;
- Historical aerial photographs;
- Historical maps and site drawings;
- Employee interviews; and
- City and State files.

4.1

BONNEVILLE POWER SUBSTATION ANNEX

The majority of the information in this section was incorporated from the *Phase Two Environmental Site Assessment for Bonneville Power Administration; Pennwalt Substation* report by PBS Environmental (PBS 2002).

4.1.1

Operational History

The Bonneville Power Administration owned and operated an electrical substation on the ATOFINA Chemicals facility. The substation, which is divided into the main substation and a substation annex to the north, occupied a total area of 1.28 acres of the facility (Figure 4-1). Only the annex was located on the Site (Lot 2). The annex was operational from the late 1970s or early 1980s until it was shut down in Spring 2001. The property on which the substation and annex were located is owned by ATOFINA Chemicals. ATOFINA Chemicals was the sole user of electricity from the substation, and due to closure of the facility, the substation was decommissioned and the associated equipment was removed from the property during Fall 2002.

The substation historically contained seven power transformers, three station service transformers, and four grounding transformers. The station also contained five oil-filled power circuit breakers. The majority of this equipment was located in the main substation; only one transformer was located in the annex on the Site. These transformers and circuit breakers contained, or were assumed to contain, polychlorinated biphenyls (PCBs).

4.1.2 *Previous Investigations*

Soil sampling was performed in November 2001 to support decommissioning of the substation. The results were documented in the *Phase Two Environmental Site Assessment for Bonneville Power Administration; Pennwalt Substation* report (PBS 2002). Four surface soil samples were collected from each side of the transformer located in the substation annex. These samples were analyzed for PCBs by USEPA Method 8082A. Analytical results for these samples indicated "non-detect" for PCBs (detection level was 50 micrograms per kilogram). One sample was analyzed for volatile organic compounds (VOCs) by USEPA Method 8260B. Analytical results for this sample indicated "non-detect" for VOCs. The results of these analyses are included as Appendix B.

4.1.3 *Previous Cleanup*

Based on the soil sampling results, no further investigation or remediation was recommended by PBS Environmental (PBS 2002).

4.1.4 *Constituents of Interest*

Based on the soil sampling results, there are no CoIs associated with the substation annex.

4.2 **ASBESTOS TRENCHES AND POND**

4.2.1 *Operational History*

ATOFINA Chemicals operated asbestos diaphragm cells in the Chlorine Cell Room. These cells utilized an asbestos coated cathode and titanium anodes. The feed to the cells was salt brine and electricity. The cells produced chlorine gas, a weak caustic solution, and hydrogen gas. The cells needed to be rebuilt periodically to improve their efficiency. The rebuilding process involved recovering the salt brine solution from the cell and removing the anodes from the cathode cell assembly. Water was used to wash the asbestos diaphragm material from the cathode. The residue entered two earthen impoundments near the former Chlorine Plant (not on the Site). A manually controlled pump was used to transfer the slurry to a third surface impoundment, located on Lot 2 of the Site. In the past, the ponds would be cleaned occasionally and the material would be placed in trenches located on the Site. This pond maintenance practice was reported to the ODEQ (Elf Atochem 1999).

Scrubber water from the Orthosilicate Plant was also discharged into the asbestos pond nearest the river for an unknown period of time. The

scrubber was used to control particulate dusts from the handling of silica sands and bentonite clay (Elf Atochem 1999). No hazardous substances entered the scrubber system. Other than sodium hydroxide, no other hazardous substances were used in the Orthosilicate process.

By the late 1980s, approximately 12 trenches had been filled with asbestos-containing residue on the north end of the property (Figure 4-1). These trenches were believed to be approximately 60 ft long, 15 ft wide, and 15 ft deep (ODEQ 1991). Pennwalt kept maps to identify the location of the trenches (Elf Atochem 1999).

4.2.2 *Previous Investigations*

ODEQ samples collected from the pond and trench areas indicated the material contained Chrysotile asbestos. Therefore, ODEQ determined that this material required handling and treatment as friable asbestos material.

4.2.3 *Previous Cleanup*

In order to make the property useful for potential development, and to meet conditions in its renewed air permit, ATOFINA Chemicals undertook a project to decommission the ponds and to voluntarily excavate the trenches containing asbestos residues. The asbestos removal work was conducted under a work plan approved by the ODEQ and under the agency's oversight. The procedure called for removal of all visible asbestos material, plus several additional inches of the surrounding soil. The project was completed in 1992 (Elf Atochem 1999). The cleanup action procedure was documented by the ODEQ in a technical paper entitled *Excavation of Asbestos-Containing Material* (ODEQ 1991).

4.2.4 *Constituents of Interest*

The only hazardous substance associated with the asbestos pond and trenches was asbestos. Based on the complete removal of the trenches and pond, there are no CoIs associated with these AOCs.

4.3 *DDT TRENCH*

4.3.1 *Operational History*

In 1992, a trench identified on the northern property was found to contain what appeared to be pesticide residues (Figure 4-1). A sample of the trench residue was analyzed for organochlorine pesticides, semivolatiles (by USEPA Method 8270), PCBs, and petroleum hydrocarbons. The only constituent that was detected was DDT. The sample was also analyzed for

organic toxic constituents on the RCRA Characteristic Waste List. The only detected constituent was monochlorobenzene (MCB) (3.60 mg/L). Tests confirmed this trench held soils which contained residue from a DDT manufacturing process.

A review of prior operations at the plant indicated that Pennwalt had manufactured DDT for a brief period of time and that the material in the trench came from a former manufacturing process waste pond (Elf Atochem 1999). Pennwalt began manufacturing DDT in 1947 and although most operations terminated in 1952, some production continued until 1954. DDT plant operations occurred in what is now known as the Acid Plant Area (not on the Site). Raw materials consisted of MCB, oleum (104 percent fuming sulfuric acid), and chloral (trichloroacetaldehyde).

4.3.2 *Previous Investigations*

In the Fall of 1992, ATOFINA Chemicals conducted a soil exploration program to assess the horizontal and vertical extent of the affected soil in the trench. The investigation determined that the trench was approximately 30 ft wide by 80 ft long and approximately 10 to 11 ft deep. The top of the trench was located 3 feet below ground surface. The chemical of concern identified in the soil was DDT residue in concentrations exceeding ODEQ simple soil cleanup rules. These cleanup levels were developed by ODEQ to provide conservative, residential standards for the cleanup of contaminated soil while protecting human health. A composite sample of the trench was analyzed for VOCs (by USEPA Method 8020), organochlorine pesticides (by USEPA Method 8080), and PCBs. The only chemicals detected in the soils in the trench were DDT and MCB. MCB concentrations were well below any of Oregon's simple soil cleanup levels. Toxicity Characteristic Leaching Procedure (TCLP) concentrations of MCB were below the leachate reference concentration of 3.0 milligrams per liter (OAR 340-122-045). Therefore, MCB was not a targeted constituent of concern during the cleanup activities (CH2M Hill 1995).

4.3.3 *Previous Cleanup*

Because the trench was a clearly defined, discrete unit, the trench was completely excavated during the summer of 1994. Approximately 1,700 tons of soil were removed from the Site and disposed at the Waste Management Subtitle C landfill in Arlington, Oregon. Post-excavation confirmation sampling showed that surrounding soils met Oregon's residential soil cleanup levels, the target cleanup level for the soil removal. The results of the confirmation sampling are presented in Table 4-1. After sampling was performed, the excavation was backfilled with clean fill to

the ground surface (CH2M Hill 1995). Because the trench was originally located 3 feet below the ground surface, backfilling resulted in 3 feet of clean fill over the former trench location. This soil removal action was documented in the *Remedial Action Report, North Plant Area*, dated April 1995 (CH2M Hill 1995).

4.3.4 *Constituents of Interest*

Based on the verification sampling results, the only remaining CoIs associated with this AOC are DDT, and its metabolites DDD and DDE. These CoIs will be retained for evaluation in this ESR.

4.4 **BRINE RESIDUE PILE AND POND**

4.4.1 *Operational History*

Historically, sea salt (NaCl) was used as a raw material for products manufactured at the ATOFINA Chemicals facility. The impurities calcium (Ca) and magnesium (Mg) were precipitated from the brine as calcium carbonate (CaCO₃) and magnesium hydroxide (Mg[OH]₂) (CES 1988). These compounds (referred to as "brine residue" or "brine mud") were separated from the brine through clarification. Historically, the brine residue was removed from the bottom of a primary clarifier and disposed in either the brine residue pile or pond on the Site (Figure 4-1). In the early 1990s, the plant installed a filter press which eliminated the need to dispose of the material on the Site.

Throughout the process of generating the brine residue, the only hazardous substances that entered the system were sodium carbonate and weak sodium hydroxide. These substances were added to the brine to precipitate the calcium and magnesium. The pH of the brine during the precipitation process was about 9 to 10. Metals were never introduced to this process. To evaluate the possibility that metals were entering the process with the salt, samples of the brine residue were analyzed for TCLP metals (the results of which are discussed in the following section). The brine residue did not contain any hazardous materials other than very dilute sodium hydroxide.

4.4.2 *Previous Investigations*

In 1988, the plant evaluated the potential sale of brine residue as an agricultural soil amendment. Samples were collected and analyzed to assess the suitability of the brine mud for this application. During that study, samples were analyzed for several trace metals. Results indicated

very low levels that compared with average concentrations typically found in soil (CES 1988).

In 1995 and 1996, freshly generated brine residue was sampled and analyzed for TCLP metals. The 1995 sample result indicated that lead was the only metal detected. However, the TCLP concentration was two orders of magnitude below the applicable regulatory limit. The 1996 result was non-detectable. The laboratory analytical reports for these TCLP samples are included as Appendix C.

4.4.3 *Previous Cleanup*

The brine pile was completely removed from the Site in February 1989. A front-end loader was used to load the brine mud from the pile into 10-yard truck and pups. The material in the pile was solid (no free liquids). The pile was initially removed so that all visible brine residue was removed, then an additional 6-inch soil cut was made to ensure removal of all brine residue materials. Visual inspection was made to ensure all brine residue material was removed. The material was transported to the Hillsboro Landfill and beneficially used as a soil amendment to the final landfill cap.

The pond was completely removed from the Site in August 1992. A front-end loader was used to load the brine mud from the pile into 10-yard truck and pups. Some free liquid was present in the pond from storm water accumulation. Over a foot of solid from the entire pond bottom and the sidewall area was removed and mixed with the residue to thicken it sufficiently and absorb all free liquids. Visual inspection was made to ensure all brine residue material was removed. The material was transported to the Hillsboro Landfill and beneficially used as a soil amendment to the final landfill cap.

4.4.4 *Constituents of Interest*

Based on the soil sampling results and the non-hazardous nature of the brine residue, there are no COIs associated with the brine residue pile or pond.

4.5 **RHONE-POULENC GROUNDWATER PLUME**

4.5.1 *Operational History*

Rhone-Poulenc is located west (and hydraulically upgradient) of the ATOFINA Chemicals facility, at 6200 NW St. Helens Road. Rhone-Poulenc formulated and manufactured pesticides at East Doane Lake from

1943 to 1991. During that time, an unknown quantity of chemicals entered the environment through spills and leaks from a variety of sources and direct discharge of wastewater to the former East Doane Lake.

4.5.2 *Previous Investigations*

Rhone-Poulenc began soil and groundwater investigations in the early 1980s in cooperation with and under the direction of ODEQ. In 1989, Rhone-Poulenc and ODEQ signed a consent order to develop a plan to address contaminated soil, groundwater, and surface water.

ODEQ is continuing to work with Rhone-Poulenc on the site investigation. The company and ODEQ will collect information to evaluate the extent of the contamination; future land and water uses; assess risks associated with contamination; and evaluate the range of cleanup options. On-going semi-annual groundwater monitoring is currently performed by AMEC Earth and Environmental, Inc. (AMEC).

Potentiometric surface maps of the shallow, intermediate, deep, and basalt groundwater aquifers beneath the subject area are included as Figures 4-2, 4-3, 4-4, and 4-5, respectively. These figures were incorporated from the Spring 2002 groundwater monitoring report for the Rhone Poulenc site (AMEC 2002) and show general groundwater flow towards the east or northeast (towards the river and the Site) in each aquifer.

Contaminants associated with the Rhone-Poulenc facility have been detected at low concentrations in the shallow, intermediate, deep, and basalt groundwater aquifers on Lots 1 and 2. These constituents include VOCs, dioxins/furans, and herbicides/pesticides. Limited data available for semi-volatile organic compounds do not reveal any detections at the Site.

Tables 4-2, 4-3, 4-4, and 4-5 present select historical groundwater monitoring data for the Rhone-Poulenc monitoring wells located on Lots 1 and 2 and several wells located immediately upgradient of the Site for the shallow, intermediate, deep, and basalt groundwater aquifers, respectively. This data is not complete, but is intended to illustrate typical historical groundwater concentrations associated with the Rhone Poulenc plume. Table 4-6 summarizes the historical detections of constituents above their respective laboratory quantitation limits. The following sections discuss the specific constituents detected in groundwater at the Site.

VOCs have been detected at low concentrations on the Site and upgradient. The VOCs that have been historically detected in groundwater on the Site are summarized in Table 4-6. Generally, detections of VOCs have been in the intermediate, deep, and basalt aquifers, with the highest detections in the deep and basalt aquifers. Detections of VOCs in the shallow aquifer above laboratory quantitation limits have been limited to one direct-push sample collected in 1999 (Cable Huston 1999). These detections were only slightly above the respective laboratory quantitation limits. Similar, or higher, concentrations of all of these constituents have been detected in the shallow aquifer upgradient from the Site. The available data indicates there have been no detections of VOCs above laboratory quantitation limits in either of the shallow groundwater monitoring wells located on the Site (i.e., wells RP-02-31 and W-19-S).

Figure 4-6 presents select VOC data for the shallow aquifer Rhone Poulenc wells on the Site and upgradient. The VOCs presented on Figure 4-6 (i.e., benzene, 1,2-dichlorobenzene [1,2-DCB], and trichloroethene [TCE]) are three of the major constituents of concern for the Rhone Poulenc plume (AMEC 2002).

Based on the analytical results presented in Tables 4-2, 4-3, 4-4, and 4-5, all of the VOCs detected in the intermediate, deep, and basalt aquifers were either (or both):

- Detected at similar or higher concentrations upgradient of the Site (either same or higher aquifer);
- Not detected in the shallow aquifer on the Site.

Both of these observations imply an upgradient source of contamination. The majority of the VOCs detected on Lots 1 and 2 are known contaminants of potential concern associated with the Rhone Poulenc groundwater plume and have been detected across the Rhone Poulenc site, in all four investigated aquifers (AMEC 2002).

Dioxins have been detected in the shallow, intermediate, deep, and basalt aquifers on the Site and upgradient. The dioxins/furans that have been historically detected in groundwater on the Site are listed in Tables 4-2, 4-3, 4-4, and 4-5. For every dioxin/furan detected on the Site, similar or higher concentrations of that constituent have been detected upgradient of

the Site. This observation implies an upgradient source of contamination. Dioxins/furans are known contaminants of potential concern associated with the Rhone Poulenc groundwater plume and have been detected across the Rhone Poulenc site, in all four investigated aquifers (AMEC 2002).

4.5.2.3 *Pesticides/Herbicides*

Pesticides and herbicides have been detected on a limited basis in the deep and basalt aquifers on the Site and in all four aquifers upgradient. The pesticides that have been historically detected in groundwater on the Site are listed in Tables 4-2, 4-3, 4-4, and 4-5. The lack of presence of these constituents in the shallow and intermediate groundwater aquifers on the Site implies an upgradient source of contamination. All of the detected pesticides/herbicides are known contaminants of potential concern associated with the Rhone Poulenc groundwater plume and have been detected across the Rhone Poulenc site, in all four investigated aquifers (AMEC 2002).

4.5.3 *Previous Cleanup*

No previous cleanups have been performed on the Rhone-Poulenc groundwater plume at the Site.

4.5.4 *Contaminated Aquifer Policy*

Based on the discussion above, the constituents historically detected in groundwater on the Site appear to be the result of an upgradient source. In accordance with ODEQ's Contaminated Aquifer Policy, this section presents information necessary for ODEQ to apply this Policy to the Site.

- The information presented in this ESR provides documentation that ATOFINA has not caused, contributed to, or exacerbated the release of hazardous substances identified in the aquifers beneath the Site;
- There is no relationship between Rhone Poulenc and ATOFINA Chemicals;
- The source of contamination beneath the Site did not occur in connection with a contractual relationship between Rhone Poulenc and ATOFINA Chemicals;
- ATOFINA Chemicals has not unlawfully hindered or delayed response actions;

- ATOFINA Chemicals has not failed to notify ODEQ of the release, to the extent Rhone Poulenc is under a Consent Order for the site; and
- ATOFINA Chemicals has exercised due care and reasonable precautions regarding the known contamination. ATOFINA has not installed any groundwater wells on the Site.

4.5.5 *Constituents of Interest*

For purposes of the risk evaluation, the following constituents identified at the Site will be retained for evaluation in this ESR:

- Acetone;
- Benzene;
- MCB;
- 1,2-DCB;
- 1,3-DCB;
- 1,4-DCB;
- 1,2-Dichloroethene (1,2-DCE);
- Toluene;
- TCE;
- Trichlorofluoromethane;
- Xylene;
- Vinyl Chloride;
- Dioxins/furans;
- DDT;
- Dichloroprop;
- 4-(2,4-dichlorophenoxy)butyric acid (2,4-DB); and
- Silvex.

5.0 CONTAMINANT FATE AND TRANSPORT

5.1 CONCEPTUAL SITE MODEL

5.1.1 *Constituents of Interest*

CoIs in soil that were retained for evaluation from Section 4.0 include:

- DDT and its metabolites (DDD and DDE).

CoIs in groundwater that were retained for evaluation from Section 4.0 include:

- Acetone;
- Benzene;
- MCB;
- 1,2-DCB;
- 1,3-DCB;
- 1,4-DCB;
- 1,2-Dichloroethene (1,2-DCE);
- Toluene;
- TCE;
- Trichlorofluoromethane;
- Xylene;
- Vinyl Chloride;
- Dioxins/furans;
- DDT;
- Dichloroprop;
- 4-(2,4-dichlorophenoxy)butyric acid (2,4-DB); and

- Silvex.

It should be noted that these groundwater CoIs are present at the Site as a result of an off-site source and are not the result of historical activity at the Site or the ATOFINA Chemicals facility. They are discussed in this ESR only for completeness.

5.1.2 *Potential Source Areas*

The former DDT Trench is the only potential source area that exists on the Site. As discussed in Section 4.3, low levels of residual DDT, DDD, and DDE are present in shallow soil in a discrete area between 3 and 14 ft bgs. The DDT trench was originally located 3 feet beneath clean surface soil. When the trench was excavated, the trench was backfilled to ground surface with clean fill.

DDT and DDT metabolites are organochlorine pesticides that are solid at ambient temperatures and have a low aqueous solubility and low volatility. In aqueous solutions, DDT readily partitions to the solid or organic carbon phases in the matrix. DDT is, consequently, persistent in soils and is therefore not expected to leach to groundwater, especially considering the low concentrations present in the area of the former DDT Trench.

DDT can be degraded by both aerobic and anaerobic degradation pathways, although extensive dechlorination of DDT is usually observed under anaerobic conditions. DDT degrades by reductive dechlorination to DDD and by dehydrodechlorination to DDE. Typically, DDE has been considered a recalcitrant chemical generally resistant to further degradation.

Low levels of VOCs, dioxins/furans, and pesticides/herbicides are present at low concentrations in groundwater on the Site. As demonstrated in Section 4.5, these contaminants have migrated onto the Site via groundwater flow from an off-site source. No on-site source is associated with these CoIs.

5.2 **LOCALITY OF THE FACILITY**

According to Oregon Administrative Rule (OAR) 340-122-115(35):

“‘Locality of the facility’ means any point where a human or an ecological receptor contacts, or is reasonably likely to come into contact with, facility-related hazardous substances, considering:

- (a) The chemical and physical characteristics of the hazardous substances;
- (b) Physical, meteorological, hydrogeological, and ecological characteristics that govern the tendency for hazardous substances to migrate through environmental media or to move and accumulate through food webs;
- (c) Any human activities and biological processes that govern the tendency for hazardous substances to move into and through environmental media or to move and accumulate through food webs; and
- (d) The time required for contaminant migration to occur based on the factors described in (a) through (c)."

Considering the persistence of DDT and its metabolites in soil, and the depth of constituents below the ground surface, potential for migration of constituents from the former DDT Trench is low. It is not likely that these constituents will leach to groundwater and the presence of clean fill over the area will prevent future transport to the river via overland flow as long as the soil cover is maintained. Therefore, the locality of facility for the Site is limited to the Lots 1 and 2 portion of the facility.

Because groundwater at the Site is not impacted by "facility-related hazardous substances", the locality of facility does not include groundwater at the Site.

6.0

LAND AND WATER USE DETERMINATIONS

The following sections discuss current and reasonably anticipated land uses, and current and reasonably likely future beneficial uses of groundwater and surface water in the locality of the facility. The results will support efforts to identify and evaluate exposure pathways, identify potential source areas, and select the preferred remedial alternative.

6.1

CURRENT AND FUTURE LAND USE

This section describes the current and reasonably anticipated future land use in the locality of facility in accordance with OAR 340-122-0080(3)(e) and *Consideration of Land Use in Environmental Remedial Actions* (ODEQ 1998). According to this guidance, in selecting a remedial action, the following must be taken into account:

- Current land uses;
- Zoning, comprehensive plan, or other land use designations;
- Land use regulations from any governmental body having jurisdiction;
- Concerns of the facility owner, the neighboring owners, and the community; and
- Other relevant factors.

The current and reasonably likely future land use at the Site is well defined. The Site is located in the heart of the Guild's Lake Industrial Sanctuary, zoned and designated "IH" for heavy industrial use. On 14 December 2001, the Portland City Council voted to adopt the Guild's Lake Industrial Sanctuary Plan (GLISP). The plan is intended to preserve industrial land in the area generally bounded by Vaughn Street on the south, the St. Johns Bridge on the north, Highway 30 on the west, and the Willamette River on the east. The plan became effective on 21 December 2001.

The purpose of the GLISP is to maintain and protect this area as a dedicated place for heavy and general industrial uses. The plan's vision statement, policies, and objectives were adopted as part of Portland's Comprehensive Plan and are implemented through amendments to the City's Zoning Code. As a result of the GLISP, future land use at the Site will be industrial.

BENEFICIAL WATER USE

This section describes the current and reasonably likely future beneficial uses of groundwater and surface water by humans and ecological receptors in accordance with OAR 340-122-0080(3)(f) and ODEQ *Guidance for Conducting Beneficial Water Use Determinations at Environmental Cleanup Sites* (ODEQ 1998). However, a formal water use determination was not performed as part of this ESR.

No drinking water wells are located on or near the Site. Groundwater is not currently used nor is reasonably likely to be used in the future as a drinking water source. Because of the proximity of the Site to the Willamette River, future industrial water needs (e.g., non-contact cooling water) are likely to be met by surface water or by the City of Portland municipal water supply. The beneficial use for groundwater in the locality of the facility is expected to be surface water recharge to the nearby Willamette River.

7.0 RISK ASSESSMENT

7.1 EXPOSURE PATHWAY SUMMARY

The following sections present a model for human health and ecological exposure pathways at the site in accordance with ODEQ *Guidance for Conduct of Deterministic Human Health Risk Assessments* (ODEQ 2000) and *Guidance for Ecological Risk Assessment, Level I – Scoping* (ODEQ 1998). A complete exposure pathway requires a contaminant source, an exposure point (such as on-site soils), and an exposure route (such as inhalation, dermal adsorption, or ingestion).

7.1.1 *Groundwater Pathways of Exposure*

7.1.1.1 *Ingestion of Groundwater*

The ingestion of groundwater pathway entails future site worker ingestion of site groundwater. As discussed in Section 6.2, groundwater within the Site is not currently used and is not reasonably likely to be used in the future as a drinking water source. Thus, the pathway is incomplete due to lack of an exposure route.

7.1.1.2 *Dermal Adsorption*

The dermal adsorption pathway entails direct contact of a future site worker with site groundwater. Because of the proximity of the Site to the Willamette River, any future industrial water needs (e.g., non-contact cooling water) are likely to be met by surface water or by the City of Portland municipal water supply. Therefore, worker contact with groundwater through industrial or engineering water use is not reasonably likely.

Shallow groundwater within the locality of the facility is located 25 to 30 ft bgs. Because of this depth, direct human exposure to groundwater in a trench or excavation is unlikely. Thus, the pathway is incomplete due to lack of an exposure route.

7.1.1.3 *Volatilization to Indoor Air*

The volatilization to indoor air pathway entails volatilization of contaminants in shallow groundwater and infiltration of these vapors into buildings via cracks in the foundation. Considering the depth to groundwater and low contaminant concentrations, this exposure pathway

is unlikely. However, this pathway is evaluated in Section 7.2 for completeness because of the future development of the property.

Volatilization to indoor air is considered a more conservative exposure pathway than outdoor air; therefore, the volatilization to outdoor air pathway is not considered in the ESR.

7.1.1.4 *Recharge to Willamette River*

The recharge pathway entails groundwater flow to the nearby Willamette River. This pathway is an ecological receptor pathway and should be evaluated in accordance with appropriate ODEQ ecological risk guidance and Oregon regulations. However, impacts to groundwater at the Site have not resulted from activities at the ATOFINA Chemicals facility or the Site. Additionally, this exposure pathway will not directly affect current or future occupants of the Site. Therefore, this pathway is not evaluated in this ESR. Investigation and risk evaluation of these groundwater impacts will be performed by off-site parties under the authority of the ODEQ.

7.1.2 *Soil Pathways of Exposure*

7.1.2.1 *Dermal Adsorption*

The dermal adsorption pathway entails direct contact of a future site worker with site soil during excavation or trenching work. This pathway is complete and is evaluated in Section 7.2.

7.1.2.2 *Ingestion of Soil*

The ingestion of soil pathway entails accidental ingestion of site soil by a future site worker during excavation work. This pathway is complete and is evaluated in Section 7.2.

7.1.3 *Surface Water and Sediment Pathways of Exposure*

7.1.3.1 *Overland Storm Water Flow to River*

The overland storm water flow to river pathway entails transport of shallow surface soil to the river via storm water runoff. This pathway is an ecological receptor pathway and is evaluated in accordance with ODEQ *Guidance for Ecological Risk Assessment, Level I – Scoping* (ODEQ 1998). Currently, the depth of constituents below grade (3 ft) prevents transport to the river via overland storm water flow. However, the

removal of the cover soils could create a complete exposure pathway in the future. Therefore, this pathway is evaluated in Section 7.3.

7.2 *SCREENING HUMAN HEALTH RISK EVALUATION*

The following sections provide a screening human health risk evaluation for soil and groundwater at the Site. This evaluation does not constitute a formal risk assessment, but instead a comparison of concentrations of CoIs at the Site to applicable risk-based standards.

7.2.1 *Soil*

Two complete soil exposure pathways were carried forward from Section 7.1 for evaluation: 1) ingestion, and 2) dermal adsorption. The source area for these exposure pathways is the former DDT Trench. As discussed in Section 4.3, verification sampling following removal of the former DDT Trench confirmed that soils exceeding the target cleanup goals had been removed, and that only traces of DDT and its metabolites remained in soil along the former trench sidewalls.

Table 4-1 presents the results of the 1994 confirmation sampling and comparison to USEPA Region 9 Residential and Industrial Preliminary Remediation Goals (PRGs). PRGs are risk-based concentrations (RBCs) that are intended to assist risk assessors in initial screening-level evaluations of environmental measurements. These levels are more applicable to the Site than Oregon's residential soil cleanup levels due to the exposure assumptions used in developing the concentrations (e.g., industrial versus residential land use assumption). The industrial PRG is applicable to the Site due its location in the Guild's Lake Industrial Sanctuary (Section 6.1). The two complete soil exposure routes for the site (i.e., ingestion and dermal adsorption) are taken into account by the industrial PRG value.

The DDT concentrations detected during confirmation sampling were below the industrial PRG value (developed for protection of future site workers' health), and only one detection was slightly above the residential PRG value (developed for protection of hypothetical residents' health). Therefore, soil at the Site does not present an unacceptable human health risk for the exposure pathways developed.

7.2.2 *Groundwater*

One complete groundwater exposure pathways were carried forward from Section 7.1 for evaluation: 1) inhalation of indoor air. The source area for this exposure pathway is the Rhone-Poulenc groundwater plume.

Constituents identified in the intermediate, deep, and basalt aquifers are not able to reach the surface via volatilization. Only constituents within the shallow groundwater aquifer could present a potential risk from volatilization to indoor air. Therefore, only the constituents detected in the shallow aquifer will be considered in the risk evaluation. Additionally, dioxins/furans are not volatile and therefore do not present a potential risk from volatilization to indoor air and will not be considered in the risk evaluation. The remaining groundwater CoIs are:

- Acetone;
- Benzene;
- MCB;
- 1,2-DCB;
- 1,4-DCB; and
- Toluene.

The Underground Storage Tank Division of ODEQ has developed screening-level RBCs for the remediation of petroleum-impacted sites. These RBCs are presented in the ODEQ guidance document, *Risk-Based Decision Making for the Remediation of Petroleum Contaminated Sites* (ODEQ 1999). RBCs have been calculated for several petroleum-related contaminants and a variety of exposure pathways, including the volatilization to indoor air pathway.

The only Site CoIs for which final RBCs have been published are benzene and toluene. However, the ODEQ has calculated RBCs for other constituents, including 1,2-DCB, in a draft spreadsheet. Using this spreadsheet, site-specific RBCs were generated by inputting the correct depth to groundwater (25 feet) for the Site. The RBC calculation spreadsheets are included as Appendix D.

Table 4-7 compares the highest concentrations of CoIs detected at the Site to the calculated RBCs for the volatilization to indoor air pathway. This is the only complete groundwater exposure pathway for the Site. The concentrations of CoIs detected in these wells are approximately three or more orders of magnitude below the RBCs.

RBCs have not been developed by ODEQ for acetone, MCB, or 1,4-DCB. Table 4-7 provides the USEPA Region IX Tap Water PRG for these three constituents. The Tap Water PRG is a conservative concentration which

assumes ingestion of groundwater. Groundwater ingestion is not a complete exposure pathway for the Site, and these values are provided for purposes of comparison only. The detections of acetone and MCB are one to two orders of magnitude below their respective Tap Water PRGs. The one detection of 1,4-DCB at the Site is only slightly above the Tap Water PRG. Additionally, there has only been one detection of 1,4-DCB at the Site (direct-push sample).

Based on these comparisons to applicable risk-based screening standards, groundwater at the Site does not present an unacceptable human health risk for the exposure pathways assessed.

7.3 ***BASELINE ECOLOGICAL RISK ASSESSMENT***

Ecological risk assessment is completed through a four-tier approach: Scoping, Screening, Baseline, and Field Baseline. Level I is a conservative, qualitative determination of whether there is any reason to believe that ecological receptors and/or pathways are present or potentially present at or in the vicinity of a facility.

7.3.1 ***Upland Ecological Receptors***

The Site is undeveloped and provides a limited amount of wildlife habitat, but much of the area shows the effects of physical disturbance (e.g., grading). A Level I – Scoping site visit was performed at the Site by Exponent on 28 April 1999 and by ERM on 19 June 2003. Several upland species (but no “ecologically important species/habitats”) were identified during this walkover. However, planned industrial development of the Site will likely eliminate much of this habitat, except within the 50-foot Greenway Buffer along the Willamette River. Additionally, there are no current sources of contamination at the ground surface or in the shallow soil (top 3 ft). Thus, there is no complete pathway for upland terrestrial receptors.

7.3.2 ***Aquatic Ecological Receptors***

A variety of aquatic ecological receptors exist within the Willamette River adjacent to the Site. Low concentrations of DDT, DDD, and DDE in soil in the former DDT Trench area, if exposed to the surface, could potentially migrate to the river via overland flow of storm water containing soil particles. Although the risk to aquatic receptors has not been quantified, this potential exposure pathway will be addressed in the final remedy for the Site selected in this document.

SOURCES AND PATHWAYS TO THE RIVER

Two existing migration pathways to the river exist at the Site:

- **Soil** - The existing soil pathway is the excavation or disturbance of soil within the former DDT Trench area and migration of contaminated soil to the river via overland storm water flow. However, this exposure pathway will be managed through the development of a Soil Management Plan (SMP) for the Site.
- **Groundwater** - The groundwater pathway to the river is the migration of contaminated groundwater to the river. However, because there is no existing nor previous contamination source at the Site, this pathway should be addressed by Rhone Poulenc.

8.0 *CLEANUP STANDARDS AND HOT SPOTS*

8.1 *SELECTION OF CLEANUP STANDARDS*

The cleanup standards for soil at the Site will be USEPA Region 9 Industrial PRGs. For the CoIs, the respective PRG values are:

- DDT - 7.0 milligrams per kilogram (mg/kg);
- DDE - 7.0 mg/kg; and
- DDD - 10.0 mg/kg.

These Industrial PRGs were developed using conservative exposure assumptions for the following soil exposure routes:

- Ingestion;
- Inhalation of particulates;
- Inhalation of volatiles; and
- Dermal adsorption.

The two complete soil exposure routes for the Site, as discussed in Section 7.1 are ingestion and dermal adsorption. The Industrial PRG values take into account these routes and are therefore applicable to the Site.

8.2 *HOT SPOT DETERMINATION*

Oregon regulations require that certain actions be taken for "hot spots" of contamination. These actions are: (1) the identification of hot spots as part of the RI/FS, and (2) the treatment of hot spots, to the extent feasible, as part of a remedial action selected or approved by the Director of the ODEQ (ODEQ 1998d).

The definition of hot spots depends on the medium that is contaminated. For media other than water (e.g., soil), a hot spot exists if the site presents an unacceptable risk and if the contamination is highly concentrated, highly mobile, or cannot be reliably contained (ODEQ 1998d). Data collected as part of the investigations discussed in Section 4.0 were used to determine whether hot spots may exist in soil at the Site.

The Oregon Environmental Cleanup Rules (OAR 340-122-115[32][b]) define hot spots in media other than water as:

“For media other than groundwater or surface water, (e.g., contaminated soil, debris, sediments, and sludges; drummed wastes; ‘pools’ of dense, non-aqueous phase liquids submerged beneath groundwater or in fractured bedrock; and non-aqueous phase liquids floating on groundwater), if hazardous substances present a risk to human health or the environment exceeding the acceptable risk level, the extent to which the hazardous substances:

(A) Are present in concentrations exceeding RBCs corresponding to:

(i) 100 times the acceptable risk level for human exposure to each individual carcinogen;

(ii) 10 times the acceptable risk level for human exposure to each individual noncarcinogen; or

(iii) 10 times the acceptable risk level for exposure of individual ecological receptors or populations of ecological receptors to each individual hazardous substance.

(B) Are reasonably likely to migrate to such an extent that the conditions specified in subsection (a) or paragraphs (b)(A) or (b)(C) would be created; or

(C) Are not reliably containable, as determined in the feasibility study (FS).”

The results of the screening risk assessment indicate that for the current and planned future industrial land use of the Site, the hazardous substances identified in soil do not present an unacceptable risk to human health or the environment. By definition, a hot spot can only exist in media other than water if the hazardous substances present an unacceptable risk (ODEQ 1998d). Accordingly, there are no ODEQ-defined hot spots present in soil at the Site.

The State of Oregon has derived Pre-Calculated Hot Spot Levels for use in identifying areas of contamination producing a “highly concentrated” hot spot in soil. Table 4-1 provides a comparison of the DDT Trench removal verification sampling results to the Pre-Calculated “Highly Concentrated” Hot Spot Levels in Soil (ODEQ 1998e) for DDT, DDD, and DDE. Concentrations detected in the verification samples were several orders of magnitude below the Hot Spot Levels, thus providing additional evidence that there are no ODEQ-defined hot spots present in soil at the Site.

9.0 *FEASIBILITY STUDY*

The following sections provide a brief FS for the selection of a remedy to address the ecological risk associated with residual DDT in soil at the Site. This section includes:

- Development of remedial action alternatives;
- Evaluation of the alternatives using ODEQ evaluation criteria; and
- Selection of a preferred alternative based on the evaluation.

9.1 *DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES*

The remedial action alternatives developed to address potential ecological risks associated with the former DDT Trench are identified and described below. Four alternatives were developed:

- Alternative 1 - No Further Action;
- Alternative 2 - Soil Management and Institution Controls;
- Alternative 3 - Soil Capping and Institutional Controls; and
- Alternative 4 - Soil Excavation and Disposal.

These alternatives are described in the following subsections.

9.1.1 *Alternative 1 - No Further Action*

Alternative 1 is the No Further Action Alternative. For this alternative, no actions would be performed to control site-related risks. The FS process typically requires consideration of the No Further Action Alternative. This alternative is used as a baseline for comparison with other remedial alternatives.

9.1.2 *Alternative 2 - Soil Management and Institutional Controls*

Alternative 2 includes the development of an SMP. The SMP would provide specific protocols for disturbance and handling of soil containing residual amounts of DDT in the area of the former DDT Trench. This alternative would also provide contingency handling protocols for groundwater if dewatering of a deep trench ever occurred. The SMP will also stipulate best management practices for soil management and erosion control, as well as implement institutional controls for the Site.

9.1.3 *Alternative 3 – Soil Capping and Institutional Controls*

Alternative 3 includes installation of a soil or geosynthetic cap in the area of the former DDT Trench to prevent disturbance of the soil and prevent infiltration of storm water into the soil. This alternative would also include institutional controls to preclude disturbance of the cap or the trench soils by development or other method. Institutional controls would also likely be required as part of this alternative to ensure the long-term integrity of the cap.

9.1.4 *Alternative 4 – Excavation And Disposal*

Alternative 4 includes excavation of soil in the area of the former DDT Trench and disposal at an off-site landfill. Soil would likely be excavated from the trench using an excavator to a depth of approximately 14 ft bgs and transferred into a hauler for transport to the landfill. Based on the dimensions of the trench discussed in Section 4.3, approximately 1,300 cubic yards (approximately 2,000 tons) of soil would need to be removed. The majority of this soil would be clean fill and could potentially be backfilled following stockpile testing.

9.2 **EVALUATION OF REMEDIAL ACTION ALTERNATIVES**

This section presents an evaluation of remedial action alternatives. First, the evaluation criteria set forth in *Oregon Guidance for Conducting Feasibility Studies* (ODEQ 1998c) are described. Next, the remedial alternatives are evaluated with respect to the criteria and a comparative analysis is provided.

9.2.1 *Evaluation Criteria*

The evaluation criteria used for FSs in Oregon are briefly described below:

- **Effectiveness** - In general, effectiveness provides an assessment of the remedial action alternative's ability to achieve the desired level of protection. Effectiveness measures the performance of the alternative up to the point in time that remedial action objectives are achieved and implementation is complete. Whether the alternative can maintain these objectives over the long-term is assessed by the balancing factor long-term reliability;
- **Long-Term Reliability** - In general, long-term reliability provides an assessment of the remedial action alternative's ability to maintain the required level of protection over the long-term after it has been implemented;

- **Implementability** - The assessment of implementability is intended to determine whether, or with how much difficulty, the remedial action alternative can be implemented and whether the alternative's continued effectiveness can be assessed and verified;
- **Implementation Risk** - This evaluation criterion addresses the effects on human health and the environment during the construction and implementation phase of the remedial action;
- **Reasonableness of Cost** - In general, those alternatives which are protective, (i.e., effective and reliable), can be readily implemented with minimal impacts to the community, workers, and the environment, and have a lower cost will be regarded as having a greater level of cost reasonableness; and
- **Protectiveness** - Oregon's environmental cleanup law requires that all remedies be protective of human health and the environment, as demonstrated through a residual risk assessment. If a remedial action alternative is effective and reliable over the long-term, it is by necessity protective. The residual risk assessment provides a quantitative assessment of the risk remaining at the site (a criterion of effectiveness) and a typically, qualitative assessment of the adequacy (a criterion of effectiveness) and reliability (a criterion of long-term reliability) of engineering and/or institutional controls in managing this risk over the long-term.

9.2.2 *Effectiveness*

Since effectiveness measures the performance of the alternative up to the point in time that implementation is complete, Alternatives 1 (NFA), 2 (SMP), and 3 (Cap) would be equally effective. At the completion of implementation of these alternatives, residual DDT concentrations in soil would not be exposed to storm water, thus eliminating the ecological risk of transport to the river via overland flow. This exposure is prevented by the 3 ft of clean soil in Alternatives 1 (NFA) and 2 (SMP) and by the cap in Alternative 3 (Cap). Alternative 4 (Excavation) has a lesser degree of effectiveness over the short term due to the slight potential for spreading low levels of DDT-impacted soil around the area during excavation. Thus, this is the only alternative that has the potential to expose DDT-impacted soil to storm water during implementation. As a result, this alternative has a medium-high degree of effectiveness.

9.2.3 *Long-Term Reliability*

Alternative 4 (Excavation) has the highest degree of long-term effectiveness due to the permanence of the removal and placement of soil

in a landfill, thus moving the soil away from potential aquatic receptors. Alternative 3 (Cap) has a high degree of long-term reliability, although not as high as Alternative 4. The physical cap over the soil will provide additional protection against disturbance of the soil after installation.

Long-term reliability of Alternative 2 (SMP) is dependant upon how soil is managed following implementation of the SMP. For example, if soils were disturbed as part of development (e.g., as part of a deep utility or foundation installation) and reburied at the site, long-term reliability would decrease due to the potential for spreading of DDT-impacted soils during excavation. However, if the disturbed soils were instead transported and disposed in a landfill, long-term reliability would increase slightly (potential for spreading would be off-set by the placement of the soils away from aquatic receptors). Similarly, placement of a building, or other development, over the area (which is likely) would increase long-term reliability. Regardless of how soil is managed at the Site, the SMP will provide adequate long-term reliability by specifying protective soil management protocols.

Alternative 1 (NFA) has the lowest degree of long-term reliability due to the potential for disturbance of the soils in the former DDT Trench. However, similar to Alternative 2 (SMP), development over the area would provide additional long-term reliability.

9.2.4 *Implementability*

Alternative 1 (NFA) has the highest degree of implementability based on the fact that no field implementation is required. Alternative 2 (SMP) has a high degree of implementability, although the institutional controls that are a part of this alternative will require some legal diligence. Alternative 3 (Cap) has a high degree of implementability based on the good site access and low topographical variation in the area of the former DDT Trench. However, this alternative will likely require the same institutional controls, and thus legal diligence, that is required pursuant to Alternative 2 (SMP). Alternative 4 (Excavation) also has a high degree of implementability.

9.2.5 *Implementation Risk*

Similar to effectiveness, Alternatives 1 (NFA), 2 (SMP), and 3 (Cap) all have the same degree of implementation risk (low). Alternative 3 (Cap) may have a slightly higher risk, due to the potential risk to human health resulting from the operation of heavy construction equipment. Alternative 4 (Excavation) will also carry this risk due to construction

equipment, as well as the additional risk of spreading contamination during excavation of the soil, as discussed in Section 9.2.2.

9.2.6 *Reasonableness of Cost*

While engineering cost estimates were not developed for each of the remedial alternatives, a discussion of relative cost is provided below.

Alternative 4 (Excavation) will, by far, be the most expensive alternative to implement. Under Oregon's Pesticide Residue Rules (OAR 340-109-0010 [4][b]), soil containing concentrations of DDT greater than the Land Disposal Concentration-Based Standard specified in Title 40 of the Code of Federal Regulations Section 268.40 (0.087 mg/kg) requires disposal at a Subtitle C landfill. Several confirmation samples collected following removal of the DDT Trench indicated concentrations above this standard. Therefore, at least a portion of the soil would require disposal at a Subtitle C landfill. Considering the size of the excavation (1,300 cubic yards), this would be a large expense. Additionally, excavation and transportation of the soil would add substantial cost to this alternative.

Alternative 3 (Cap) is likely the next most expensive alternative. While this alternative does not include the costly disposal of soil at a landfill, the import of clean fill or geosynthetic materials, and the use of heavy construction equipment to place and compact the cap, will add significant expense.

Alternative 2 (SMP) is substantially less expensive, requiring only the engineering and legal costs to prepare the SMP and perform the required legal diligence.

There is no expense associated with Alternative 1 (NFA).

Alternative 4 (Excavation), being the most expensive alternative has the lowest degree of cost reasonableness. Although this alternative does provide a high degree of long-term reliability, the cost of excavation and disposal does not outweigh the minimal benefits gained, nor justify the risks of implementation.

Alternative 3 (Cap), while having a high degree of effectiveness and long-term reliability, also is significantly more expensive than other alternatives possessing similar effectiveness and reliability. Thus, this alternative has a medium to low degree of cost reasonableness.

Alternative 1 (NFA), while being the least expensive and possessing a high degree of effectiveness, does not provide an adequate level of long-

term reliability. Therefore, this alternative also has a medium to low degree of cost reasonableness.

Alternative 2 (SMP) is inexpensive, highly effective, and provides an adequate level of long-term reliability. Therefore, this alternative has a high degree of cost reasonableness.

9.2.7

Protectiveness

Alternative 3 (Cap) possesses a high degree of protectiveness based on the high degree of effectiveness and long-term reliability of this alternative. Alternative 2 (SMP) has a medium-high degree of protectiveness based on the high degree of effectiveness and adequate level of long-term reliability associated with this alternative. Alternative 4 (Excavation) possesses a high degree of protectiveness based on the high degree of long-term reliability, and medium-high degree of effectiveness over the short term. Similarly, Alternative 1 (NFA) possesses a medium degree of protectiveness based on a high degree of effectiveness, yet lower degree of long-term reliability.

9.3

RECOMMENDED REMEDIAL ALTERNATIVE

Based on a medium-high degree of protectiveness, and high degree of effectiveness, implementability and cost effectiveness, while presenting no implementation risk, the preferred alternative is Alternative 2 - Soil Management through development of an SMP and Institutional Controls. This alternative will also provide an adequate level of long-term reliability, especially if development occurs over the area which would likely consist of a building(s) and asphalt parking/loading dock areas.

10.0 RESIDUAL RISK

10.1 RESIDUAL RISK ASSESSMENT

The screening human health risk evaluation provided in Section 7.2 concluded that no unacceptable human health risks exist at the Site. Therefore, no unacceptable residual risks to human health are present.

The baseline ecological risk assessment provided in Section 7.3 concluded that the only potential unacceptable ecological risk that required management was the potential transport of residual concentrations of DDT, DDD, and DDE to the river via overland storm water flow if the soils were exposed to the ground surface. Currently, these soils are covered by 3 ft of clean fill and do not pose an ecological risk. The preferred remedial alternative for the site (soil management through the development of an SMP and institutional controls) will provide protective soil management protocols, thus eliminating this potential ecological risk.

10.2 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The preferred remedial alternative for the site (soil management through the development of an SMP and institutional controls) will be protective of human health and the environment. The protectiveness of this remedy is discussed in Section 9.2.7.

10.3 RESIDUALS MANAGEMENT PLAN

Residual DDT concentrations in the former DDT trench will be managed through development of an SMP. This SMP is included as Appendix E.

Best management practices employed at the site may include, but not be limited to, the use of silt fencing during construction, storm drain filters, and clean fill near storm water drains.

11.0

REFERENCES

AMEC 2001a. *Final Spring and Fall 2000 Groundwater Data and Evaluation*. AMEC Earth & Environmental, Inc. 31 July 2001.

AMEC 2001b. *Focused Spring 2001 Groundwater Characterization Event, Groundwater Monitoring Report, RPAC - Portland Site*. AMEC Earth & Environmental, Inc. 4 October 2001.

AMEC 2002. *Focused Spring 2002 Groundwater Characterization Event, Groundwater Monitoring Report, RPAC - Portland Site*. AMEC Earth & Environmental, Inc. 31 July 2002.

Ater Wynne 1996. Letter from Ater Wynne Hewitt Dodson & Skerritt to Larry Patterson/ATOFINA Chemicals. Re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results). 12 February 1996.

Beeson, M.H., T.L. Tolan, and I.P. Madin. 1991. *Geologic Map of the Portland Quadrangle, Multnomah and Washington Counties, Oregon, and Clark County, Washington*. State of Oregon Department of Geology and Mineral Industries, Portland, OR.

Cable Huston 1999. Letter from Cable Huston Benedict Haagensen & Lloyd LLP to Larry Patterson/ATOFINA Chemicals. Re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results). 20 December 1999.

CES 1988. *Brine Residue Potential; Preliminary Assessment*. Cascade Earth Sciences, Ltd. 23 April 1988.

CH2M Hill 1995. *Remedial Action Report, North Plant Area*. CH2M Hill. April 1995.

CH2M Hill 1997. *Phase 2 Site Characterization: Acid Plant Project*. CH2M Hill. 1997.

City of Portland 2001. *Guild's Lake Industrial Sanctuary Plan*. City of Portland, Bureau of Planning. 21 December 2001.

Elf Atochem 1999. *Preliminary Assessment for Elf Atochem North America, 6400 N.W. Front Avenue, Portland, Oregon*. Elf Atochem. 31 August 1999.

Elf Atochem 2000. *Phase II Preliminary Assessment for Elf Atochem North America, 6400 N.W. Front Avenue, Portland, Oregon*. Elf Atochem. 17 April 2000.

USEPA 2002. *Region 9 PRGs Table Users Guide/Technical Background Document*. United States Environmental Protection Agency. 1 October 2002.

Geraghty & Miller 1991. *Hydrological Investigation of the Doane Lake Area, Portland, Oregon*. Geraghty & Miller. 22 February 1991.

Madin, I.P. 1990. *Earthquake Hazard Geology Maps of the Portland Metropolitan Area; Oregon Department of Geology and Mineral Industries Open-File Report 0-90-2*. 21 pgs, eight maps.

National Oceanic Atmospheric Administration and U.S. Department of Commerce. 1974. *Climates of the States, Volume 2 (Western States)*. New York.

ODEQ 1991. *Excavation of Asbestos-Containing Material*. Wall, D.E., Tong, K. R. 1991.

ODEQ 1998. *Consideration of Land Use in Environmental Remedial Actions* Oregon Department of Environmental Quality. 1 July 1998.

ODEQ 1998b. *Guidance for Conducting Beneficial Water Use Determinations at Environmental Cleanup Sites*. Oregon Department of Environmental Quality. 1 July 1998.

ODEQ 1998c. *Guidance for Conducting Feasibility Studies*. Oregon Department of Environmental Quality. 1 July 1998.

ODEQ 1998d. *Guidance for Identification of Hot Spots*. Oregon Department of Environmental Quality. 23 April 1998.

ODEQ 1998e. *Pre-Calculated Hot Spot Look-Up Tables Guidance*. Oregon Department of Environmental Quality. 20 October 1998.

ODEQ 1999. *Risk-Based Decision Making for the Remediation of Petroleum Contaminated Sites*. Oregon Department of Environmental Quality. 29 September 1999.

ODEQ 2000. *Guidance for Conduct of Deterministic Human Health Risk Assessments*. Oregon Department of Environmental Quality. May 2000.

PBS 2002. *Phase Two Environmental Site Assessment for Bonneville Power Administration; Pennwalt Substation*. PBS Environmental. January 2002.

Tolan, T.L. and M.H. Beeson. 1984. *Intracanyon Flows of the Columbia River Basalt Group in the Lower Columbia River Gorge and their Relationship to the Troutdale Formation*. Geological Society of America Bulletin 95(4):463-477.

U.S. Army Corps of Engineers. 1991. Portland-Vancouver Harbor information package reservoir regulation and water quality section.

U.S. Department of Commerce. 1968. *Climatic Atlas of the United States*.

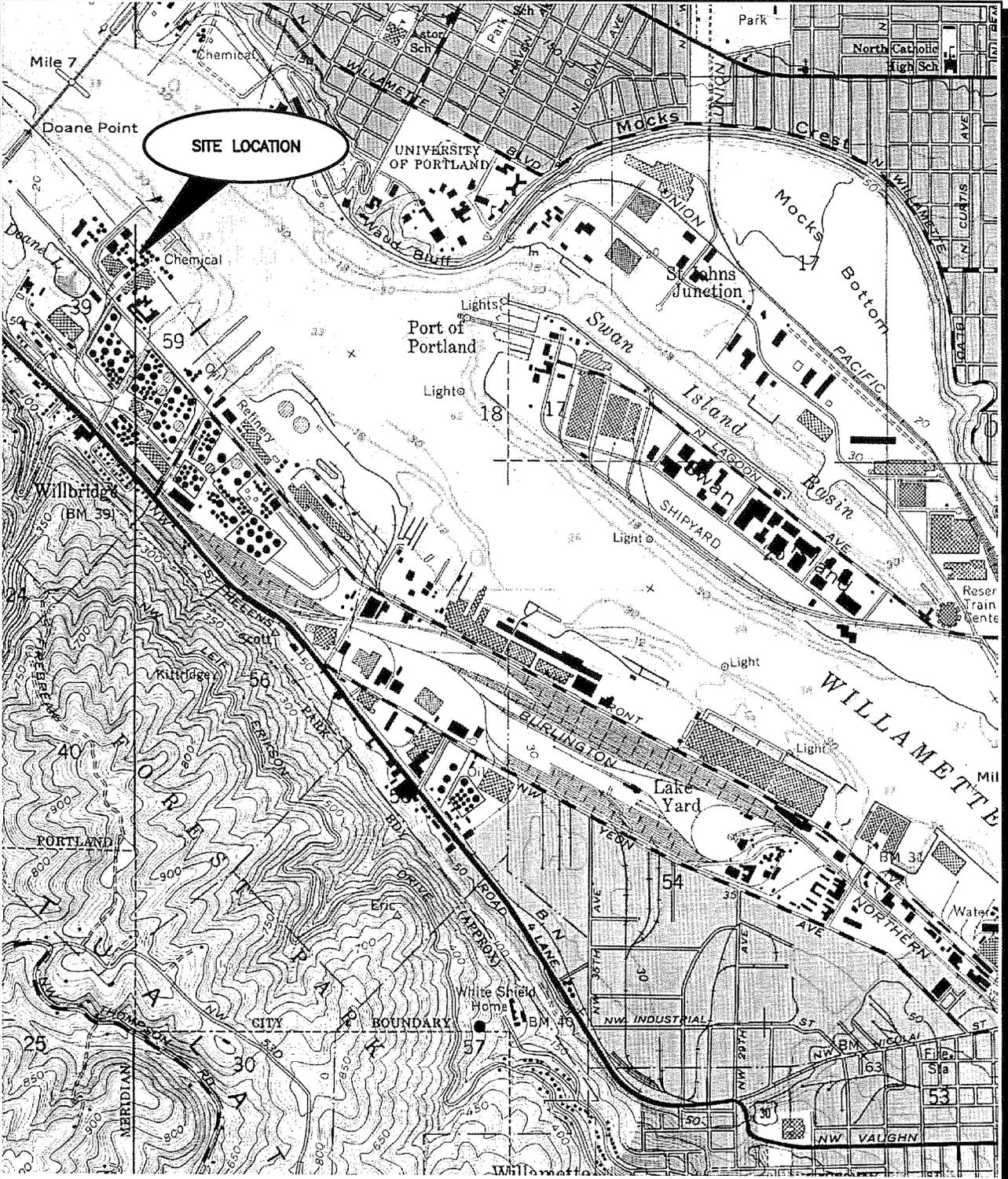
Waitt, R.B. Jr. 1985. *Case For Periodic, Colossal Jökulhlaups From Pleistocene Glacial Lake Missoula*. Geological Society of America Bulletin 96(10):1271-1286.

Weston, R.F. 1998. *Portland Harbor Sediment Investigation Report: Multnomah County, Oregon*. Prepared for U.S. Environmental Protection Agency, Region X, Seattle, Washington. Roy F. Weston, Inc., Seattle, WA.

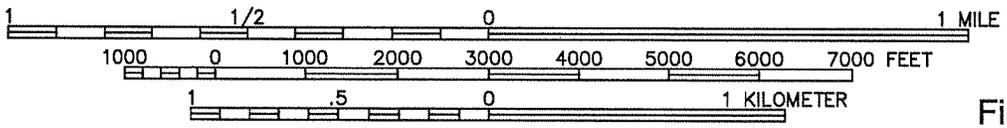
THIS PAGE INTENTIONALLY LEFT BLANK

Figures

Project No. 5204.00
 Date: 02/24/03
 Drawn By: R. Olson
 CAD File: G:\5204\00\52040003.dwg

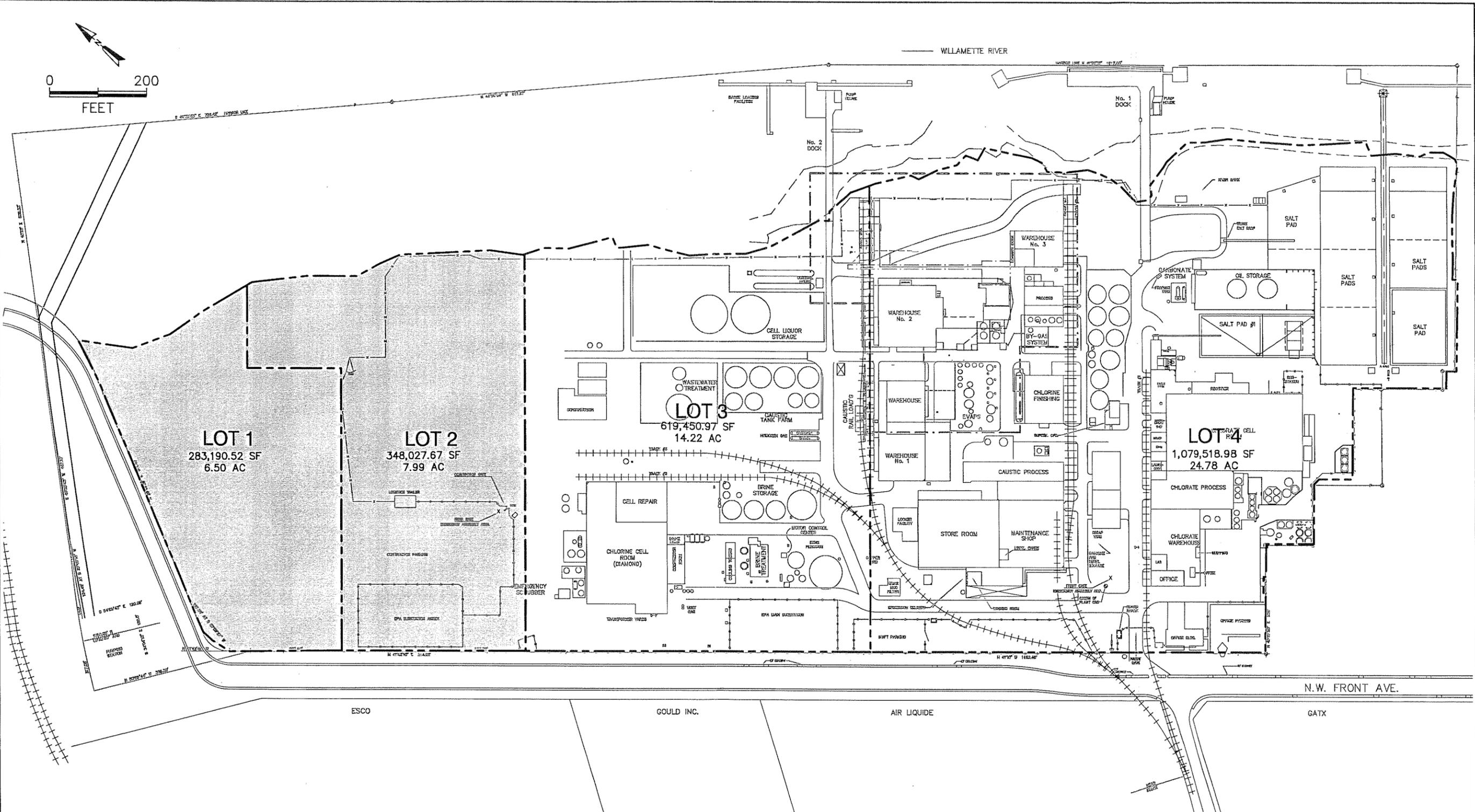


SCALE 1: 24,000



References:
 U.S.G.S. 7.5 Minute Series (Topographic Portland,
 Oregon-Washington)
 Dated: 1961; Photorevised 1970 and 1977

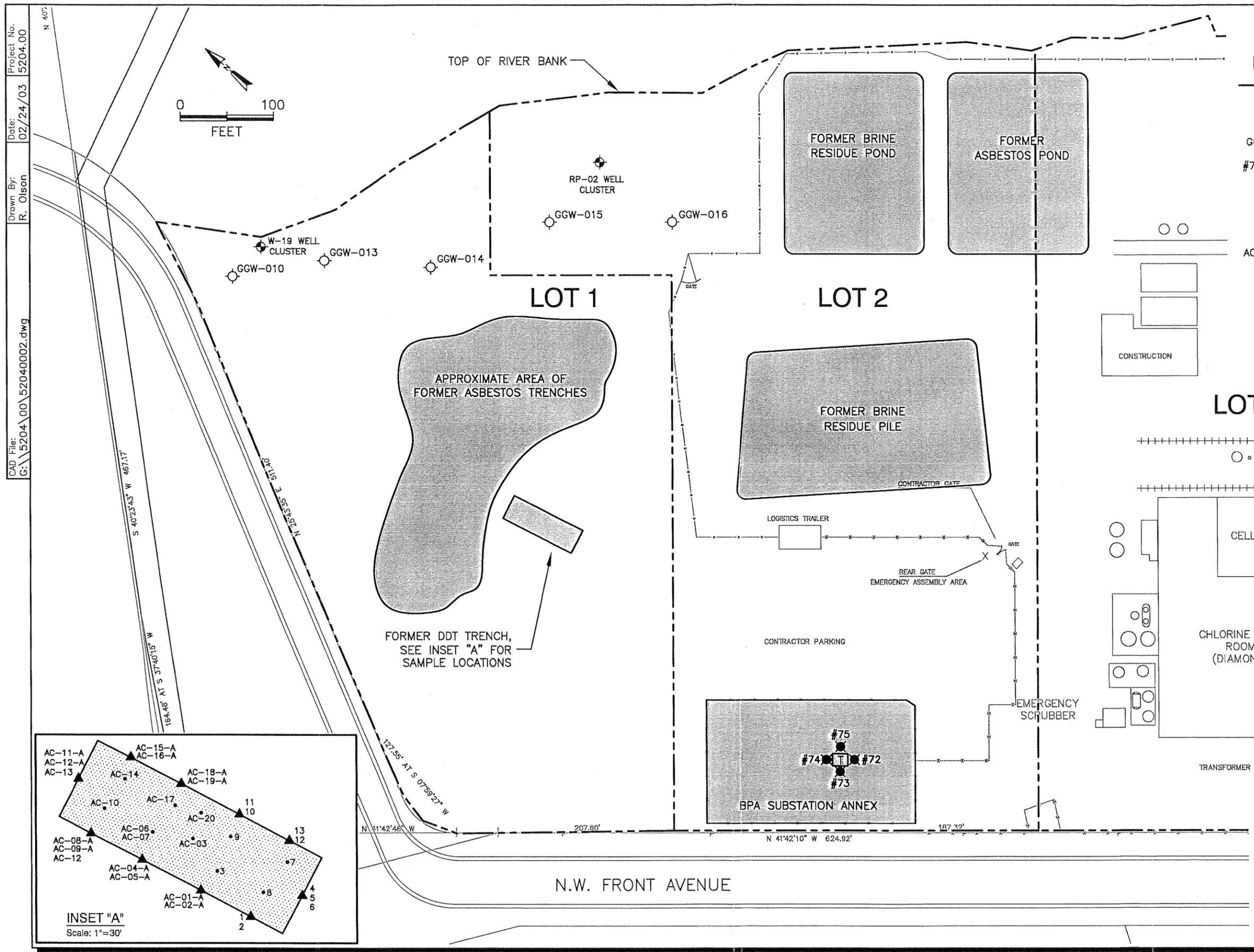
Figure 2-1
Site Location Map
ATOFINA Chemicals, Inc.
Portland, Oregon



LEGEND

SUBJECT SITE
 APPROXIMATE LOT BOUNDARIES

Figure 2-2
 Site Layout Map
 ATOFINA Chemicals, Inc.
 Portland, Oregon



- LEGEND**
- MONITORING WELL CLUSTER
 - AREA OF CONCERN
 - APPROXIMATE LOT BOUNDARIES
 - FORMER TRANSFORMER
 - DIRECT PUSH GROUNDWATER SAMPLING LOCATION (1999)
 - #73 BPA SOIL SAMPLE (2001)
 - DDT TRENCH SAMPLING (1994)
 - BOTTOM SOIL SAMPLE
 - SIDE WALLS SOIL SAMPLE
 - AC-11-A SAMPLE IDENTIFICATION

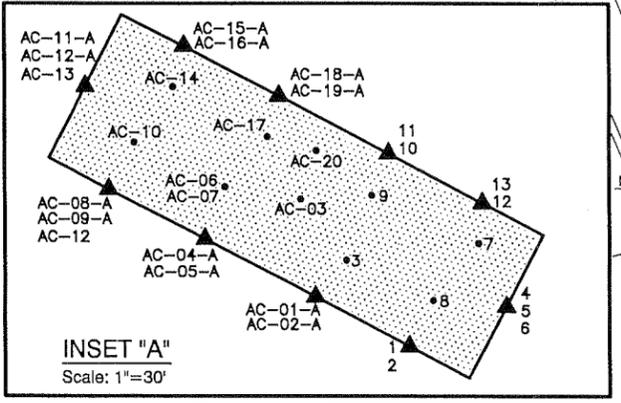
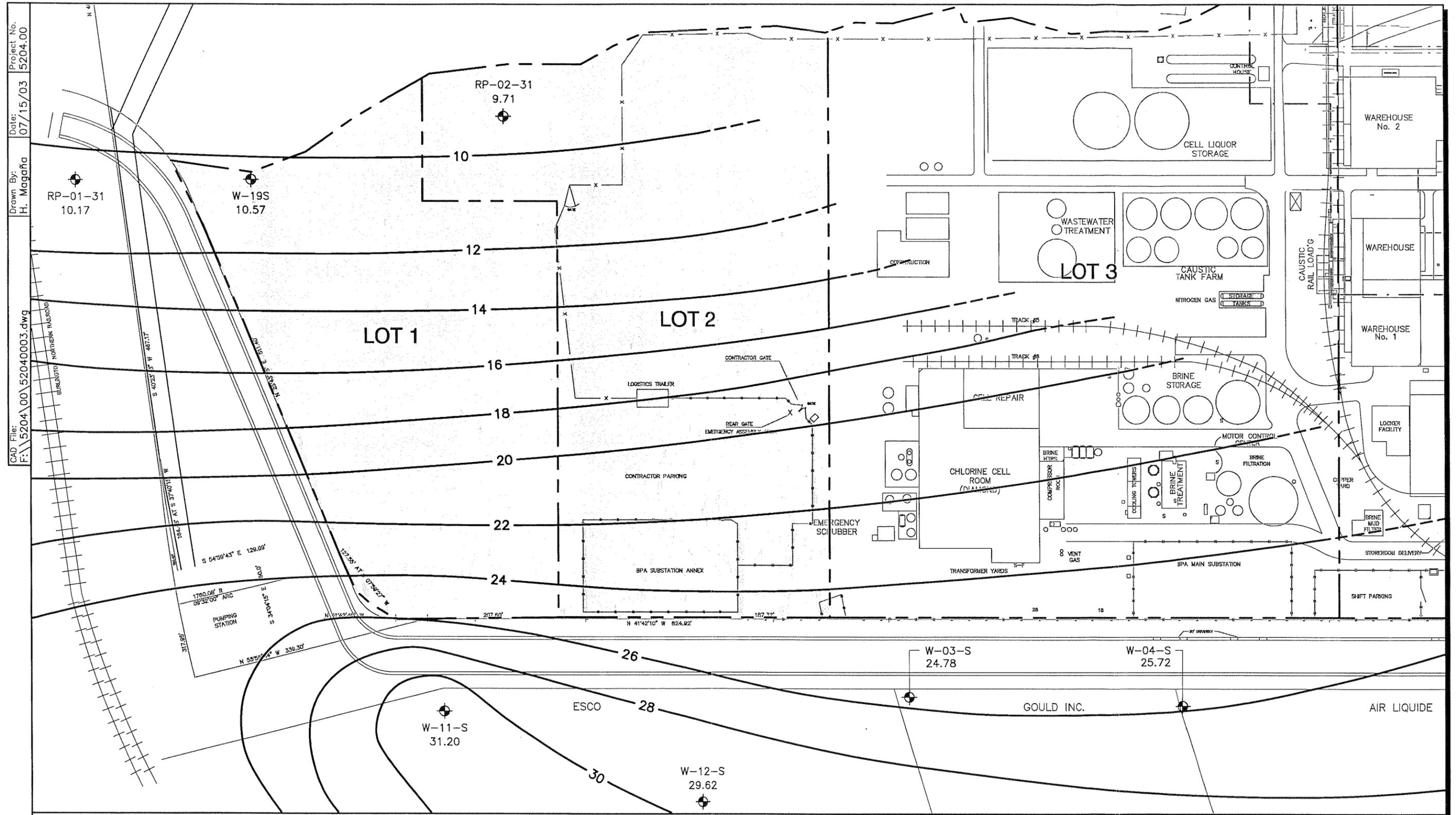


Figure 4-1
 Areas of Concern
 Lots 1 and 2
 ATOFINA Chemicals, Inc.
 Portland, Oregon



Project No. 5204.00
 Date: 07/15/03
 Drawn By: H. Magaña
 CAD File: F:\5204\00\52040003.dwg

LEGEND	
	Monitoring Wells
	Subject Site
	Approximate Lot Boundaries
	Groundwater Elevation Contours (Contour Interval of 2 Feet) Spring 2002

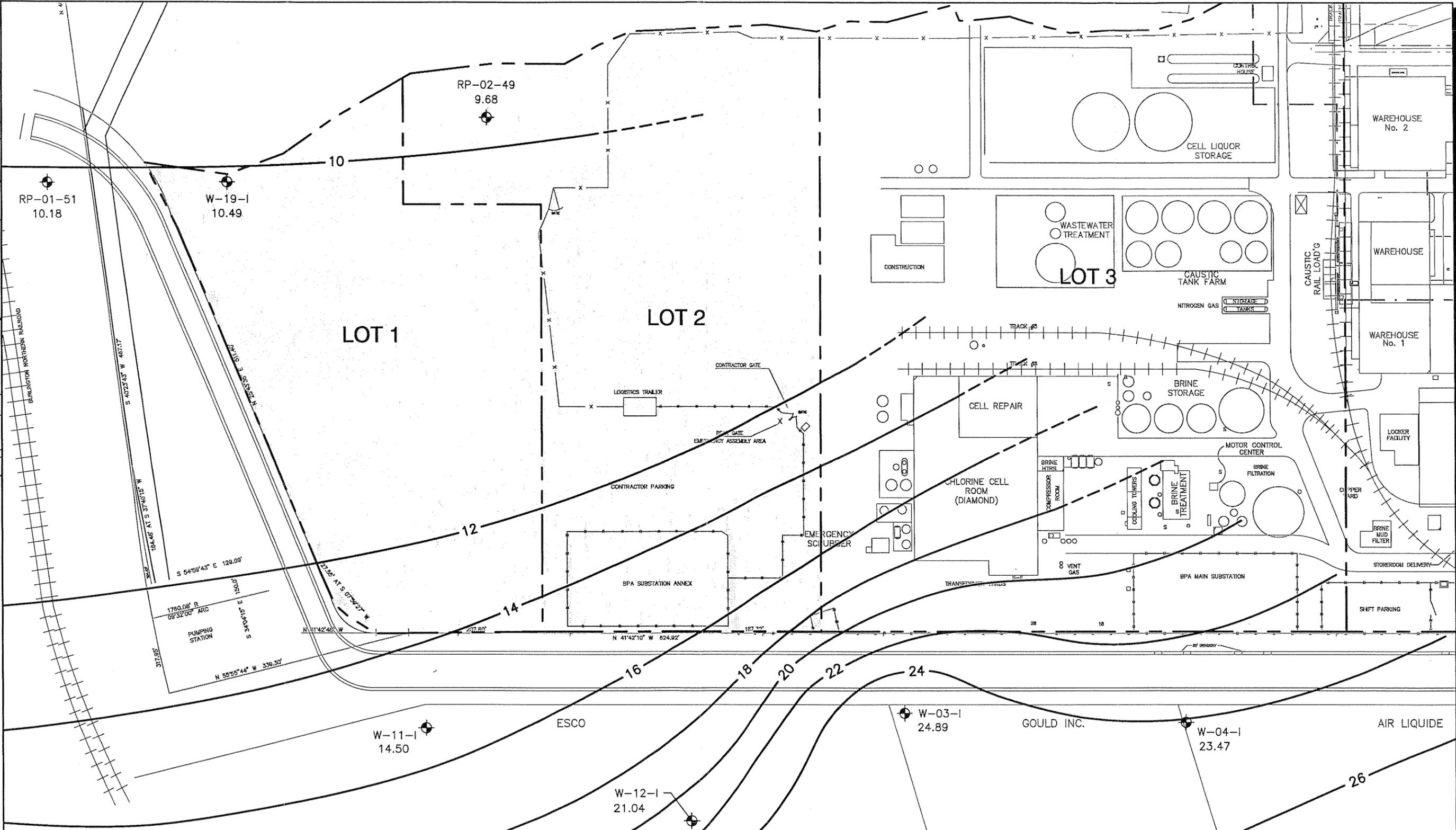


Figure 4-2
 Shallow Aquifer Potentiometric Surface Map
 ATOFINA Chemicals, Inc.
 Portland, Oregon

SOURCE: Focused Spring 2002 Groundwater Characterization Event - RPAC Portland Site (AMEC 31 July 2002).

ERM 07/03

Project No. 5204.00
 Date: 07/15/03
 Drawn By: H. Magaña
 CAD File: F:\5204\00\52040004.dwg

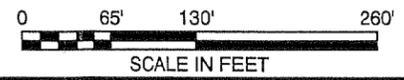


LEGEND

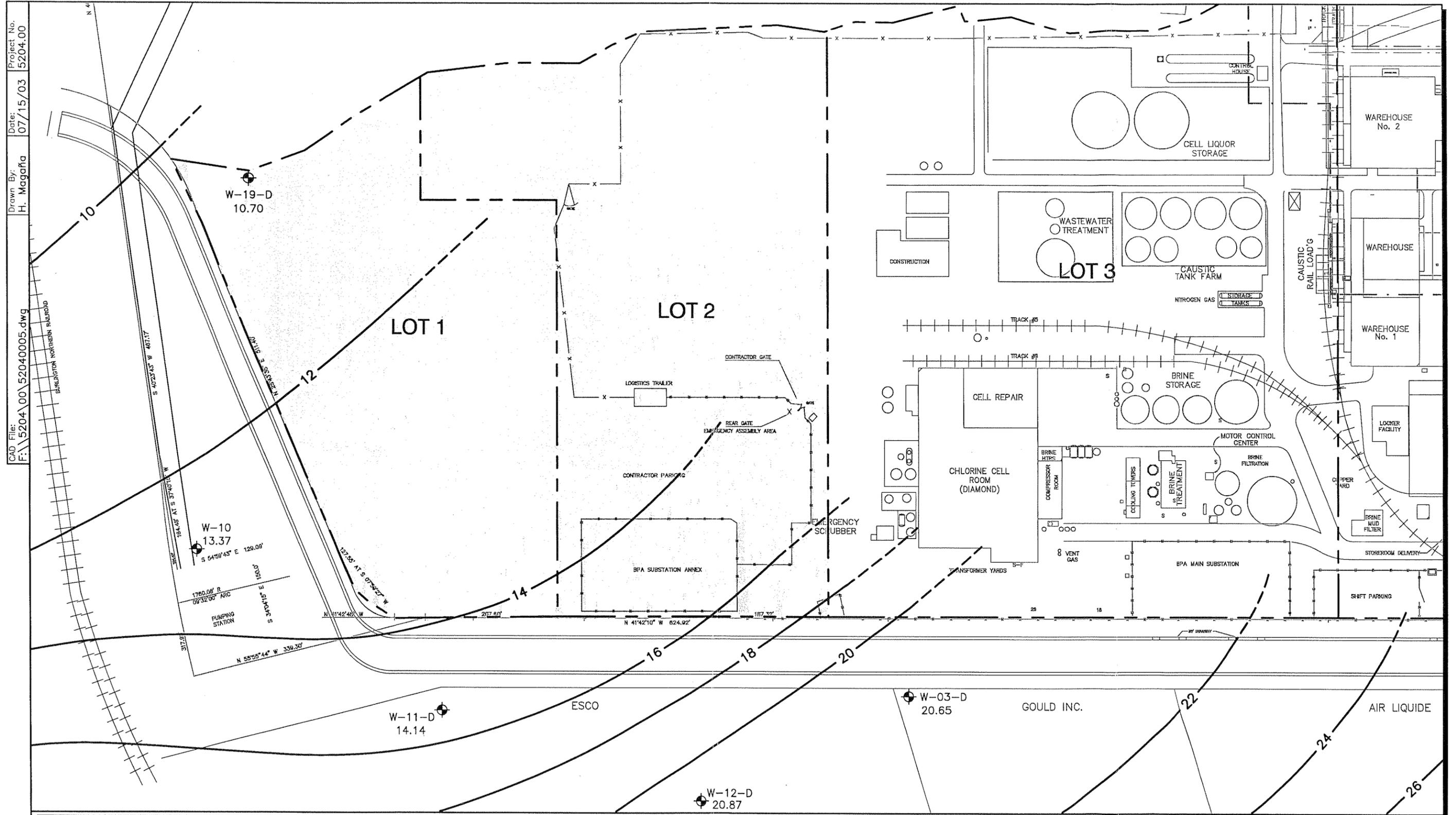
- Monitoring Wells
- Approximate Lot Boundaries
- Subject Site
- Groundwater Elevation Contours (Contour Interval of 2 Feet) Spring 2002

Figure 4-3
Intermediate Aquifer Potentiometric Surface Map
 ATOFINA Chemicals, Inc.
 Portland, Oregon

SOURCE: Focused Spring 2002 Groundwater Characterization Event - RPAC Portland Site (AMEC 31 July 2002).



ERM 07/03



Project No. 5204.00
 Date: 07/15/03
 Drawn By: H. Magaña
 CAD File: F:\5204\00\52040005.dwg
 F:\5204\00\52040005.dwg

LEGEND	
	Monitoring Wells
	Subject Site
	Approximate Lot Boundaries
	Groundwater Elevation Contours (Contour Interval of 2 Feet) Spring 2002

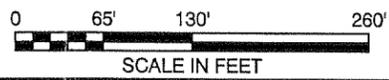
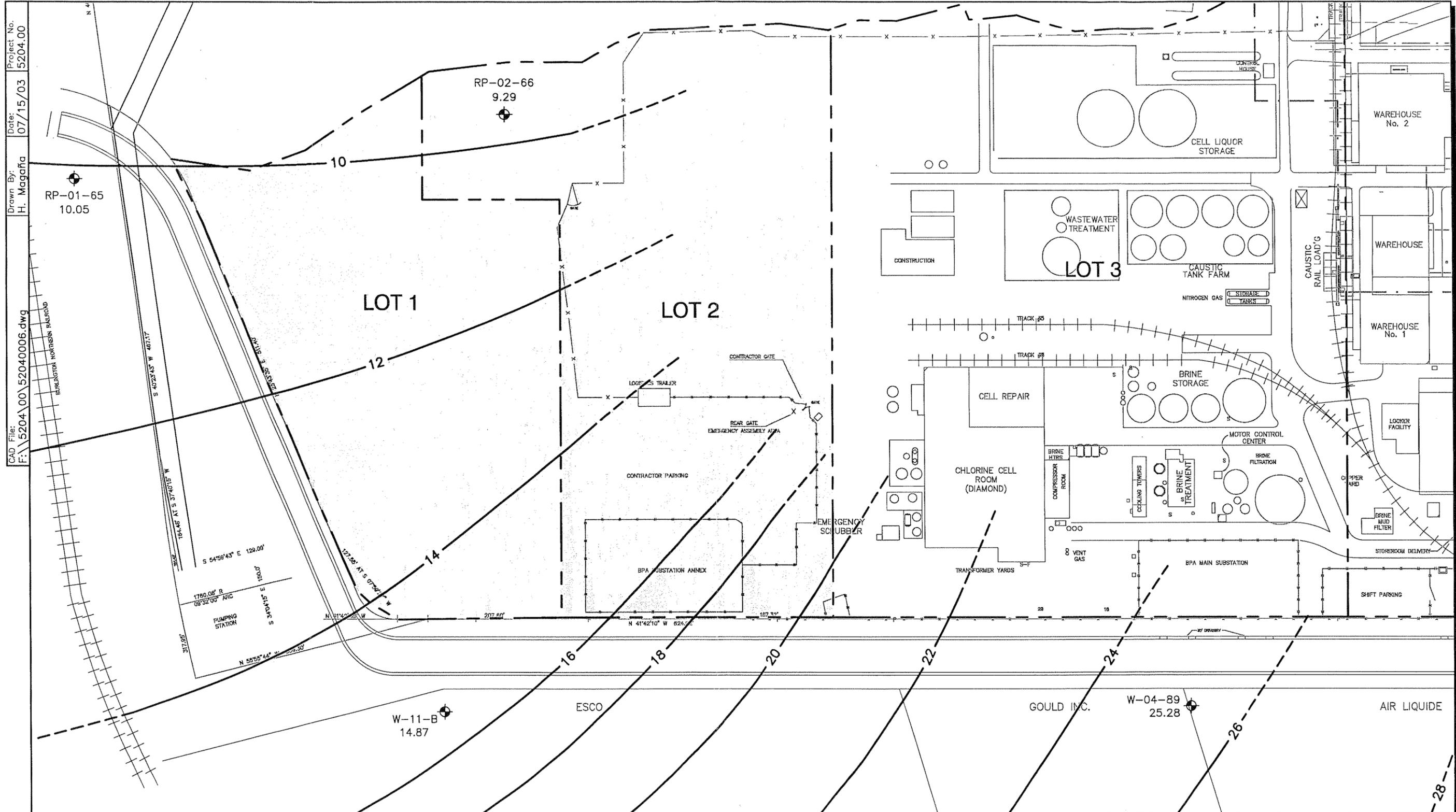


Figure 4-4
 Deep Aquifer Potentiometric Surface Map
 ATOFINA Chemicals, Inc.
 Portland, Oregon

SOURCE: Focused Spring 2002 Groundwater Characterization Event – RPAC Portland Site (AMEC 31 July 2002).

ERM 07/03



Project No. 5204.00
 Date: 07/15/03
 Drawn By: H. Magaña
 CAD File: F:\5204\00\52040006.dwg

LEGEND

- Monitoring Wells
- Approximate Lot Boundaries
- Subject Site
- Groundwater Elevation Contours (Contour Interval of 2 Feet) Spring 2002

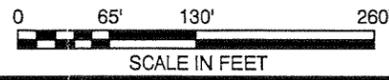
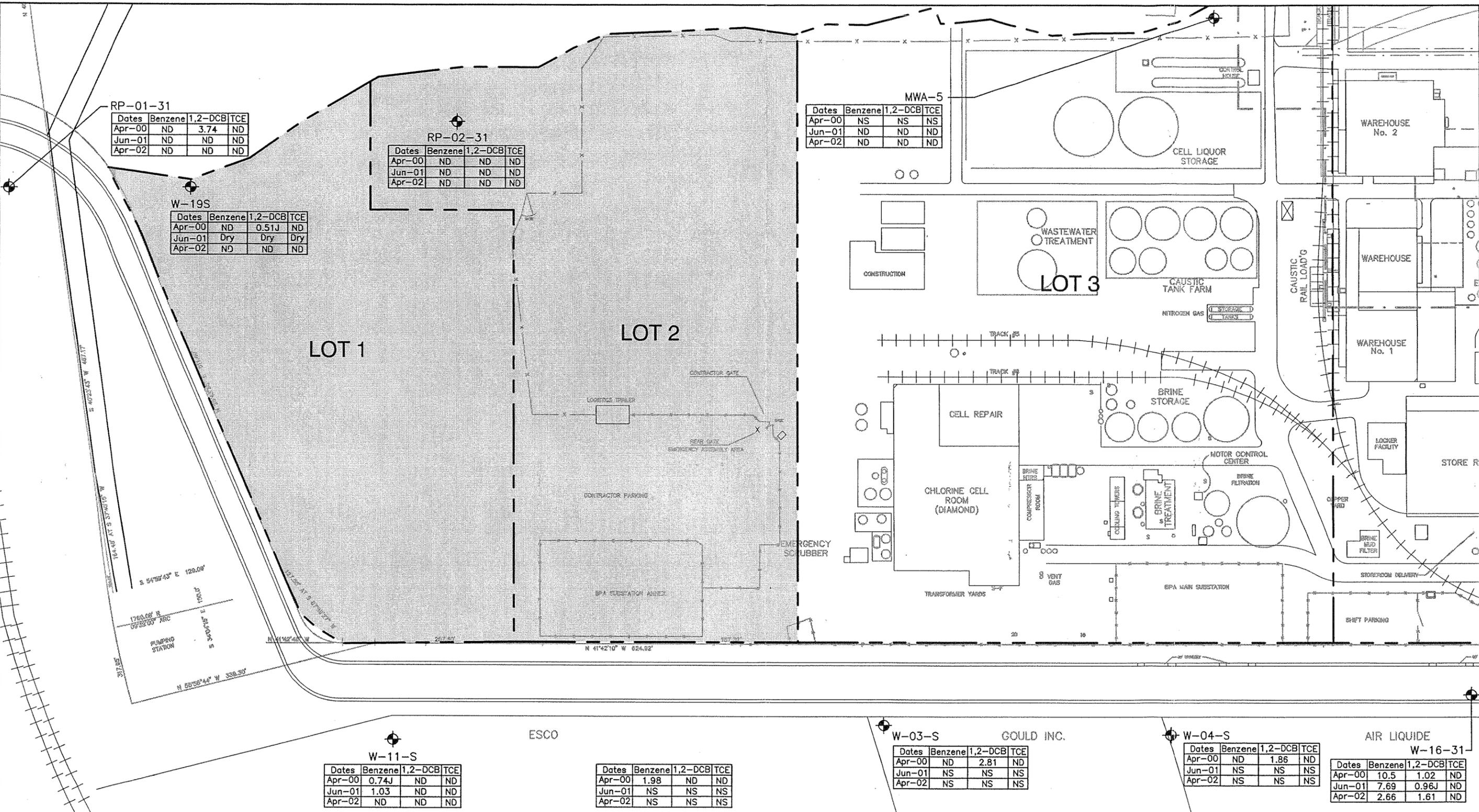


Figure 4-5
 Basalt Aquifer Potentiometric Surface Map
 ATOFINA Chemicals, Inc.
 Portland, Oregon

SOURCE: Focused Spring 2002 Groundwater Characterization Event - RPAC Portland Site (AMEC 31 July 2002).

Project No. 5204.00
 Date: 07/16/03
 Drawn By: H. Magaña
 File: F:\5204\00\52040007.dwg



SOURCE: Focused Spring 2002 Groundwater Characterization Event - RPAC Portland Site (AMEC 31 July 2002).

LEGEND

- Monitoring Wells
- Subject Site
- Approximate Lot Boundaries
- 1,2-DCB Dichlorobenzene
- TCE Trichloroethene
- ND No Detection
- NS Not Sampled
- J The analyte was positively identified, but the associated concentration is an estimate.
- Dry Well was dry during sampling event; no sample collected.

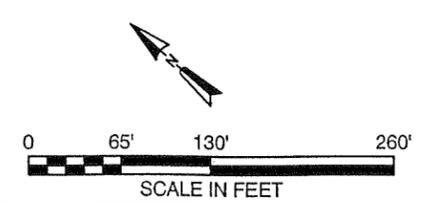


Figure 4-6
 Select Historical VOC Detections - Shallow Aquifer
 ATOFINA Chemicals, Inc.
 Portland, Oregon
 ERM 07/03

Tables

Table 4-1
 Summary of Soil Verification Data
 Lots 1 and 2
 ATOFINA Chemicals Inc.
 Portland, Oregon

Sample ID	Location Description	Approximate Depth ^a ft	Analyte		
			DDD mg/kg	DDE mg/kg	DDT mg/kg
1	West wall	4	0.039	ND	0.11
2-2	West wall	9	ND	ND	ND
3	Center west bottom	11	0.19	0.014	0.48
4-2	South wall	4.5	ND	ND	1.4
5-3	South wall	4.5	ND	ND	ND
6	South wall	8.5	0.015	ND	0.018
7	Southeast bottom	10.5	0.33	0.052	0.97
8	Southwest bottom	11	0.91	0.29	0.17
9	Center east bottom	10.5	ND	ND	ND
10-2	East wall	9.5	ND	ND	ND
11-2	East wall	4.5	ND	ND	0.9
12	East wall	9	ND	ND	ND
13	East wall	4	ND	ND	ND
AC-01-A	West wall	4	ND	ND	0.016
AC-02-A	West wall	9	ND	ND	ND
AC-03	Center bottom	11.5	0.014	0.063	ND
AC-04-2	West wall	4.5	ND	ND	ND
AC-05-A	West wall	9.5	0.056	ND	0.76
AC-06	West bottom	11.5	ND	ND	0.03
AC-07-2	West bottom	12.5	0.3	ND	0.25
AC-08-2	West wall	4	ND	ND	0.69
AC-09-A	West wall	9.5	ND	ND	ND
AC-10-2	Northwest bottom	13	0.19	ND	0.15
AC-11-2	North wall	4.5	ND	ND	1.0
AC-12-3	North wall	9.5	ND	ND	1.8
AC-13-3	North wall	9.5	ND	ND	ND
AC-14	Northeast bottom	11	ND	ND	ND
AC-15-2	East wall	4.5	ND	ND	ND
AC-16-A	East wall	9.5	ND	ND	0.13
AC-17-2	East bottom	12.5	ND	ND	ND
AC-18-A	East wall	4.5	ND	ND	0.74
AC-19-A	East wall	9.5	ND	ND	ND
AC-20	Center east bottom	11.5	0.058	ND	ND
USEPA Region 9 PRG; Industrial Soil Cleanup			10	7.0	7.0
USEPA Region 9 PRG; Residential Soil Cleanup			2.4	1.7	1.7
ODEQ Pre-Calculated "Highly Concentrated" Hot Spot Levels in Soil (Industrial) ¹			1,000	700	700

Results based on confirmation sampling results presented in Remedial Action Report,

North Plant Area (CH2M Hill 1995)

ND = Not detected

PRG = Preliminary Remediation Goals (October 2002)

USEPA = United States Environmental Protection Agency

ODEQ = Oregon Department of Environmental Quality

a = Depths listed are in feet below original ground surface prior to excavation

¹ - 100 times the Industrial PRG per Pre-Calculated Hot Spot Look-Up Tables Guidance - 20 October 1998.

Shaded cells indicate exceedance of the residential PRG

Table 4-2a
 Historical Summary of Groundwater Analytical Results
 Volatile Organic Compounds, Semi-Volatile Organic Compounds, and Petroleum Hydrocarbons
 Shallow Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Volatile Organic Compounds (ug/l)																				Semivolatile Organic Compounds (ug/l)					Hydrocarbons (mg/l)									
			Acetone	Benzene	Chloro benzene	1,2-DCB	1,4-DCB	1,1-DCA	1,1-DCE	1,2-DCE	cis-1,2-DCE	Ethyl-benzene	Hexachloro-butadiene	Isopropyl-benzene	p-isopropyl-toluene	Napthalene	n-propyl-benzene	PCE	Toluene	TCE	1,2,4-TMB	1,3,5-TMB	m,p-xylene	o-xylene	total xylene	Vinyl Chloride	2-methyl phenol	4-methyl phenol	Phenol	2,4-DCP	2,4-DMP	Diesel	Fuel Oil #6				
ONSITE WELLS																																					
GGW-010 (27-30')	10/28/1999	3	<25.0	<1.0	<1.0	<1.0	<1.0	NR	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	<1.0	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	NR	NR	NR	NR	NR	NR				
GGW-015 (30-33')	10/28/1999	3	<25.0	1.39	<1.0	<1.0	<1.0	NR	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	<1.0	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	NR	NR	NR	NR	NR	NR			
GGW-016 (27-30')	10/28/1999	3	27.9	1.41	1.29	11.5	1.83	NR	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR			
RP-02-31	4/16/2000	6	<25.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR			
RP-02-31	10/16/2000	6	<25.0	<1.0	<1.0	(0.30) U	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	<25.0	<25.0	<25.0	NS	NS	NS	NS			
RP-02-31	6/19/2001	1	<5.0	<1.21	<0.14	<0.087	<0.176	<0.214	<5.0	<0.087	<0.187	<0.143	0.31 J	<0.175	<0.134	<0.104	<0.114	<5.0	0.28 J,U,T,B	<5.0	<0.119	<0.171	<0.262	<0.091	NR	<0.310	NS	NS	NS	NS	NS	NS	NS	NS	NS		
RP-02-31	4/4/2002	5	<25.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NS	NS	NS	NS	<0.25	NS	NS			
W-19-S	3/28/1995	4	NR	<0.5	<0.5	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		
W-19-S	4/18/2000	6	<25.0	<1.0	<1.0	(0.51) J	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
W-19-S*	6/19/2001	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
W-19-S	4/5/2002	5	<25.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
OFFSITE WELLS																																					
GM-1-S	10/1/1990	2	NS	1 J	5 U	2 J	10 U	NS	5 U	5 U	NS	1 J	NS	NS	NS	NS	NS	10 U	NS	5 U	170	5 U	ND	ND	NR	NR	3 J	NS	10	10	10 U,J	10 U	10 U	NR	NR		
RP-01-31	4/17/2000	6	NR	<1.0	<1.0	3.74	1.28	NR	<1.0	NR	<1.0	<1.0	NR	<1.0	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR	
RP-01-31	6/26/2001	1	<5.0	<1.21	<0.14	<0.087	<0.176	<0.214	<5.0	<0.087	<0.187	<0.143	<0.263	<0.175	<0.134	0.57 J,B,U,N,MB,SB	<0.114	<5.0	<0.115	<5.0	<0.119	<0.171	<0.262	<0.091	NR	NR	NS	NS	NR	NR	NR	NR	NR	<0.125	<0.250		
RP-01-31	4/1/2002	5	NR	<1.0	NR	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NS	NS	NR	NR	NR	NR	NR	NR	NR	<0.25	NR	
W-03-S	4/12/2000	6	<25.0	<1.0	<1.0	2.81	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR	
W-03-S	10/9/2000	6	<25.0	<1.0	<1.0	3.23	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR	
W-04-S	4/12/2000	6	NR	<1.0	<1.0	1.86	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR	
W-04-S	10/9/2000	6	NR	<1.0	1.9	4.01	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR	
W-11-S	10/10/2000	6	NR	1.11	<1.0	<1.0	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR	
W-11-S	6/21/2001	1	5.91 LC	1.03	<0.14	<0.087	<0.176	<0.214	<5.0	<0.087	<0.187	<0.143	<0.263	<0.175	0.15 J	0.78 J,B,U,MB	<0.114	<5.0	0.98 J	<5.0	0.29 J	0.19 J,J,CH	0.4 J	0.3 J	NR	NR	NS	NS	NR	NR	NR	NR	NR	1.08	0.505		
W-11-S	4/9/2002	5	<25.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR	
W-12-S	10/1/1990	2	NS	2 J	5 U	10 U	10 U	NS	5 U	5 U	NS	5 U	NS	NS	NS	NS	NS	10 U	NS	5 U	1 J	5 U	ND	ND	NR	NR	5 U	NS	20 U	20 U	8 J	25	11	NR	NR	NR	
W-12-S	4/11/2000	6	NR	1.98	<1.0	<1.0	<1.0	NR	<1.0	NR	5.44	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR	
W-12-S	10/10/2000	6	NR	1.79	<1.0	<1.0	<1.0	NR	<1.0	NR	6.57	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR	
W-15-S	10/1/1990	2	NS	ND J	ND	10 U	10 U	NS	ND U	ND U	NS	ND U	NS	NS	NS	NS	NS	10 U	NS	ND U	ND J	ND U	ND	ND	NR	NR	ND	NS	10 U	10 U	14	10 U	10 U	<0.25	NR	NR	
W-16-31	6/22/2001	1	6.35 J	7.69	3.59	0.96 J	0.31 J	1.12	<5.0	<1.0	<0.187	0.56 J	<0.263	0.2 J,N,SB	<0.134	1.08	0.12 J	<5.0	3.65	<5.0	0.82 J	0.27 J	2.61	1.9	NR	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	<0.125	<0.250	
W-16-31	4/1/2002	5	NR	2.66	NR	1.61	NR	1.13	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCB = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 4-2b
 Historical Summary of Groundwater Analytical Results
 Dioxins/Furans and Herbicides/Pesticides
 Shallow Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Dioxins/Furans (pg/l)																								Herbicides/Pesticides (ug/l)						
			1,2,3,4,6,7,8,9-OCDD	EMPC-PeCDF	EMPC-TCDD	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDF	2,3,4,6,7,8-HxCDF	1,2,3,4,6,7,8,9-OCDF	1,2,3,7,8-PeCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	EMPC-TCDF	Total HpCDD	Total HpCDF	Total HxCDD	Total HxCDF	Total PeCDF	Total TCDD	Total TCDF	delta-BHC	2,4-D	2,4-DB	2,4,5-T	2,4,5-TP (Silvex)
ONSITE WELLS																																	
RP-02-31	4/18/2000	6	<11.67	NR	NR	<8.79	<5.36	<7.55	<7.28	<6.35	<6.31	<5.31	<3.99	<4.66	<14.65	<6.23	<6.3	<7.77	<6.89	NR	<8.79	<5.36	<6.35	<3.99	<8.73	<7.77	<6.89	NS	<1.0	<4.0	<1.0	<1.0	
RP-02-31	10/16/2000	6	31.7	NR	NR	3.8 J	1.9 J	<2.0	<1.8	<1.8	<1.7	2 J	<1.2	<1.7	4.5 J	<0.3	<1.3	0.9 J	1.9 J	NR	3.8	1.9	<1.8	2	2.4	0.9	5	NS	<1.0	<4.0	<1.0	<1.0	
RP-02-31	6/19/2001	1	<23.1	<7.08	5.2 N,E M	<8.46	<7.46	<7.66	<11.3	<8.46	<15.3	(3.40) U,N	<3.68	<5.97	<22.2	<4.28	<5.57	<2.0	<5.43	<7.57	NR	<12.4	NR	NR	NR	NR	NR	NS	<0.179	<0.266	<0.150	<0.133	
RP-02-31	4/4/2002	5	67 J	4.5 N	NR	12.5	7 J	6.7 J,N	4.4	4.9	7.9	7.7 J,U	4.1 J,N	4.1	11 J,N	8.5 J	5.6	3.1	6.5 J	19.1 J,N	12.5	10.5 J	17.2 J	22.5 J	18.3 J	3.1	16.5 J	NS	<1.0	<4.0	<1.0	<1.0	
W-19-S	4/18/2000	6	<0.8	NR	NR	<0.7	<0.4	<2.0	<1.8	<1.8	<1.7	<0.3	<1.2	<1.7	<0.7	<0.3	<1.3	<2.0	<0.4	NR	<2.6	<1.8	<1.8	<1.5	<1.3	<1.5	188.3	NS	<1.0	<4.0	<1.0	<1.0	
W-19-S*	10/16/2000	6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
W-19-S*	6/19/2001	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
W-19-S	4/5/2002	5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
OFFSITE WELLS																																	
GM-1-S	10/1/1990	2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
RP-01-31	10/11/2000	6	10.9 B,J	NR	NR	<0.7	<0.4	<2.0	<1.8	<1.8	<1.7	1.4 J	<1.2	<1.7	<0.7	<0.3	<1.3	<2.0	<0.4	NR	<2.6	<1.8	<1.8	<1.5	<1.3	<1.5	<10.0	NS	<1.0	NR	NR	100 U	
RP-01-31	6/26/2001	1	<23.1	<7.08	A	NR	NR	NR	NR	NR	NR	<11.3	NR	NR	<22.2	NR	<27.1	<2.0	<5.43	<7.57	NR	<12.4	NR	NR	NR	<6.44	<7.72	NS	<0.179	<0.266	0.811 C	J,N,H,T,S C	
RP-01-31	4/1/2002	5	252	NR	NR	41.8 J	<0.6	NR	<0.7	<0.6	7.8	NR	NR	1.9	NR	3.6	2.9	4.5	5 J	NR	95.6	<0.7	7.8	5.4	6.6	10.4	10.9	NS	<1.0	NR	NR	NR	
W-11-S	4/11/2000	6	<0.8	NR	NR	<0.7	<0.4	<2.0	<1.8	<1.8	<1.7	<0.3	<1.2	<1.7	<0.7	<0.3	<1.3	<2.0	<0.4	NR	<2.6	<1.8	<1.8	<1.5	<1.3	<1.5	70.53	NS	<1.0	NR	NR	NR	
W-11-S	10/10/2000	6	4130	NR	NR	549	125	11.7 J	5.6 J	30.6 J	14 J	13.1 J	5.6	8.7 J	499	3.9 J	6.5 J	16.9	<0.4	NR	981	509	120	145	136	26.4	227	NS	<1.0	NR	NR	NR	
W-11-S	6/21/2001	1	72.1 J,B,U,MB	22.2 N,EM	A	NR	NR	NR	NR	NR	NR	<11.3	NR	NR	<22.2	NR	<27.1	<2.0		N,E M													
W-11-S	4/9/2002	5	9.6 J	NR	NR	<1.2	<0.6	NR	<0.7	<0.6	<2.5	NR	NR	<1.5	NR	<1.3	<1.3	<0.4	<1.0	NR	<4.0	<0.7	<2.4	<1.6	<1.3	<1.4	<1.0	NS	1.13 T	0.728 J,HT	<0.150	NR	
W-12-S	4/11/2000	6	<0.8	NR	NR	<0.7	<0.4	<2.0	<1.8	<1.8	<1.7	<0.3	<1.2	<1.7	<0.7	<0.3	<1.3	<2.0	<0.4	NR	<2.6	<1.8	<1.8	<1.5	<1.3	<1.5	<10.0	NS	4.17 J	NR	NR	NR	
W-15-S	4/1/2002	5	3.8 J	NR	NR	<1.2	<0.6	NR	<0.7	<0.6	<2.5	NR	NR	<1.5	NR	<1.3	<1.3	<0.4	<1.0	NR	<4.0	<0.7	<2.4	<1.6	<1.3	<1.4	<1.0	NS	2.64	NR	NR	NR	
W-16-31	6/22/2001	1	<23.1	<7.08	A	NR	NR	NR	NR	NR	NR	<11.3	NR	NR	<22.2	NR	<27.1	<2.0	<5.43	<7.57	NR	<12.4	NR	NR	NR	<6.44	13.2	NS	<0.179	<0.266	<0.150	NR	

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
- 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
- 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
- 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
- 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
- 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 4-3a
 Historical Summary of Groundwater Analytical Results
 Volatile Organic Compounds and Petroleum Hydrocarbons
 Intermediate Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Volatile Organic Compounds (ug/l)																				Hydrocarbons (mg/l)																
			Benzene	sec-Butylbenzene	Chlorobenzene	4-Chloro-3-methylphenol	1,2-DCB	1,3-DCB	1,4-DCB	1,1-DCE	cis-1,2-DCE	1,2-DCE	Ethylbenzene	2-Hexanone	p-isopropyltoluen	Napthalene	n-propylbenzene	PCE	Toluene	1,1,2-TCA	1,2,3-TCB	TCE	TCFM	1,2,4-TMB	1,3,5-TMB	Total Xylene	Vinyl Chloride	Diesel	Fuel Oil #6										
ONSITE WELLS																																							
CGW-010 (36-39)	10/27/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR						
CGW-013 (36-39)	10/27/1999	3	2.94	NR	NR	NR	1	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR							
RP-02-49	4/18/2000	6	<1.0	NR	<1.0	NR	3.41	J	<1.0	<2.0	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR							
RP-02-49	10/16/2000	6	<1.0	NR	<1.0	NR	2.74	<1.0	<2.0	<1.0	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	5.99	J	NR	NR	NR	<1.0	NR	NR							
RP-02-49	6/19/2001	1	<0.121	<0.092	0.19	J,U, TB	NR	1.27	<0.125	0.26	J	<0.151	0.2	J	NR	NR	<0.572	<0.134	<0.104	<0.114	0.37	J	<0.115	<0.246	<0.081	<0.359	1.12	<0.119	<0.171	NR	<0.31	<0.125	<0.25						
RP-02-49	4/1/2002	5	NR	NR	<2.0	NR	2.27	<2.0	<1.0	NR	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR							
W-19-1	10/1/1990	2	1	J	NR	13	10	U	190	7	J	62	5	U	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR							
W-19-1	3/28/1995	4	1.0	NR	16	NR	96	D	8.9	60	D	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR							
W-19-1	4/18/2000	6	1.1	J	NR	39.4	J	NR	329	J	11.3	J	98.4	J	1.8	J	5.2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR							
W-19-1	10/16/2000	6	1.02	J	NR	39.2	D	NR	312	D	9.2	D	89.3	D	<1.0	4.82	D	NR	NR	NR	NR	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR							
W-19-1	6/20/2001	1	0.22	J,U, TB	0.4	J	6.84	NR	43.8	2.03	13.2	0.38	J	1.47	NR	NR	1.92	J	0.72	J	0.58	J,U,N, MB, SB	0.37	J	<0.27	<0.115	0.73	J	<0.081	1.11	<0.245	0.16	J,U, TB	0.46	J, CH	NR	1.57	<0.125	<0.25
W-19-1	4/1/2002	5	NR	NR	33.6	NR	188	6.38	57.1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
OFFSITE WELLS																																							
RP-01-51	4/17/2000	6	1.12	NR	17.4	NR	227	D	6.61	66.6	<1.0	2.83	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	NR	4.72	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR			
RP-01-51	10/11/2000	6	<1.0	NR	13.2	NR	150	5.7	50.4	<1.0	2.7	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	NR	2.9	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR			
RP-01-51	6/26/2001	1	0.18	J	<0.092	10.6	NR	124	3.63	36.1	0.4	J	2.44	NR	NR	<0.572	<0.134	<0.104	<0.114	<0.27	<0.115	<0.246	<0.081	2.51	<0.245	<0.119	<0.171	NR	2.44	0.305	0.63	NR	NR	NR	NR	NR			
RP-01-51	4/1/2002	5	NR	NR	19.9	NR	197	6.78	59.7	NR	4.1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	NR	4.36	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR			
W-03-1	6/26/2001	1	<0.121	<0.092	2.72	NR	10.6	<0.125	0.54	J,U, TB	<0.151	<0.187	NR	NR	<0.572	<0.134	<0.104	<0.114	<0.27	<0.115	<0.246	0.11	J, B, U, MB	<0.359	<0.245	<0.119	<0.171	NR	<0.31	<0.125	<0.25	NR	NR	NR	NR				
W-03-1	4/1/2002	5	NR	NR	1.77	NR	9.76	<2.0	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	NR	<2.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR			
W-04-1	4/12/2000	6	<1.0	NR	<1.0	NR	1.15	<1.0	<2.0	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR			
W-04-1	10/9/2000	6	<1.0	NR	<1.0	NR	2.38	<1.0	<2.0	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR			
W-15-1	10/1/1990	2	2	J	NR	5	U	21	21	J	10	J	3	J	5	U	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
W-15-1	4/10/2000	6	<1.0	NR	1.73	NR	25.6	<1.0	3.38	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
W-15-1	9/29/2000	6	1.14	NR	1.26	NR	20.1	<1.0	3.42	<1.0	1.16	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<2.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
W-15-1	6/20/2001	1	0.17	J,U, TB	<0.092	0.98	J	NR	12.1	0.47	J	2.11	<0.151	0.89	J	NR	NR	<0.572	<0.134	<0.104	<0.114	<0.27	<0.115	<0.246	<0.081	<0.359	<0.245	<0.119	<0.171	NR	0.62	J	0.215	J	<0.25	NR	NR		
W-15-1	4/1/2002	5	NR	NR	1.1	NR	12.8	<2.0	1.91	NR	1.11	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
W-16-1	6/22/2001	1	<0.121	<0.092	<0.14	NR	<0.087	<0.125	<0.176	<0.151	<0.187	NR	NR	NR	<0.572	<0.134	<0.104	<0.114	<0.27	<0.115	<0.246	<0.081	<0.359	<0.245	<0.119	<0.171	NR	<0.31	<0.125	<0.25	NR	NR	NR	NR	NR	NR			

1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling. (Woodward Clyde March 1995 monitoring results)
 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 4-3b
 Historical Summary of Groundwater Analytical Results
 Dioxins/Furans and Herbicides/Pesticides
 Intermediate Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Dioxins/Furans (pg/l)										Herbicides/Pesticides (ug/l)				
			1,2,3,4,6,7,8,9-OCDD	EMPC-HxCDD	EMPC-TCDD	2,3,7,8-TCDD	2,3,7,8-TCDF	EMPC-TCDF	Total HpCDF	Total HxCDF	Total PeCDF	Total TCDF	Dichloroprop	2,4-D	2,4-DB	2,4,5-T	2,4,5-TP (Silvex)
ONSITE WELLS																	
GGW-010 (36-39)	10/27/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
GGW-013 (36-39)	10/27/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
RP-02-49	10/16/2000	6	9.7 J	NR	NR	<0.5	NR	NR	<0.5	2.1 (as 1,2,3,4,7,8-HxCDF)	<1.0	<10.0	<1.0	<1.0	<4.0	<1.0	<1.0
RP-02-49	4/18/2000	6	ND	NR	NR	ND	ND	NR	ND	ND	ND	ND	<1.0	<1.0	<4.0	<1.0	<1.0
RP-02-49	6/19/2001	1	22.5 J	<31.3	16 Q,N	NR	NR	<7.72	A	3	A	A	<0.173	<1.0	<4.0	<0.15	<0.133
RP-02-49	4/4/2002	5	ND	2.3 U,N	NR	<1.8	<1.4	NR	2.7 (as 1,2,3,4,6,7,8-HpCDF)	2.4 (as 1,2,3,4,7,8-HxCDF) U	<1.2	<1.4	<1.0	<1.0	<4.0	<1.0	<1.0
W-19-I	4/18/2000	6	<2.8	NR	NR	<0.5	NR	NR	<0.5	<1.0	<1.0	<10.0	<1.0	<1.0	4.97 J	NR	6.13 J
W-19-I	10/16/2000	6	3.9	NR	NR	0.55 J	NR	NR	2.2 (as 1,2,3,4,7,8-HpCDF)	1.3 (as 1,2,3,4,7,8-HxCDF)	<1.0	<10.0	<1.0	<1.0	<4.0	NR	2.52 J
W-19-I	6/20/2001	1	<15.2	<31.3	A	NR	NR	<7.72	A	A	A	<7.72	<0.173	NR	NR	<0.15	4.22 J, HT
W-19-I	4/1/2002	5	NR	NR	NR	NR	<1.0	NR	NR	NR	NR	<1.0	3.61 J	NR	NR	NR	13.1 J
OFFSITE WELLS																	
RP-01-51	4/17/2000	6	<3.5	<0.7	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	<1.3	<1.0	1.49 J	<1.0	<4.0	NR	7.92 J
RP-01-51	10/11/2000	6	<3.5	<0.7	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	1.2 (as 2,3,4,7,8-PeCDF)	<1.0	<1.0	<1.0	<4.0	NR	<1.0
RP-01-51	6/26/2001	1	<15.2	39.7 Q,N,J, EM, MI	A	NR	NR	<7.72	A	A	A	A	5.57 J,N, HT, SC	NR	NR	0.161 J,N, HT, SC	9.07 J, HT
RP-01-51	4/1/2002	5	NR	NR	NR	NR	<1.0	NR	NR	NR	NR	<1.0	4.04	NR	NR	NR	16.7
W-03-I	6/26/2001	1	<15.2	<31.3	A	NR	NR	<7.72	A	A	A	A	0.189 J, HT	NR	NR	0.439 J,N, HT, SC	0.839 J,N, HT, SC
W-04-I	4/12/2000	6	<3.5	<0.7	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	<1.3	17.662	<1.0	<1.0	<4.0	NR	<1.0
W-12-I	4/11/2000	6	<3.5	<0.7	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	<1.3	<1.0	<1.0	3.12 J	<4.0	NR	<1.0
W-15-I	4/10/2000	6	<3.5	<0.7	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	<1.3	<1.0	<1.0	<1.0	<4.0	NR	1.07 J
W-15-I	6/20/2001	1	<15.2	<31.3	A	NR	NR	8.3 N, EM	A	A	A	A	<0.173	NR	NR	<0.15	0.594 J, HT
W-15-I	4/1/2002	5	NR	NR	NR	NR	2.2 J	NR	NR	NR	NR	2.2	<1.0	NR	NR	NR	1.08
W-16-I	6/22/2001	1	<15.2	<31.3	A	NR	NR	<7.72	A	A	A	A	<0.173	NR	NR	<0.15	<0.133

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
- 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
- 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
- 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
- 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
- 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 4-4a
 Historical Summary of Groundwater Analytical Results
 Volatile Organic Compounds and Petroleum Hydrocarbons
 Deep Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Volatile Organic Compounds (ug/l)																				Hydrocarbons (mg/l)	
			Benzene	Chloro benzene	Chloro form	1,2-DCB	1,3-DCB	1,4-DCB	1,2-DCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,2-DCE	2,4-DCP	Ethylbenzene	Napthalene	PCE	Toluene	TCE	TCFM	m,p-xylene	total xylene	Vinyl Chloride	Diesel
ONSITE WELLS																								
GGW-010 (47 50)	10/26/1999	3	<1.0	32.2	<1.0	<1.0	6.03	57.7	NR	1.51	6.07	NR	NR	NR	NR	NR	<1.0	4.05	<1.0	<2.0	NR	13.4	NR	
GGW-015 (44 47)	10/26/1999	3	4.71	6.89	<1.0	20.9	<1.0	4.09	NR	<1.0	3.58	NR	NR	NR	NR	NR	12.1	<1.0	<1.0	2.35	NR	9.65	NR	
GGW-014 (46 49)	10/27/1999	3	4.02	8.74	<1.0	30.7	<1.0	6.04	NR	<1.0	4.7	NR	NR	NR	NR	NR	8.92	1.05	<1.0	<2.0	NR	11.5	NR	
GGW-016 (42 45)	10/28/1999	3	2.33	<1.0	1.62	<1.0	<1.0	<1.0	NR	<1.0	<1.0	NR	NR	NR	NR	NR	5.63	<1.0	26.4	<2.0	NR	<1.0	NR	
RP-02-66	4/18/2000	6	<1.0	5.35 J	NR	59.5 J	1.58 J	14.9 J	<1.0	<1.0	1.1 J	<1.0	NR	NR	NR	NR	<1.0	NR	1.19 J	3.28 J	<2.0	NR	1.87 J	NR
RP-02-66	10/16/2000	6	<1.0	6.27	NR	70.2	1.75	18.2	<1.0	<1.0	1.07	<1.0	NR	NR	NR	NR	<1.0	NR	1.12	2.7	<2.0	NR	4.77	NR
RP-02-66	6/19/2001	1	<0.605	6.3	0.76 J	60.2	1.64	15.9	<0.925	0.3 J	1.25	<0.194	NR	NR	NR	<0.104	<1.35	NR	1.09	1.64	NR	NR	2.28	<0.125
RP-02-66	4/1/2002	5	NR	8.43	NR	72.8	2.09	19.4	NR	NR	1.32	NR	NR	NR	NR	NR	4.34	1.17	1.2	NR	NR	2.57	<0.25	
W-19-D	10/1/1990	2	3 J	34	NR	370 E	20	140	NR	5 U	NR	NR	4 J	10	5 U	NR	5 U	2 J	10	NR	NR	5 U	NR	NR
W-19-D	3/28/1995	4	ND	2.7	NR	41	1.8	11	NR	NR	NR	NR	NR	NR	1.8	NR	NR	NR	NR	NR	NR	10	NR	NR
W-19-D	4/18/2000	6	3.13	110	NR	830 D	27.2	244 D	<1.0	4.75	12.9	1.21	NR	NR	NR	NR	<1.0	NR	9.84	<1.0	<2.0	NR	32.3	NR
W-19-D	10/16/2000	6	<1.0	117 D	NR	861 D	24.8 D	248 D	<1.0	<1.0	10.7 D	<1.0	NR	NR	NR	NR	<1.0	NR	7.5 D	<1.0	<2.0	NR	60.5 D	NR
W-19-D	6/20/2001	1	0.43 J,U,TB	18.9	<0.423	120	4.71	35.3	<0.925	0.93 J	3.71	0.27 J	NR	NR	NR	0.6 J,U,N,M,B,SB	<1.35	NR	2.46	<0.245	NR	NR	5.99	0.269
W-19-D	4/1/2002	5	NR	121	NR	657	22	201	NR	NR	11	NR	NR	NR	NR	NR	<1.0	7.8	<1.0	<2.0	NR	NR	21.6	0.349
OFFSITE WELLS																								
RP-01-65	10/11/2000	6	13.7 D	43.4 D	NR	537 D	20.7 D	<10.0	<1.0	<1.0	7 D	<1.0	NR	NR	NR	NR	<1.0	NR	12.7 D	<1.0	<2.0	NR	6.1 D	NR
RP-01-65	6/26/2001	1	41.4 D	55.4 D	<0.423	722 D	21.8 D	207 D	<0.925	1.85 D	9 D	<0.194	NR	NR	NR	<0.104	<1.35	NR	17.4 D	<1.22	NR	NR	9.05 D	0.448
RP-01-65	4/1/2002	5	NR	53.9	NR	546	19	171	NR	NR	9.1	NR	NR	NR	NR	NR	<1.0	NR	11.4	<1.0	NR	NR	11.8	0.363
W-04-89	6/26/2001	1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.125
W-12-D	10/1/1990	2	5 U	5 U	ND	ND	ND	ND	NR	5 U	NR	NR	5 U	ND	5 U	NR	5 U	4 J	5 U	NR	NR	5 U	NR	NR
W-15-D	10/1/1990	2	1 J	23	NR	200	11	61	NR	5 U	NR	NR	5 U	10	5 U	NR	2 J	1 J	5 U	NR	NR	5 U	NR	NR
W-15-D	4/10/2000	6	2.2	91.2	NR	606	24.6	150	1.54	<1.0	<1.0	<1.0	NR	NR	NR	NR	2.44	NR	1.06	<1.0	<2.0	NR	<1.0	NR
W-15-D	9/29/2000	6	<1.0	79 D	NR	593 D	28.3 D	165 D	<1.0	<1.0	<1.0	<1.0	NR	NR	NR	NR	<1.0	NR	<1.0	<1.0	<2.0	NR	<1.0	NR
W-15-D	6/22/2001	1	1.95 J,D	83.8 D	<0.423	606 D	23.5 D	152 D	4.35 D	<0.151	<0.187	<0.194	NR	NR	NR	<0.104	1.85 D	NR	<1.35	<0.245	NR	NR	<0.31	0.4
W-15-D	4/1/2002	5	<2.0	58.9	NR	342	16.6	94.5	5.64	<2.0	<2.0	<2.0	NR	NR	<2.0	<2.0	<2.0	<2.0	<2.0	<1.0	<4.0	NR	<2.0	0.325

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
- 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
- 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
- 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling. (Woodward Clyde March 1995 monitoring results)
- 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
- 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.

J = The analyte was positively identified, but the associated concentration is an estimate.

D = Compound identified in an analysis at a secondary dilution factor.

N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.

EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.

() = analyte was detected in the sample but the detection level was below the method reporting limit

* = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source

NS = Not sampled

ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 4-4b
 Historical Summary of Groundwater Analytical Results
 Dioxins/Furans and Herbicides/Pesticides
 Deep Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Dioxins/Furans (pg/l)											Herbicides/Pesticides (ug/l)								
			1,2,3,4,6,7,8,9-OCOD	EMPC-HxCDD	EMPC-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	EMPC-TCDF	Total HpCDF	Total HxCDF	Total PeCDF	Total TCDD	Total TCDF	4,4'-DDT	Dicamba	Dichloroprop	2,4-DB	gamma-BHC (Lindane)	MCP	2,4,5-TP (Silvex)		
ONSITE WELLS																						
GGW-010 (4750')	10/26/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.1	NR	1.43	<4.0	NR	NR	10.6
GGW-014 (4649')	10/27/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.1	NR	<1.0	4.54	NR	NR	4.37
GGW-015 (4447')	10/26/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.1	NR	1	<4.0	NR	NR	6.31
GGW-016 (4245')	10/28/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.741	NR	<1.0	<4.0	NR	NR	<1.0
RP-02-66	4/18/2000	6	<1.3	NR	NR	<0.5	<0.5	NR	NR	NR	<3.3	<0.6	<1.2	NR	NR	NR	NR	<1.0	NR	NR	<250	1.58 J
RP-02-66	10/16/2000	6	5.7 J	NR	NR	<0.5	2.2 J	NR	NR	NR	<3.3	<0.6	2.2	NR	NR	NR	NR	<1.0	NR	NR	<250	1.66 J
RP-02-66	6/19/2001	1	<23.6	2.9 N, EM	<7.23	33.7 Q,N,J, EM, MI	<8.16	6.3 Q,N,J, EM, MI	5.7	8.3	<7.23	A	A	NR	0.194	<0.173	1.36 J,J,R, HT, SC	NR	NR	NR	1.94 J, HT	
RP-02-66	4/1/2002	5	NR	NR	NR	NR	NR	NR	NR	NR	10.3	NR	NR	NR	<1.0	3.18	NR	NR	NR	NR	4.59	
W-19-D	4/18/2000	6	<1.3	NR	NR	<0.5	<0.5	NR	NR	NR	<3.3	<0.6	86	NR	NR	3.62 J	NR	NR	NR	324 D,J	31.9 D,J	
W-19-D	10/16/2000	6	65.2 J	NR	NR	<0.5	<0.5	NR	NR	NR	<3.3	8.5	18.9	NR	NR	2.52	NR	NR	NR	<250	22.8 D,J	
W-19-D	6/20/2001	1	<23.6	A	<7.23	A	<8.16	A	A	A	<7.23	A	A	NR	<0.139	1.34 J, HT	<0.266	NR	NR	NR	15.6	
W-19-D	4/1/2002	5	NR	NR	NR	NR	NR	NR	NR	NR	<1.2	NR	NR	NR	<1.0	6.42	NR	NR	NR	NR	34.6	
OFFSITE WELLS																						
RP-01-65	10/11/2000	6	<1.3	NR	NR	<0.5	4.5 J	NR	NR	NR	<3.3	<0.6	10.1	NR	NR	<1.0	NR	NR	NR	<250	<1.0	
RP-01-65	6/26/2001	1	<23.6	A	<7.23	A	<8.16	A	A	A	<7.23	A	A	NR	<0.139	8.1 J,N, HT, SC	<0.266	NR	NR	NR	30 D,J, HT	
RP-01-65	4/1/2002	5	NR	NR	NR	NR	NR	NR	NR	NR	6.9	NR	NR	NR	1.29	10.2	NR	NR	NR	NR	39.8	
W-04-89	6/26/2001	1	<23.6	A	16 N, EM	A	<8.16	A	A	A	11.4	A	33	NR	<0.139	<0.173	<0.266	NR	NR	NR	<0.133	
W-15-D	10/1/1990	2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.95	NR	
W-15-D	4/10/2000	6	<1.3	NR	NR	<0.5	<0.5	NR	NR	NR	<3.3	<0.6	36	NR	NR	3.74 J	NR	NR	NR	<250	6.57 J	
W-15-D	9/29/2000	6	<1.3	NR	NR	10.2	1.1 J	NR	NR	NR	13.4	22.6	110	NR	NR	4.22	NR	NR	NR	<250	6.3	
W-15-D	6/22/2001	1	<23.6	A	<7.23	A	<8.16	A	A	A	<7.23	A	A	NR	<0.139	7.03 J,N,U, HT, SC, R	<0.266	NR	NR	NR	5.41 J, HT	
W-15-D	4/1/2002	5	NR	NR	NR	NR	NR	NR	NR	NR	<1.2	NR	NR	NS	<1.0	5.2	<4.0	NR	NR	<200	5.33	
W-16-D	10/17/2000	6	4.9 J	NR	NR	0.84 J	2.4 J	NR	NR	NR	<3.3	0.84	2.4	NR	NR	<1.0	NR	NR	NR	<250	<1.0	

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
- 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
- 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
- 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
- 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
- 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 4-5a
 Historical Summary of Groundwater Analytical Results
 Volatile Organic Compounds and Petroleum Hydrocarbons
 Basalt Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Volatile Organic Compounds (ug/l)																				
			Benzene	Chloro benzene	Chloro form	1,2-DCB	1,3-DCB	1,4-DCB	1,2-DCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,2-DCE	2,4-DCP	Ethylbenzene	Napthalene	PCE	Toluene	TCE	TCFM	m,p-xylene	total xylene	Vinyl Chloride
ONSITE WELLS																							
RP-02-66	4/18/2000	6	ND	5.35 J	(0.88) J	59.5 J	1.58 J	14.9 J	ND	(0.37) J	1.1 J	ND	NR	ND	ND	ND	ND	1.19 J	3.28 J	ND	ND	1.87 J	
RP-02-66	10/16/2000	6	(0.13)	6.27	(0.8)	70.2	1.75	18.2	ND	(0.32)	1.07	ND	NR	ND	ND	ND	ND	(0.14)	1.12	2.7	ND	ND	4.77
RP-02-66	6/19/2001	1	ND	6.3	0.76	60.2	1.64	15.9	ND	0.3	1.25	ND	NR	ND	ND	ND	ND	1.09	1.64	ND	ND	2.28	
RP-02-66	4/4/2002	5	ND	8.43	ND	72.8	2.09	19.4	ND	ND	1.32	ND	NR	ND	ND	ND	ND	4.34	1.17	1.2	ND	ND	2.57
OFFSITE WELLS																							
W-11-B	4/11/2000	6	33.4	13.9	ND	185	5.08	45.7	ND	(0.62)	5.84	ND	NR	ND	ND	ND	ND	1.5	ND	ND	(0.28)	ND	4.21
W-11-B	10/10/2000	6	24	60.5	ND	522	19.7	172	ND	(2.6)	23.8	(1.05)	NR	ND	ND	ND	ND	5.25	ND	ND	ND	ND	8.95
W-11-B	6/21/2001	1	21.4	60.2	ND	530	14.8	150	ND	(2.60)	21	ND	NR	ND	ND	ND	ND	0.65	2.2	ND	ND	ND	10.4
W-11-B	4/9/2002	5	16.6	64.8	ND	447	15.4	135	ND	ND	23.2	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.3 J
W-04-89	4/12/2000	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
W-04-89	10/9/2000	6	ND	ND	ND	(0.16)	ND	ND	ND	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RP-01-65	4/17/2000	6	27.4	49.9	1.63	640	19.6	187	ND	1.61	5.91	(0.56)	NR	ND	ND	ND	ND	(0.25)	16.1	ND	(0.37)	ND	6.9
RP-01-65	10/11/2000	6	13.7	43.4	ND	537	20.7	180	ND	(1.55)	7	ND	NR	ND	ND	ND	ND	ND	12.7	ND	ND	ND	6.1
RP-01-65	6/26/2001	1	41.4	55.4	ND	722	21.8	207	ND	1.85	9	ND	NR	ND	ND	ND	ND	ND	17.4	9.05	ND	ND	ND
RP-01-65	4/5/2002	5	ND	53.9	ND	546	19	171	ND	ND	9.1	ND	NR	ND	ND	ND	ND	ND	11.4	ND	ND	ND	11.8

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
- 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
- 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
- 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
- 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
- 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene PCE = tetrachloroethene
 DCA = Dichloroethane DCP = Dichlorophenol
 DCE = Dichloroethene TCB = trichlorobenzene
 DMP = Dimethylphenol TCA = trichloroethane
 TMB = trimethylbenzene TCFM = trichlorofluoromethane
 TCE = trichloroethene

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 4-5b
 Historical Summary of Groundwater Analytical Results
 Dioxins/Furans and Herbicides/Pesticides
 Basalt Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Dioxins/Furans (pg/l)								Herbicides/Pesticides (ug/l)						
			EMPC-PeCDF	2,3,7,8-TCDF	Total HpCDF	Total HxCDD	Total HxCDF	Total PeCDD	Total PeCDF	Total TCDF	4-4-DDT	Dicamba	Dichloroprop	2,4-DB	BHC (Lindane)	MCCP	2,4,5-TP (Silvex)
ONSITE WELLS																	
RP-02-66	4/18/2000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.58 J
RP-02-66	10/16/2000	ND	ND	2.2	ND	ND	ND	ND	0.66	N, EMPC	2.2	ND	ND	ND	ND	ND	1.66 J
RP-02-66	6/19/2001	ND	ND	(2.7)	5.7	ND	8.3	ND	ND	ND	ND	0.194 J	ND	1.36 J, R	ND	ND	1.94 J
RP-02-66	4/4/2002	ND	ND	3	N, EMPC	11.7 U	3.1 U	15.5 U	4 U	10.3	ND	ND	3.18	ND	ND	ND	4.59
OFFSITE WELLS																	
RP-01-65	4/17/2000		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.4 J	ND	ND	ND	33.9 J
RP-01-65	10/11/2000		ND	4.5	ND	10.2	ND	ND	ND	10.1	ND	ND	ND	ND	ND	ND	1.58 J
RP-01-65	6/26/2001		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.1 J, N	ND	ND	ND	30 J
RP-01-65	4/5/2002		11.6 J, U, N, E MPC	ND	5.7 J, U	12.9 J, U	18.5 J, U	6 U	6.9	ND	ND	1.29 J	10.2 J	ND	ND	ND	39.8 J
W-04-89	4/12/2000	6	<0.3	<4.5	<1.8	<1.8	<1.3	<1.6	<1.3	6.28	ND	ND	ND	ND	ND	ND	ND
W-04-89	10/9/2000	6	<0.3	<4.5	9.3	6.2	17.6	4.4	10	4.1	ND	ND	ND	ND	ND	ND	ND
W-04-89	6/26/2001	1	16 N, EM	NR	NR	NR	NR	NR	11.4	33	NR	NR	NR	NR	NR	NR	NR
W-04-89	4/8/2002		10.4 N, EMPC	10.4	ND	ND	5.6 U	ND	5.5	20.1	NR	NR	NR	NR	NR	NR	NR
W-11-B	4/11/2000		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
W-11-B	10/10/2000		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	19.2 J
W-11-B	6/21/2001		ND	ND	ND	ND	(1.8)	ND	ND	ND	ND	ND	(0.85)	ND	ND	ND	23.3
W-11-B	4/9/2002		ND	ND	ND	ND	ND	2.1	ND	ND	ND	ND	2.41 N	ND	ND	ND	17.8

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene PCE = tetrachloroethene
 DCA = Dichloroethane DCP = Dichlorophenol
 DCE = Dichloroethene TCB = trichlorobenzene
 DMP = Dimethylphenol TCA = trichloroethane
 TMB = trimethylbenzene ECFM = trichlorofluoromethane
 TCE = trichloroethene

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 4-6
Summary of Groundwater Detections Above Laboratory Quantitation Limits
Lots 1 and 2
ATOFINA Chemicals, Inc.
Portland, Oregon

Aquifer	Analyte	Detected in Monitoring Well	Detected in Direct-Push Sample	Detected Upgradient of Lots 1 & 2?*	Notes	
Shallow	VOCs	Acetone		X	Yes	One detection during 1999 direct-push investigation
		Benzene		X	Yes	One detection during 1999 direct-push investigation
		MCB		X	Yes	One detection during 1999 direct-push investigation
		1,2-DCB		X	Yes	One detection during 1999 direct-push investigation
		1,4-DCB		X	Yes	One detection during 1999 direct-push investigation
		Toluene		X	Yes	One detection during 1999 direct-push investigation
	SVOCs	None				
		Dioxins/ Furans	Various	X		Yes
	Pesticides/ Herbicides	None				
Intermediate	VOCs	Benzene	X	X	Yes	
		MCB	X		Yes	
		1,2-DCB	X	X	Yes	
		1,3-DCB	X		Yes	Not detected in Site shallow aquifer
		1,4-DCB	X		Yes	
		1,2-DCE	X		Yes	Not detected in Site shallow aquifer
		Toluene	X	X	Yes	
		TCE	X		No	Not detected in Site shallow aquifer
		TCFM	X		No	Not detected in Site shallow aquifer
		Total Xylene	X		Yes	One detection in 1995; not detected in Site shallow aquifer
	Vinyl Chloride	X		Yes	Not detected in Site shallow aquifer	
	SVOCs	No Data				
		Dioxins/ Furans	Various	X		Yes
	Pesticides/ Herbicides	None				

Table 4-7

Comparison of Shallow Groundwater Detections and Screening Values

Lots 1 and 2

ATOFINA Chemicals Inc.

Portland, Oregon

Analyte	Units	Highest Concentration Detected on Site	Oregon UST RBCs ¹	USEPA Region IX PRG
			Vapor Intrusion into Buildings (Occupational)	Tap Water
Acetone	µg/L	27.9	NV	610
Benzene	µg/L	1.41	1,200	
Chlorobenzene	µg/L	1.29	NV	110
1,2-Dichlorobenzene	µg/L	11.5	156,000	
1,4-Dichlorobenzene	µg/L	1.83	NV	0.5
Toluene	µg/L	3.73	526,000	

USEPA = United States Environmental Protection Agency

PRG = Preliminary Remediation Goals (October 2002)

N/A = Not Applicable

NV = No value available

UST = Under Ground Storage Tank

RBC = Risk-Based Concentration

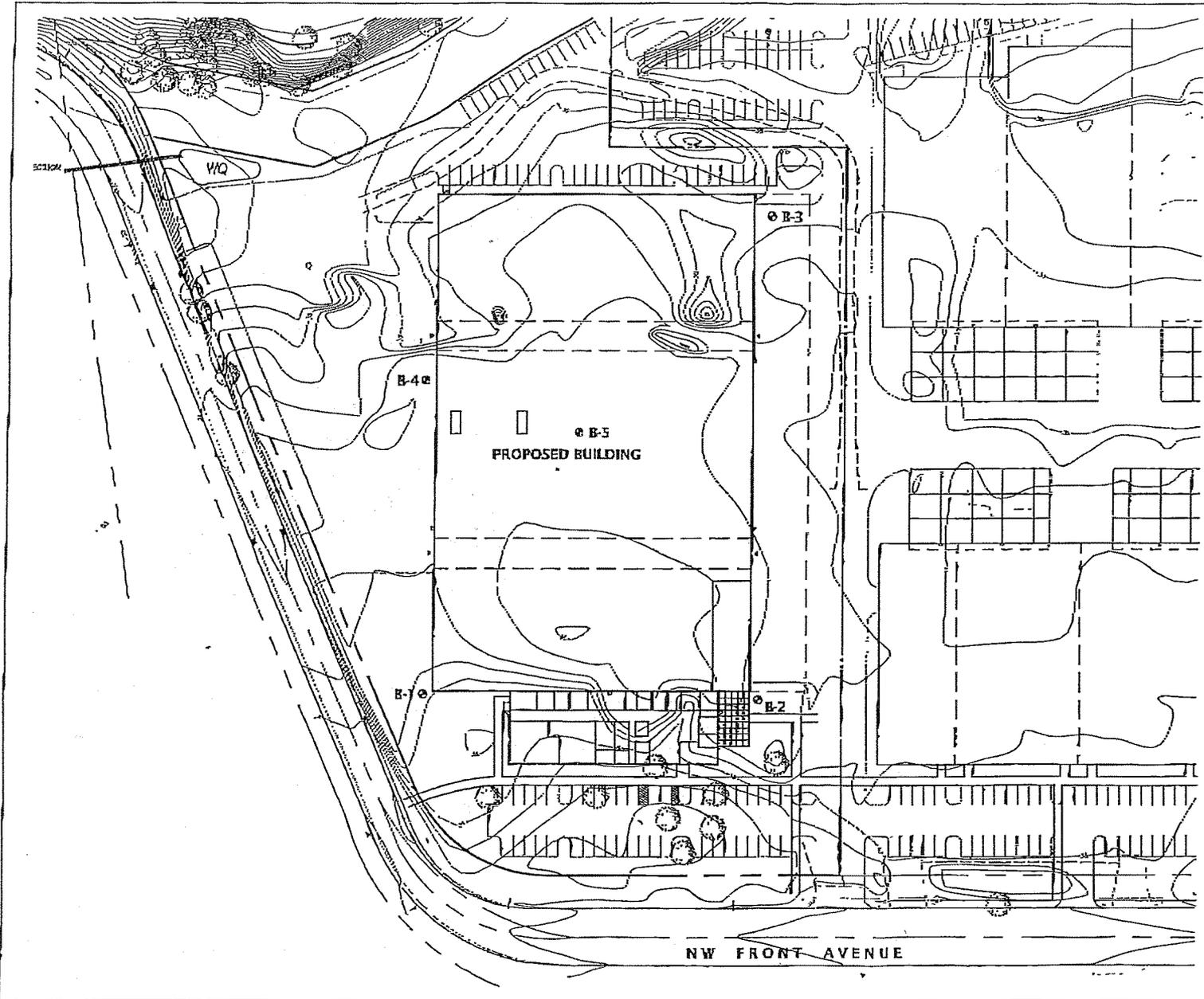
¹ - Concentration from Draft tables provided by ODEQ based on ODEQ Guidance *Risk-Based Decision Making for the Remediation of Petroleum Contaminated Sites* (OAR 340-122-0205 through 340-122-0360)

Appendix A
Boring Logs

SITE PLAN

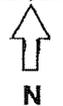
DRAFT

GEODESIGN



EXPLANATION:

B-1
BORING BY GEODESIGN, INC.
JANUARY, 2003



0 40 160
(IN FEET)

SITE PLAN BASED ON DRAWING
PROVIDED BY GROUP MACKENZIE

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEV. DEPTH	TESTING	SAMPLE	▲ N-VALUE ● MOISTURE CONTENT % ▨ RQD% ▩ CORE REC%	INSTALLATION AND COMMENTS
0		Brown, sandy SILT with some gravel; moist (brick fragments) (fill).					
1.3		Brown GRAVEL with some sand and trace silt; moist, fine- to coarse-grained sand, subangular to subrounded.	1.3				
2.5		Very stiff, olive-brown, clayey SILT with trace sand and gravel; moist, low plasticity, fine- to coarse-grained sand (occasional brick fragments).	2.5			● 28	
4.5		Medium dense, brown SAND with trace silt; moist, fine- to medium-grained.	4.5			▲ 30	
7.5		Medium stiff, dark gray SILT with trace clay and sand; moist, low plasticity, fine-grained sand (contains wood and rubber fragments).	7.5			P	
10.0		thin fine-grained sand layers at 10.0 feet	10.0			▲ 5	
11.5		Medium stiff, dark gray SILT with some sand; wet, non-plastic, fine-grained sand (abundant wood fragments). Boring completed at 11.5 feet.	11.5			●	
15							
20							
25							
30							
35							
40							

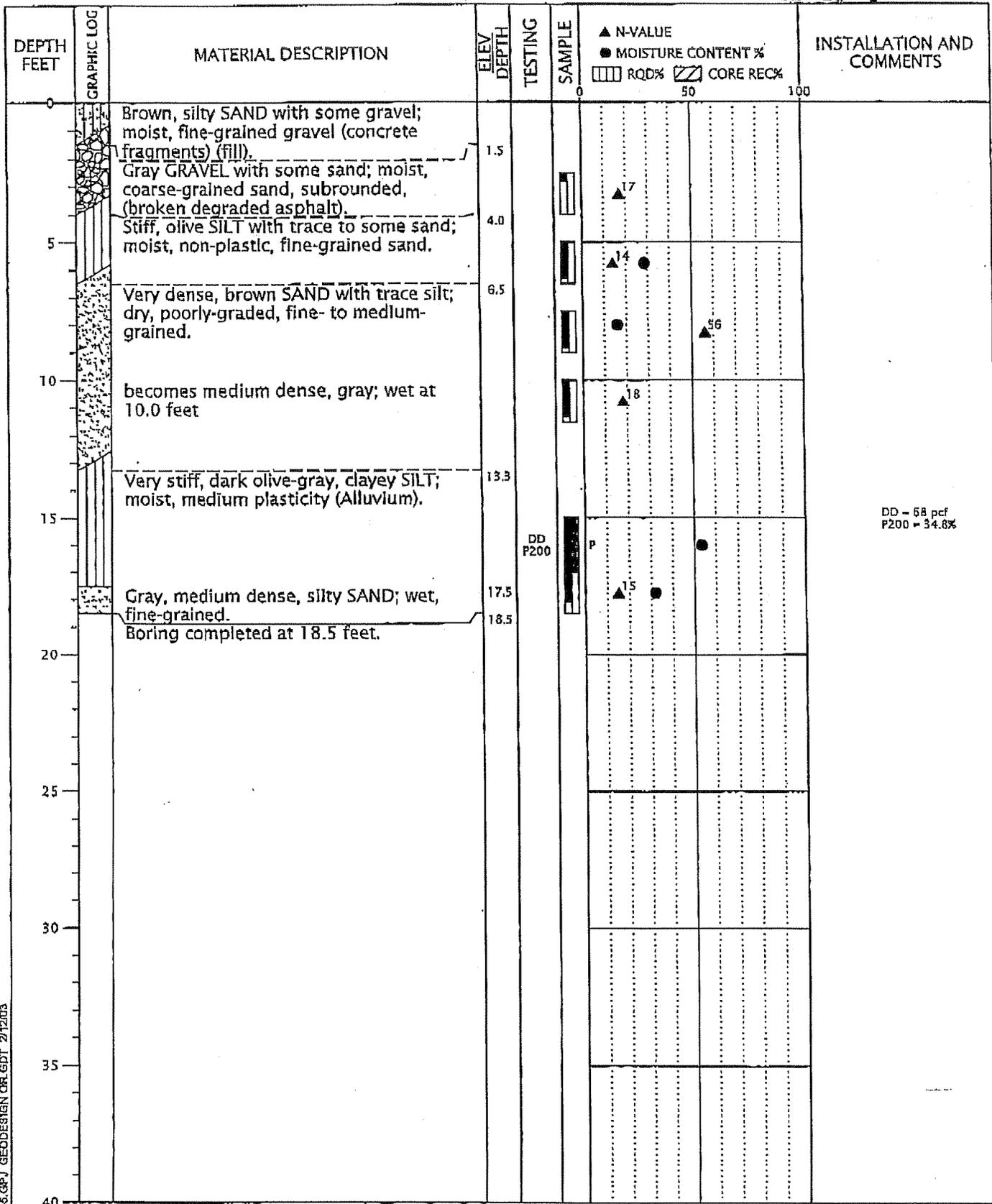
BORING LOG ATOFINA-1-01-B1-S.GPJ GEODESIGN OR.GDT 2/12/03

PROJECT NAME: Pacific Metal Building LOGGED BY: JEJ DRILLED BY: Geo-Tech Explorations Inc. COMPLETED: 1/16/03
 BORING METHOD: Mud Rotary BORING DIAMETER: 5 7/8" LOCATION: SE Corner of Proposed Bldg.



BORING B-1

ATOFINA-1-01	FEBRUARY 2003	FIGURE A-1
--------------	---------------	------------



DD = 68 pcf
P200 = 34.8%

BORING LOG ATOFINA-1-01-B1-S.GPJ GEODESIGN OR.GDT 2/12/03

PROJECT NAME: Pacific Metal Building LOGGED BY: JEJ DRILLED BY: Geo-Tech Explorations Inc. COMPLETED: 1/16/03
 BORING METHOD: Mud Rotary BORING DIAMETER: 5 7/8" LOCATION: SW Corner of Proposed Bldg.



BORING B-2

ATOFINA-1-01
FEBRUARY 2003
FIGURE A-2

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEV. DEPTH	TESTING	SAMPLE	INSTALLATION AND COMMENTS		
						▲ N-VALUE	● MOISTURE CONTENT %	▨ RQD% ▨ CORE REC%
0		Brown, sandy SILT with some clay; moist (fill).						
1.5		Gray, sandy GRAVEL; moist (brick fragments).	1.5					
2.4		Very stiff, olive-brown, sandy SILT with trace gravel; moist, non-plastic, fine-grained gravel, coarse-grained sand (occasional wood fragments).	2.4					
5.0		Medium dense, gray SAND; moist, poorly-graded, fine-grained. becomes loose at 7.0 feet	5.0					
10.0		contains brick fragments at 10.0 feet						
12.0		contains fine-grained gravel at 12.0 feet						
13.0		Medium stiff, dark gray SILT with some clay and trace sand; wet, non-plastic, medium- to coarse-grained sand.	13.0					
18.5		Boring completed at 18.5 feet.	18.5	DD				DD = 94 pcf

PROJECT NAME: Pacific Metal Building

LOGGED BY: JEJ

DRILLED BY: Geo-Tech Explorations Inc.

COMPLETED: 1/18/03

BORING METHOD: Mud Rotary

BORING DIAMETER: 5 7/8"

LOCATION: NE Corner of Proposed Bldg.



BORING B-3

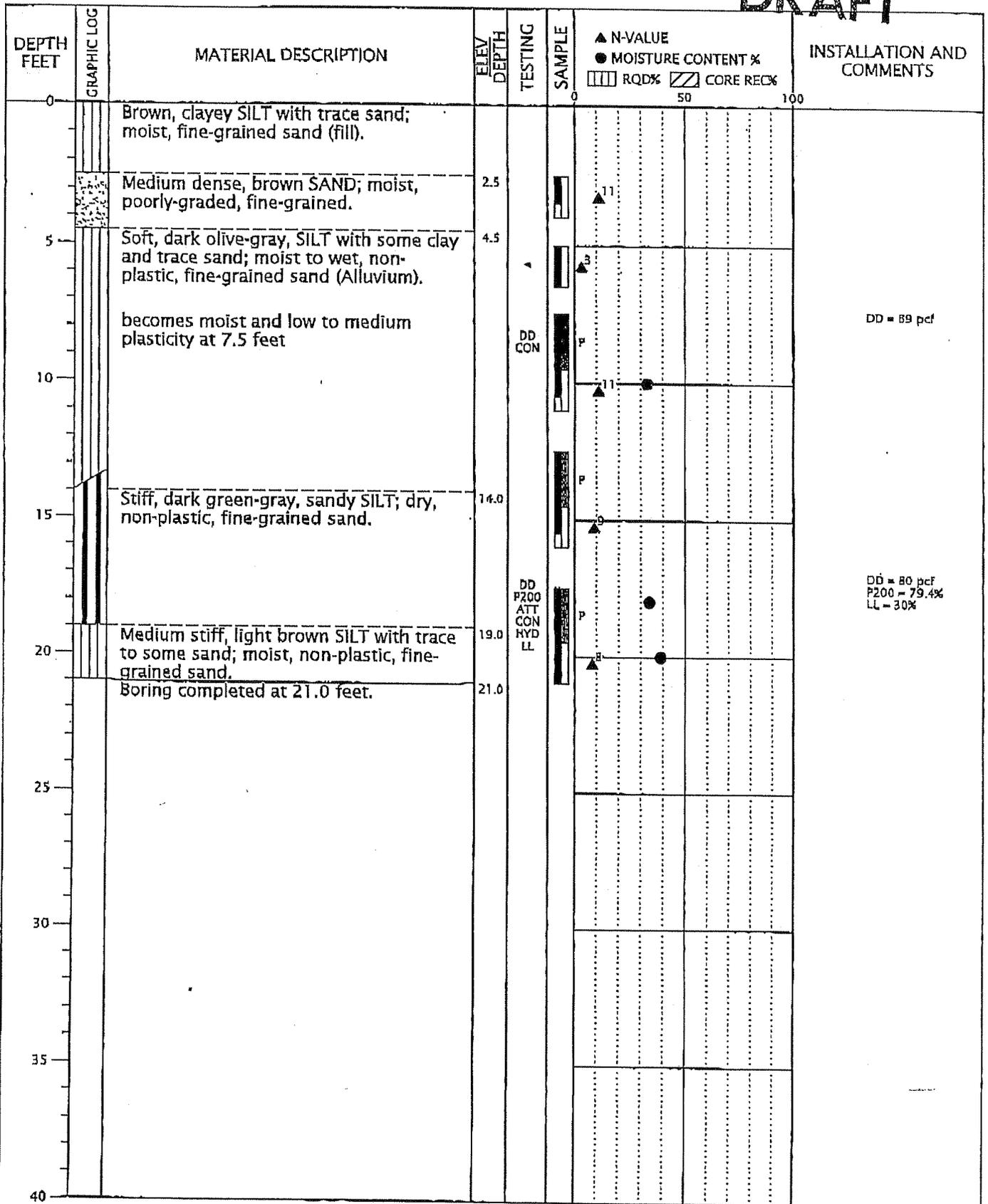
ATOFINA-1-01

FEBRUARY 2003

FIGURE A-3

BORING LOG ATOFINA-1-01-B1-5.GPJ GEODESIGN DR.GDT 2/12/03

DRAFT



BORING LOG ATOFINA-1-01-B1-S.GPJ GEODESIGN OR.GDT 2/12/03

PROJECT NAME: Pacific Metal Building LOGGED BY: JEJ DRILLED BY: Geo-Tech Explorations Inc. COMPLETED: 1/16/03

BORING METHOD: Mud Rotary BORING DIAMETER: 5 7/8" LOCATION: W Side of Proposed Bldg.



BORING B-4

ATOFINA-1-01

FEBRUARY 2003

FIGURE A-4

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEV. DEPTH	TESTING	SAMPLE	▲ N-VALUE ● MOISTURE CONTENT % ▨ RQD% ▩ CORE REC%	INSTALLATION AND COMMENTS
0		Stiff, brown, sandy SILT with gravel; moist, non-plastic, coarse-grained sand, subrounded to subangular gravel (occasional brick fragments) (fill).					
5		becomes dark olive-brown at 5.5 feet					
8.0		Medium dense, gray SAND with trace silt; wet (occasional wood fragments).	8.0				
11.0		Medium stiff, olive-gray SILT with some clay; moist, low to medium plasticity (Alluvium).	11.0	P200		▲ 8 ●	P200 = 38.2%
15						▲ 9 ●	
21.0		Medium dense, brown SAND with trace silt; wet, fine- to medium-grained, homogenous.	21.0			P ▲ 13 ●	
24.0		Stiff, olive-gray SILT with trace clay; moist, non-plastic to low plasticity, homogenous.	24.0	P200 ATT LL		▲ 17 ●	P200 = 90.5% LL = 44%
30							
32.5		with some clay, low to medium plasticity at 32.5 feet		DD CON ATT HYD LL		P ▲ 12 ●	DD = 81 pcf LL = 47%
35							
40							

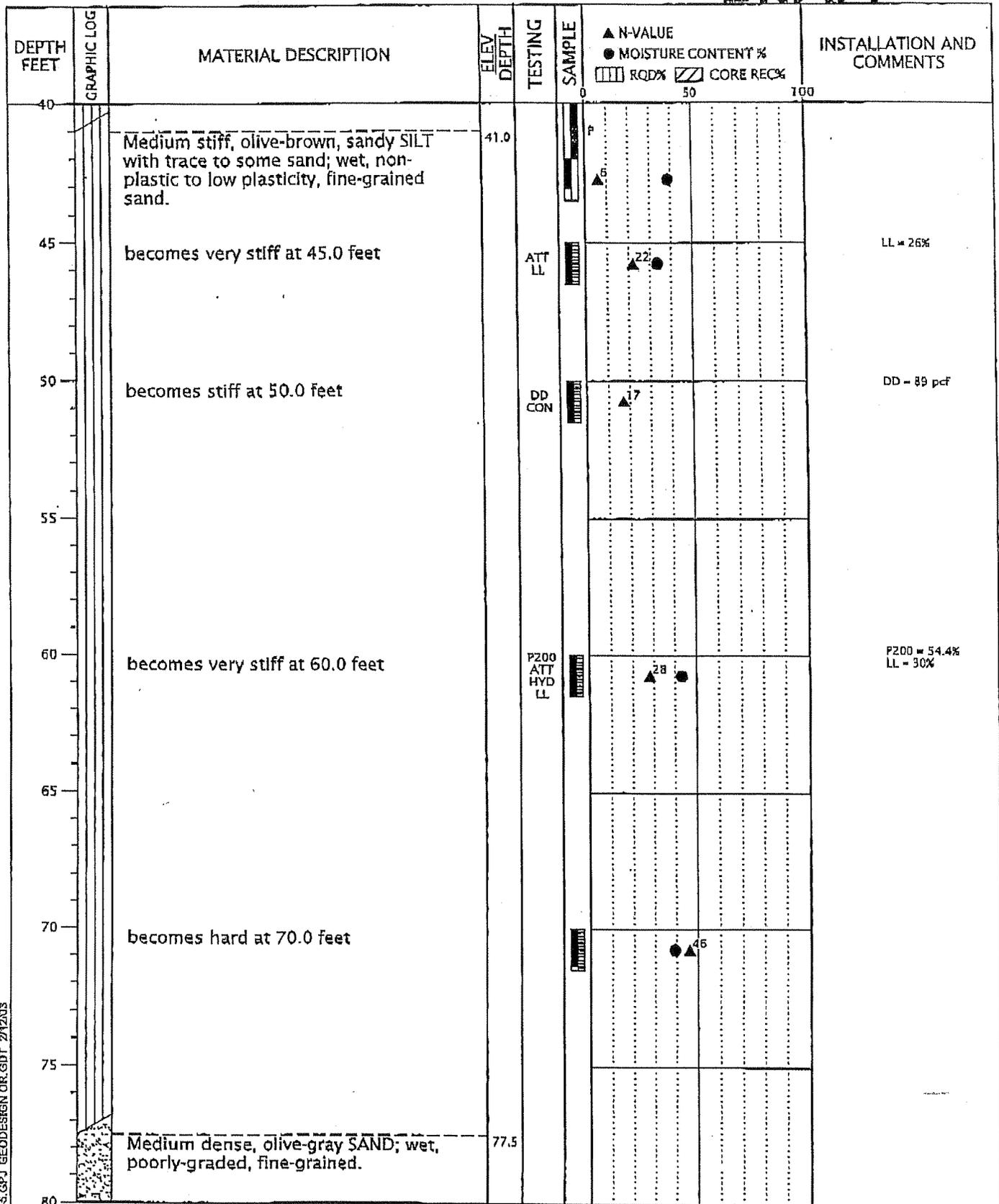
BORING LOG ATDFINA-1-01-B1-S.GPJ GEODESIGN OR.GDT 2/12/03

PROJECT NAME: Pacific Metal Building LOGGED BY: JEJ DRILLED BY: Geo-Tech Explorations Inc. COMPLETED: 1/17/03
 BORING METHOD: Mud Rotary BORING DIAMETER: 5 7/8" LOCATION: Center of Proposed Bldg.



BORING B-5

ATOFINA-1-01 FEBRUARY 2003 FIGURE A-5



BORING LOG ATOFINA-1-01-B1-5.GPJ GEODESIGN OR.GDT 2/12/03

PROJECT NAME: Pacific Metal Building LOGGED BY: JEJ DRILLED BY: Geo-Tech Explorations Inc. COMPLETED: 1/17/03
 BORING METHOD: Mud Rotary BORING DIAMETER: 5 7/8" LOCATION: Center of Proposed Bldg.



BORING B-5 (continued)

ATOFINA-1-01
FEBRUARY 2003
FIGURE A-5

DRAFT

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEV. DEPTH	TESTING	SAMPLE	INSTALLATION AND COMMENTS
80					0	
		Boring completed at 81.5 feet.	81.5		15	
85					50	
90					100	
95						
100						
105						
110						
115						
120						

BORING LOG ATOFINA-1-01-BT-S.GPJ GEODESIGN OR.GDT 2/12/03

PROJECT NAME: Pacific Metal Building

LOGGED BY: JEJ

DRILLED BY: Geo-Tech Explorations Inc.

COMPLETED: 1/17/03

BORING METHOD: Mud Rotary

BORING DIAMETER: 5 7/8"

LOCATION: Center of Proposed Bldg.



BORING B-5 (continued)

ATOFINA-1-01

FEBRUARY 2003

FIGURE A-5

Appendix B

BPA Substation Annex Analytical Results

Environmental Services Laboratory

Date: 19-Dec-01

CLIENT: PBS Environmental
 Lab Order: 0111250
 Project: 16291.018/Penwalt
 Lab ID: 0111250-73A

Client Sample ID: PSS-72
 Tag Number:
 Collection Date: 11/29/01
 Matrix: SOIL

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
PCBS IN SOIL OR SOLID WASTE		EPA 8082A				Analyst: mrs
Aroclor 1016	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1221	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1232	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1242	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1248	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1254	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1260	ND	50.0		µg/Kg	1	12/4/01
Surr: Decachlorobiphenyl	113.4	70-130		%REC	1	12/4/01

Qualifiers:
 ND - Not Detected at the Reporting Limit
 J - Analyte detected below quantitation limits
 B - Analyte detected in the associated Method Blank
 * - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
 R - RPD outside accepted recovery limits
 E - Value above quantitation range

Environmental Services Laboratory

Date: 19-Dec-01

CLIENT: PBS Environmental
 Lab Order: 0111250
 Project: 16291.018/Penwalt
 Lab ID: 0111250-74A

Client Sample ID: PSS-73
 Tag Number: -
 Collection Date: 11/29/01
 Matrix: SOIL

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
PCBS IN SOIL OR SOLID WASTE		EPA 8082A				Analyst: mrs
Aroclor 1016	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1221	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1232	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1242	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1248	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1254	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1260	ND	50.0		µg/Kg	1	12/4/01
Surr: Decachlorobiphenyl	109.6	70-130		%REC	1	12/4/01

Qualifiers:
 ND - Not Detected at the Reporting Limit
 J - Analyte detected below quantitation limits
 B - Analyte detected in the associated Method Blank
 * - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
 R - RPD outside accepted recovery limits
 E - Value above quantitation range

Environmental Services Laboratory

Date: 19-Dec-01

CLIENT: PBS Environmental
 Lab Order: 0111250
 Project: 16291.018/Penwalt
 Lab ID: 0111250-75A

Client Sample ID: PSS-74
 Tag Number:
 Collection Date: 11/29/01
 Matrix: SOIL

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
PCBS IN SOIL OR SOLID WASTE		EPA 8082A				Analyst: mrs
Aroclor 1016	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1221	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1232	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1242	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1248	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1254	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1260	ND	50.0		µg/Kg	1	12/4/01
Surr: Decachlorobiphenyl	94.8	70-130		%REC	1	12/4/01

Qualifiers:
 ND - Not Detected at the Reporting Limit
 J - Analyte detected below quantitation limits
 B - Analyte detected in the associated Method Blank
 * - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
 R - RPD outside accepted recovery limits
 E - Value above quantitation range

Environmental Services Laboratory

Date: 19-Dec-01

CLIENT: PBS Environmental
 Lab Order: 0111250
 Project: 16291.018/Penwalt
 Lab ID: 0111250-76A

Client Sample ID: PSS-75
 Tag Number:
 Collection Date: 11/29/01
 Matrix: SOIL

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
PCBS IN SOIL OR SOLID WASTE		EPA 8082A				Analyst: mrs
Aroclor 1016	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1221	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1232	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1242	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1248	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1254	ND	50.0		µg/Kg	1	12/4/01
Aroclor 1260	ND	50.0		µg/Kg	1	12/4/01
Surr: Decachlorobiphenyl	91.0	70-130		%REC	1	12/4/01
VOLATILES BY GC/MS		EPA 8260B				Analyst: tmh
1,1,1-Trichloroethane	ND	25.0		µg/Kg	1	11/30/01
Surr: 4-Bromofluorobenzene	99.8	74-121		%REC	1	11/30/01
Surr: Dibromofluoromethane	95.4	80-120		%REC	1	11/30/01
Surr: Toluene-d8	98.6	81-117		%REC	1	11/30/01

Qualifiers: ND - Not Detected at the Reporting Limit
 J - Analyte detected below quantitation limits
 B - Analyte detected in the associated Method Blank
 * - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits
 R - RPD outside accepted recovery limits
 E - Value above quantitation range

Appendix C
Brine Residue TCLP Results

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Elf Atochem North America, Inc.
Project: NA
Sample Matrix: Misc.

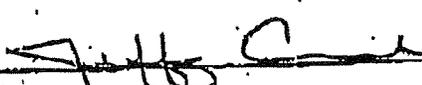
Service Request: K9501837
Date Collected: 3/28/95
Date Received: 3/29/95
Date TCLP Performed: 3/29/95
Date Extracted: 3/31/95
Date Analyzed: 4/3/95

Matrix Spike Summary
Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
Units: mg/L (ppm) in TCLP Extract

Sample Name: Brine Mud
Lab Code: K9501837-001

Analyte	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery*
Arsenic	5	ND	4.8	96
Barium	5	ND	4.4	88
Cadmium	1	ND	0.93	93
Chromium	5	ND	4.28	86
Lead	5	0.05	4.10	81
Mercury	0.01	ND	0.010	100
Selenium	1	ND	1.0	100
Silver	1	ND	0.82	82

* Percent recovery information is provided in order to assess the performance of the method on this matrix.

Approved By: 

Date: 4/4/95

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Elf Atochem North America, Inc.
 Project: NA
 Sample Matrix: Misc.

Service Request: K9501837
 Date Collected: 3/28/95
 Date Received: 3/29/95
 Date TCLP Performed: 3/29/95
 Date Extracted: 3/31/95

Toxicity Characteristic Leaching Procedure (TCLP)
 EPA Method 1311
 Metals
 Units: mg/L (ppm) in TCLP Extract

Sample Name:	Brine Mud	Method Blank:
Lab Code:	K9501837-001	K9501837-MB
Date Analyzed:	4/3/95	4/3/95

Analyte	EPA Method	MRL	Regulatory Limit*	Brine Mud	Method Blank
Arsenic	3010/6010A	0.1	5	ND	ND
Barium	3010/6010A	0.5	100	ND	ND
Cadmium	3010/6010A	0.01	1	ND	ND
Chromium	3010/6010A	0.01	5	ND	ND
Lead	3010/6010A	0.05	5	0.05	ND
Mercury	7470	0.001	0.2	ND	ND
Selenium	3010/6010A	0.1	1	ND	ND
Silver	3010/6010A	0.01	5	ND	ND

* From 40 CFR Part 261, et al., and Federal Register, March 29, 1990 and June 29, 1990.

Approved By: [Signature] Date: 4/4/95
 TCLP/102104
 DIRECTOR, WMI - Sample 4/4/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Elf Atochem North America, Inc.
 Project: Brine Filter Press
 Sample Matrix: Misc.

Service Request: K9602437
 Date Collected: 4/25/96
 Date Received: 4/26/96
 Date TCLP Performed: 4/30/96
 Date Extracted: 5/1/96
 Date Analyzed: 5/7/96

Matrix Spike Summary
 Toxicity Characteristic Leaching Procedure (TCLP)
 EPA Method 1311

Metals
 Units: mg/L (ppm) in TCLP Extract

Sample Name: Brine Mud-Filter...
 Lab Code: K9602437-001

Analyte	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery*
Arsenic	5	ND	4.6	92
Barium	5	ND	4.4	88
Cadmium	1	ND	0.93	93
Chromium	5	ND	4.23	85
Lead	5	ND	4.30	86
Mercury	0.01	ND	0.009	90
Selenium	1	ND	1.0	100
Silver	1	ND	0.92	92

* Percent recovery information is provided in order to assess the performance of the method on this matrix.

Approved By: _____
 TCLP 9602437-001 - Spike 5/10/96

JC

Date: 5-10-96

Page No:

00004

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Elf Atochem North America, Inc.
 Project: Brine Filter Press
 Sample Matrix: Misc.

Service Request: K9602437
 Date Collected: 4/25/96
 Date Received: 4/26/96
 Date TCLP Performed: 4/30/96
 Date Extracted: 5/1/96

Toxicity Characteristic Leaching Procedure (TCLP)

EPA Method 1311

Metals

Units: mg/L (ppm) in TCLP Extract

	Brine Mud-Filter	
Sample Name:	Press	Method Blank
Lab Code:	K9602437-001	K9602437-MB
Date Analyzed:	5/7/96	5/7/96

Analyte	EPA		Regulatory		Brine Mud-Filter	Method Blank
	Method	MRL	Limit*			
Arsenic	3010A/6010A	0.1	5		ND	ND
Barium	3010A/6010A	0.5	100		ND	ND
Cadmium	3010A/6010A	0.01	1		ND	ND
Chromium	3010A/6010A	0.01	5		ND	ND
Lead	3010A/6010A	0.05	5		ND	ND
Mercury	7470	0.001	0.2		ND	ND
Selenium	3010A/6010A	0.1	1		ND	ND
Silver	3010A/6010A	0.01	5		ND	ND

* From 40 CFR Part 261, et al., and *Federal Register*, March 29, 1990 and June 29, 1990.

Approved By: _____

JC

Date: _____

5-10-96

TCLP/102194

02437(CR)C1 - Sample 5/10/96

Page No.:

00003

Appendix D

ODEQ Risk-Based Concentration Calculations

RISK-BASED CONCENTRATIONS

Contaminant of Concern	Note	SOIL (mg/Kg)						SOIL (mg/Kg)						SOIL (mg/Kg)						SOIL (mg/Kg)						GROUNDWATER (mg/L)						GROUNDWATER (mg/L)						GROUNDWATER (mg/L)						GROUNDWATER (mg/L)						AIR (see notes)			
		Surface Soil Ingestion, Dermal Contact, and Inhalation RBC _{SS}						Volatilization to Outdoor Air RBC _{SO}						Vapor Intrusion into Buildings RBC _{BI}						Leaching to Groundwater RBC _{GW}						Groundwater Ingestion RBC _{GI}						Volatilization to Outdoor Air RBC _{SO}						Vapor Intrusion into Buildings RBC _{BI}						Ingestion & Inhalation from Tapwater RBC _{WT}						GW in Excavation RBC _{EX}		Inhalation RBC _{AI}	
		Residential		Occupational		Excavation Worker		Residential		Occupational		Residential		Occupational		Residential		Occupational		Residential		Occupational		Residential		Occupational		Residential		Occupational		Residential		Occupational		Excavation Worker		Residential		Occupational													
Benzene	c, v	5.2E+00	>Csat	2.3E+01	>Csat	1.0E+03	>Csat	1.1E+01	>Csat	2.1E+01	>Csat	9.1E-02	>Csat	5.0E-01	>Csat	2.3E-02	>Csat	5.4E-02	>Csat	9.6E-04	>Csat	2.3E-03	>Csat	3.2E+00	>Csat	7.1E+00	>Csat	1.8E-01	>Csat	1.2E+00	>Csat	3.6E-04	>Csat	8.2E-04	>Csat	7.6E-01	>Csat	3.0E-01	>Csat	6.5E-01	>Csat												
Toluene	nc, v	2.0E+03	>Csat	3.8E+04	>Csat	5.0E+04	>Csat	5.4E+02	>Csat	5.4E+02	>Csat	2.4E+02	>Csat	5.4E+02	>Csat	3.9E+02	>Csat	5.4E+02	>Csat	6.3E+00	>Csat	8.9E+00	>Csat	5.3E+02	>Csat	5.3E+02	>Csat	2.8E+02	>Csat	5.3E+02	>Csat	9.1E-01	>Csat	1.3E+00	>Csat	3.7E+01	>Csat	5.3E+02	>Csat	7.4E+02	>Csat												
Ethylbenzene	nc, v	2.1E+03	>Csat	5.3E+04	>Csat	1.1E+05	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat										
Xylenes	nc, v	8.0E+02	>Csat	1.2E+04	>Csat	1.4E+04	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	1.4E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat	3.6E+02	>Csat										
Acenaphthene	nc, v	8.0E+02	>Csat	2.5E+04	>Csat	1.1E+05	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat	1.0E+02	>Csat										
Anthracene	nc, v	4.4E+03	>Csat	1.8E+05	>Csat	7.5E+05	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat	6.4E+00	>Csat										
Benz[a]anthracene	c, nv	2.1E-01	>Csat	2.7E+00	>Csat	2.7E+02	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat	1.9E+01	>Csat										
Benz[b]fluoranthene	c, nv	2.1E-01	>Csat	2.7E+00	>Csat	2.7E+02	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat	9.2E+00	>Csat										
Benzofluoranthene	c, nv	2.1E+00	>Csat	2.7E+01	>Csat	2.7E+03	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat	4.9E+00	>Csat										
Benzofluoranthene	c, nv	2.1E+00	>Csat	2.7E+01	>Csat	2.7E+03	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat	8.3E+00	>Csat										
Chrysene	c, nv	2.1E+01	>Csat	2.7E+02	>Csat	2.7E+04	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat	3.2E+00	>Csat										
Dibenz[a,h]anthracene	c, nv	2.1E-02	>Csat	2.7E-01	>Csat	2.7E+01	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat	4.7E+00	>Csat										
Fluoranthene	nc, nv	6.0E+02	>Csat	2.9E+04	>Csat	1.1E+05	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat	1.1E+02	>Csat										
Fluorene	nc, v	5.7E+02	>Csat	2.3E+04	>Csat	9.4E+04	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat	1.4E+02	>Csat										
Indeno[1,2,3-cd]pyrene	c, nv	2.1E-01	>Csat	2.7E+00	>Csat	2.7E+02	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat	3.8E-01	>Csat										
Naphthalene	nc, v	3.1E+01	>Csat	3.6E+02	>Csat	1.4E+03	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat	3.1E+02	>Csat										
Pyrene	nc, v	4.5E+02	>Csat	2.1E+04	>Csat	8.4E+04	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat	7.1E+01	>Csat										
MTBE (methyl t-butyl ether)	c, v	1.1E+02	>Csat	6.9E+02	>Csat	5.4E+04	>Csat	9.4E+02	>Csat	1.7E+03	>Csat	1.3E+01	>Csat	8.4E+01	>Csat	1.6E-01	>Csat	1.6E-01	>Csat	2.0E-02	>Csat	2.0E-02	>Csat	1.4E-01	>Csat	1.4E-01	>Csat	1.4E-01	>Csat	1.4E-01	>Csat	1.4E-01	>Csat	1.4E-01	>Csat	1.4E-01	>Csat	1.4E-01	>Csat	1.4E-01	>Csat	1.4E-01	>Csat										
EDB (1,2-dibromoethane)	c, v	3.3E-03	>Csat	3.0E-02	>Csat	3.6E+00	>Csat	4.3E-01	>Csat	7.8E-01	>Csat	2.6E-02	>Csat	1.7E-01	>Csat	7.9E-06	>Csat	1.9E-05	>Csat	6.2E-07	>Csat	1.5E-06	>Csat	9.9E-01	>Csat	2.2E+00	>Csat	1.3E-01	>Csat	8.5E-01	>Csat	6.0E-07	>Csat	1.4E-06	>Csat	8.6E-03	>Csat	1.1E-02	>Csat	2.4E-02	>Csat												
EDC (1,2-dichloroethane)	c, v	2.2E+00	>Csat	9.0E+00	>Csat	3.6E+02	>Csat	3.6E+00	>Csat	6.6E+00	>Csat	3.9E-02	>Csat	2.6E-01	>Csat	5.7E-03	>Csat	1.3E-02	>Csat	5.8E-04	>Csat	1.4E-03	>Csat	2.8E+00	>Csat	6.2E+00	>Csat	2.6E-01	>Csat	1.7E+00	>Csat	1.4E-04	>Csat	3.2E-04	>Csat	2.9E-01	>Csat	9.4E-02	>Csat	2.1E-01	>Csat												
Lead	NA, nv	4.0E+02	L	1.0E+03	L	1.0E+03	L	NA	NA	NA	NA	NA	NA	NA	NA	4.0E-01	L	1.5E+00	L	4.0E-03	L	1.5E-02	L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA												
iso-propylbenzene	nc, v	1.5E+03	>Csat	3.1E+04	>Csat	4.7E+04	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat	3.3E+02	>Csat										
n-propylbenzene	nc, v	5.7E+02	>Csat	1.2E+04	>Csat	1.7E+04	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat	2.0E+02	>Csat										
1,2,4-Trimethylbenzene	nc, v	4.7E+01	>Csat	7.2E+02	>Csat	9.6E+02	>Csat	4.8E+00	>Csat	4.8E+00	>Csat	4.8E+00	>Csat	4.8E+00	>Csat																																						

Exposure Factors

Parameter (unit)	Symbol	Residential	Note	Occupational	Note	Excavation Wrkr	Note
ACCEPTABLE RISK LEVELS							
Acceptable Risk Level - Carcinogens	ARLc	1.00E-06	1	=		=	
Acceptable Risk Level - Noncarcinogens	ARLn	1	1	=		=	
EXPOSURE PARAMETERS							
Averaging Time - Carcinogen (yr)	ATc	70	2	=		=	
Averaging Time - Noncarcinogen (yr)	ATn	30	2	25	2	1	2
Averaging Time - Noncarcinogen, Child (yr)	ATnc	6	2	NA		NA	
Body Weight - Adult (kg)	BWa	70	3	=		=	
Body Weight - Child (kg)	BWc	15	3	NA		NA	
Exposure Duration - Adult (yr)	ED	30	3	25	3	1	3
Exposure Duration - Child (yr)	EDc	6	3	NA		NA	
Exposure Frequency (day/yr)	EF	350	3	250	3	9	6
Event Frequency - Groundwater (events/day)	EvFwe	NA		NA		2	6
Event Time - Groundwater (hr/event)	t _{event}	NA		NA		2	6
Inhalation Rate - Adult (m ³ /day)	IRA	15.2	4	15.2	4	15.2	4
Inhalation Rate - Child (m ³ /day)	IRAc	8.30	4	NA		NA	
Soil Ingestion Rate - Adult (mg/day)	IRS	100	4	100	6	480	4
Soil Ingestion Rate - Child (mg/day)	IRSc	400	4	NA		NA	
Water Ingestion Rate - Adult (L/day)	IRW	2.30	4	2.30	4	NA	
Water Ingestion Rate - Child (L/day)	IRWc	1.50	4	NA		NA	
Skin Surface Area - Adult to Soil (cm ²)	SA	6900	4	4100	4	4100	4
Skin Surface Area - Child to Soil (cm ²)	SAC	5000	4	NA		NA	
Skin Surface Area - Adult to Groundwater (cm ²)	SAW	NA		NA		7000	4
Soil to Skin Adherence Factor - Adult (mg/cm ² -day)	AF	0.08	5	0.08	5	1.00	5
Soil to Skin Adherence Factor - Child (mg/cm ² -day)	AFc	1.00	5	NA		NA	
AGE-ADJUSTED EXPOSURE FACTORS							
Inhalation Factor - Air (m ³ -yr/kg-d)	IFAadj	8.53	7	NA		NA	
Ingestion Factor - Soil (mg-yr/kg-d)	IFSadj	194	7	NA		NA	
Ingestion Factor - Water (L-yr/kg-d)	IFWadj	1.39	7	NA		NA	
Surface Area Factor - Skin (mg-yr/kg-d)	SFSadj	2189	7	NA		NA	
SITE PARAMETERS							
Soil Bulk Density (g/cm ³)	ρ _b	1.70	8	=		=	
Soil Particle Density (g/cm ³)	ρ _s	2.74	9	=		=	
Soil Porosity	n	0.38	8	=		=	
Air Content - Vadose Zone Soils	n _a	0.26	10	=		=	
Air Content - Cap. Fringe Soils	n _{acap}	0.038	10	=		=	
Air Content - Foundation Cracks	n _{acrck}	0.26	10	=		=	
Water Content - Vadose Zone Soils	n _w	0.12	8	=		=	
Water Content - Cap. Fringe Soils	n _{wcap}	0.342	8	=		=	
Water Content - Foundation Cracks	n _{wcrck}	0.12	11	=		=	
Vadose Zone Thickness (cm)	L _v	757	12	=		=	
Capillary Fringe Thickness (cm)	L _{cap}	5.00	8	=		=	
Fraction Organic Carbon (shallow soil)	f _{oc}	0.005	8a	=		=	
Depth to Groundwater (cm)	L _w	762	8	=		=	
Groundwater Dilution-Attenuation Factor	DAF	60	19	=		=	
SOIL CONTAMINATION PARAMETERS							
Thickness of Contaminated Surface Soils (cm)	L _{ss}	100	8	=		=	
Fraction of Site with Surface Soil Contamination	f _{ss}	0.50	16	=		=	
Thickness of Clean Surface Soils (cm)	L _c	100	8	=		=	
Thickness of Subsurface Contamination (cm)	L _s	200	8	=		=	
Fraction of Site with Subsurface Vol. To Outdoor Air	f _{so}	0.50	17	=		=	
Thickness of Clean Soils Under Building (cm)	L _{cb}	100	8	=		=	
Thickness of Contaminated Soils Under Building (cm)	L _{sb}	200	8	=		=	

Exposure Factors

Parameter (unit)	Symbol	Residential		Occupational		Excavation Wrkr	
			Note		Note		Note
Fraction of Contaminated Soils Under Building	f_{sb}	0.50	18	=		=	
Particulate Emission Factor for Soils (kg/m ³)	PEF	7.58E-10	13	=		=	
BUILDING PARAMETERS							
Building Air Exchange Rate (1/day)	ER	24	14	48	14	NA	
Building Height (indoor air mixing zone) (cm)	L_B	200	8	300	8	NA	
Foundation Wall Thickness (cm)	L_{crk}	15	8	NA		NA	
Foundation Crack Fraction	f_{crk}	0.0010	15	NA		NA	
VOLATILIZATION FACTORS							
Max. Soil to Building Vol. Factor (kg/m ³)	$VF_{sb,max}$	3.23E-03	18	1.29E-03	18	NA	
Max. Surface Soil Vol. Factor - Adult (kg/m ³)	$VF_{ss,max}$	1.31E-05	16	1.57E-05	16	3.92E-04	16
Max. Surface Soil Vol. Factor - Child (kg/m ³)	$VF_{ss,max}$	6.53E-05	16	NA		NA	
Max. Soil to Outdoor Air Vol. Factor - Adult (kg/m ³)	$VF_{so,max}$	2.61E-05	17	3.13E-05	17	NA	
Vol. Factor from Tapwater to Indoor Air (L/m ³)	VF_w	5.00E-01	20	NA		NA	
Vol. Factor from GW to Air in Excavation (L/m ³)	VF_{we}	NA		NA		5.00E-01	21
Volatile Organics Dispersion Term (g/m ² -s per kg/m ³)	Q/C	6.88E+01	13	=		NA	
MISCELLANEOUS PARAMETERS							
Ideal Gas Law Constant (m ³ -atm/K-mol)	R	8.21E-05	22	=		=	
Absolute Temperature (K)	T	2.93E+02	22	=		=	

Exposure Factor Notes:

The symbols and numbers in the "Note" columns are explained below. The references can be found in *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* (DEQ, 1999).

= This exposure parameter is the same as the residential value.

NA This exposure parameter is not required for any of the RBCs.

- Acceptable risk levels are specified in statute (ORS 465.315) and defined in rule (OAR 340-122-0115).
- EPA (1989)
- EPA (1991b)
- EPA (1997c)
- EPA (1998c)
- DEQ (1998b)
- Calculated from equations given in EPA (1998a).
- ASTM (1995b)
 - f_{oc} is an average of ASTM (1995b) and EPA (1996b) defaults.
- Calculated from $\rho_s = \rho_l / (1-n)$.
- Calculated from $n_s = n - n_w$; $n_{acap} = n - n_{wcap}$; $n_{acrk} = n - n_{wcrk}$.
- n_{wcrk} assumed = n_w .
- Calculated from $L_v = L_w - L_{cap}$
- EPA (1996b)
- Estimated from data reported in Michigan DEQ (1998).
- Derived from range of floor-wall seam gaps given in EPA (1997b).
- Refer to Section B.3.2.1.
- Refer to Section B.3.2.2.
- Refer to Section B.3.2.3.
- Refer to Section B.3.2.4.
- Refer to Section B.3.3.4.
- Refer to Section B.3.3.5.
- Refer to discussion of Henry's Law Constants in Section B.2.2.2.

Chemical Data

Chemical	Vol Class	Mol. Wt. (g/mol)	S (mg/L)		P _v (µg/m ³)		C _{sat} (mg/kg)		K _{oc} (cm ² /g)		K _H (m ³ -atm/mol)		H		D _{air} (cm ² /s)		D _w (cm ² /s)	
			Note 1	Note 2	Note	Note 4a	Note 4b	Note	Note	Note	Note 5	Note	Note	Note	Note	Note		
Benzene	v	78	1.75E+03	3	4.04E+08	7.01E+02	5.89E+01	5	5.55E-03	3	2.31E-01	8.80E-02	3	9.80E-06	3			
Toluene	v	92	5.26E+02	3	1.45E+08	5.38E+02	1.82E+02	5	6.84E-03	3	2.78E-01	8.70E-02	3	8.60E-06	3			
Ethylbenzene	v	106	1.69E+02	3	5.54E+07	3.27E+02	3.63E+02	5	7.88E-03	3	3.28E-01	7.50E-02	3	7.80E-06	3			
Xylenes	v	106	1.75E+02	3a	4.90E+07	3.58E+02	3.86E+02	5a	6.73E-03	3a	2.80E-01	7.80E-02	3a	8.75E-06	3a			
Acenaphthene	v	154	4.24E+00	3	2.73E+04	1.04E+02	4.90E+03	5	1.55E-04	3	6.45E-03	4.21E-02	3	7.69E-06	3			
Anthracene	v	178	4.34E-02	3	1.17E+02	6.40E+00	2.95E+04	5	6.50E-05	3	2.70E-03	3.24E-02	3	7.74E-06	3			
Benz[a]anthracene	nv	228	9.40E-03	3	1.31E+00	1.87E+01	3.98E+05	5	3.35E-06	3	1.39E-04	5.10E-02	3	9.00E-06	3			
Benzo[b]fluoranthene	nv	252	1.50E-03	3	6.93E+00	9.23E+00	1.23E+06	5	1.11E-04	3	4.62E-03	2.26E-02	3	5.56E-06	3			
Benzo[k]fluoranthene	nv	252	8.00E-04	3	2.78E+02	4.92E+00	1.23E+06	5	8.29E-07	3	3.45E-05	3.26E-02	3	6.58E-06	3			
Benzo[a]pyrene	nv	252	1.62E-03	3	7.61E-02	8.26E+00	1.02E+06	5	1.13E-06	3	4.70E-05	4.30E-02	3	9.00E-06	3			
Chrysene	nv	228	1.60E-03	3	6.30E+00	3.18E+00	3.98E+05	5	9.46E-05	3	3.93E-03	2.48E-02	3	6.21E-06	3			
Dibenz[a,h]anthracene	nv	278	2.49E-04	3	1.52E+04	4.73E+00	3.80E+06	5	1.47E-08	3	6.11E-07	2.02E-02	3	5.18E-06	3			
Fluoranthene	nv	202	2.06E-01	3	1.38E+02	4.92E+00	1.07E+05	5	1.61E-05	3	6.70E-04	3.02E-02	3	6.35E-06	3			
Fluorene	v	166	1.98E+00	3	5.23E+03	1.37E+02	1.38E+04	5	6.35E-05	3	2.64E-03	3.63E-02	3	7.88E-06	3			
Indeno[1,2,3-cd]pyrene	nv	276	2.20E-05	3	1.46E+03	3.82E-01	3.47E+06	5	1.60E-06	3	6.85E-05	1.90E-02	3	5.66E-06	3			
Naphthalene	v	128	3.10E+01	3	6.23E+05	3.12E+02	2.00E+03	5	4.83E-04	3	2.01E-02	5.90E-02	3	7.50E-06	3			
Pyrene	nv	202	1.35E-01	3	6.18E+01	7.09E+01	1.05E+05	5	1.10E-05	3	4.58E-04	2.72E-02	3	7.24E-06	3			
MTBE (methyl t-butyl ether)	v	88	5.10E+04	7	1.25E+09	6.65E+03	1.12E+01	7	5.87E-04	7	2.44E-02	1.10E-01	8	1.05E-05	8			
EDB (1,2-dibromoethane)	v	188	3.40E+03	9	4.53E+07	7.25E+02	2.81E+01	9	3.20E-04	9	1.33E-02	7.33E-02	9	8.06E-06	9			
EDC (1,2-dichloroethane)	v	99	8.52E+03	3	3.45E+08	1.40E+03	1.74E+01	5	9.74E-04	3	4.05E-02	1.04E-01	3	9.90E-06	3			
Lead	nv	207	NA	10	NA	NA	NA	10	NA	10	NA	NA	10	NA	10			
iso-propylbenzene	v	120	3.00E+01	9	1.62E+07	3.35E+02	2.20E+03	9	1.30E-02	9	5.41E-01	7.50E-02	9	7.80E-06	9			
n-propylbenzene	v	120	1.40E+01	9	7.57E+06	1.99E+02	2.80E+03	9	1.30E-02	9	5.41E-01	7.50E-02	9	7.80E-06	9			
1,2,4-trimethylbenzene	v	120	2.60E-01	9	6.16E+04	4.84E+00	3.70E+03	9	5.70E-03	9	2.37E-01	7.50E-02	9	7.10E-06	9			
1,3,5-trimethylbenzene	v	120	5.00E+01	9	1.60E+07	2.11E+02	8.20E+02	9	7.70E-03	9	3.20E-01	7.50E-02	9	7.10E-06	9			
1,1-Dichloroethane	v	97	2.25E+03		2.44E+09	1.20E+03	5.89E+01		2.61E-02		1.09E+00	9.00E-02		1.04E-05				
cis-1,2-Dichloroethane	v	97	3.50E+03		5.94E+08	9.59E+02	3.55E+01		4.08E-03		1.70E-01	7.36E-02		1.13E-05				
trans-1,2-Dichloroethane	v	97	6.30E+03		2.46E+09	2.47E+03	5.25E+01		9.38E-03		3.90E-01	7.07E-02		1.19E-05				
Tetrachloroethane	v	166	2.00E+02		1.53E+08	1.93E+02	1.55E+02		1.84E-02		7.85E-01	7.20E-02		8.20E-06				
1,1,1-Trichloroethane	v	133	1.33E+03		9.51E+08	9.71E+02	1.10E+02		1.72E-02		7.15E-01	7.80E-02		8.80E-06				
Trichloroethane	v	131	1.10E+03		4.71E+08	1.06E+03	1.66E+02		1.03E-02		4.28E-01	7.90E-02		9.10E-06				
Vinyl chloride - Residential	v	63	2.76E+03		3.10E+09	9.26E+02	1.86E+01		2.70E-02		1.12E+00	1.06E-01		1.23E-06				
Vinyl chloride - Occupational	v	63	2.76E+03		3.10E+09	9.26E+02	1.86E+01		2.70E-02		1.12E+00	1.06E-01		1.23E-06				
1,4-Dioxane	nv	88	1.00E+08		2.00E+08	1.56E+05	1.70E+01		4.80E-06		2.00E-04	5.00E-02		1.00E-05				
1,2-Dichlorobenzene	v	147	1.56E+02		1.23E+07	4.94E+02	6.17E+02		1.90E-03		7.90E-02	6.90E-02		7.90E-06				

Chemical Data Notes:

The symbols and numbers in the "Note" columns are explained below. The references can be found in *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* (DEQ, 1999).

- nv This chemical is classified as "nonvolatile" for purposes of the exposure calculations in this document.
- v This chemical is classified as "volatile" for purposes of the exposure calculations in this document.
- 1. Volatility is based on EPA (1991a). A volatile constituent has a Henry's constant > 10⁻⁵ m³-atm/mol and a molecular weight < 200 g/mol.
- 2. Molecular weights can be obtained from many common chemical handbooks and chemistry texts. No specific reference was used here.
- 3. Values from Table 36 (S and H) and Table 37 (D_{air} and D_w) in EPA (1996b).
 - a. These are the average values for the three xylene isomers.
- 4. a. Vapor pressures are calculated from the relationship P_v = H * S * 1000000, where H is the dimensionless Henry's constant, S is the solubility in mg/L, and 1000000 is a conversion factor yielding units of µg/m³ for direct comparison to RBC_{air} values.
 - b. C_{sat} is calculated using Equation [B-12]. See Section B.2.2.3.
- 5. K_{oc}s are the "Calculated Values" from Table 39 in EPA (1996b).
 - a. This is the average K_{oc} value for the three xylene isomers.
- 6. Dimensionless Henry's constants are calculated from the relationship H = K_H / R * T where K_H is the Henry's constant in m³-atm/mol, R is the ideal gas law constant (8.21 x 10⁻⁵ m³-atm/K-mol), and T is the absolute temperature (293 K).
- 7. Howard (1993)
- 8. D_{air} and D_w are estimated using Equation [B-22]. See Section B.2.5.
- 9. EPA (1998a)
- 10. NA: These data are not applicable since the lead RBCs are not calculated by the Department. See Section B.3.4.

Toxicological Data

Chemical	Risk	RfD _i		RfD _o		SF _i		SF _o		RAF _d	K _p	τ	t*	B	DA _{we}	
	Type	(mg/Kg-day)	Note	(mg/Kg-day)	Note	(mg/Kg-day) ¹	Note	(mg/Kg-day) ¹	Note	Note 5	(cm/hr)	(hr)	(hr)		(L/cm ² -event)	
Benzene	c	1.70E-03		3.00E-03		2.90E-02	1g	5.50E-02	1g	5.00E-04	2.10E-02	2.60E-01	6.30E-01	1.30E-02	5	5.27E-05
Toluene	nc	1.10E-01	1d,2	2.00E-01	1b					3.00E-02	4.50E-02	3.20E-01	7.70E-01	5.40E-02	6	1.17E-04
Ethylbenzene	nc	2.90E-01	1c,2	1.00E-01	1a	0.00385		0.00385		3.00E-02	7.40E-02	3.90E-01	1.30E+00	1.40E-01	6	2.02E-04
Xylenes	nc	2.90E-02	1h,2	7.00E-01	1a					3.00E-02	8.00E-02	3.90E-01	1.40E+00	1.60E-01	6	2.18E-04
Acenaphthene	nc	6.00E-02	3	6.00E-02	1f					1.30E-01	1.33E-01	7.61E-01	6.03E+00	8.32E-01	7	4.53E-04
Anthracene	nc	3.00E-01	3	3.00E-01	1a					1.30E-01	2.62E-01	1.07E+00	5.45E+00	3.47E+00	7	1.08E-03
Benz[a]anthracene	c					7.30E-01	4	7.30E-01	4	1.30E-01	8.10E-01	2.20E+00	1.00E+01	4.60E+01	6	4.70E-03
Benzo[b]fluoranthene	c					7.30E-01	4	7.30E-01	4	1.30E-01	1.20E+00	3.00E+00	1.40E+01	1.30E+02	6	8.12E-03
Benzo[k]fluoranthene	c					7.30E-02	4	7.30E-02	4	1.30E-01	1.11E+00	3.01E+00	1.42E+01	1.15E+02	7	7.53E-03
Benzo[a]pyrene	c					7.30E+00	4	7.30E+00	4	1.30E-01	1.20E+00	2.90E+00	1.40E+01	1.30E+02	6	7.99E-03
Chrysene	c					7.30E-03	4	7.30E-03	4	1.30E-01	8.10E-01	2.20E+00	1.00E+01	4.60E+01	6	4.70E-03
Dibenz[a,h]anthracene	c					7.30E+00	4	7.30E+00	4	1.30E-01	2.70E+00	4.40E+00	2.10E+01	6.90E+02	6	2.41E-02
Fluoranthene	nc	4.00E-02	3	4.00E-02	1a					1.30E-01	3.60E-01	1.50E+00	7.30E+00	8.90E+00	6	1.72E-03
Fluorene	nc	4.00E-02	3	4.00E-02	1b					1.30E-01	1.72E-01	9.00E-01	5.54E+00	1.51E+00	7	6.37E-04
Indeno[1,2,3-cd]pyrene	c					7.30E-01	4	7.30E-01	4	1.30E-01	1.90E+00	4.20E+00	2.00E+01	3.80E+02	6	1.52E-02
Naphthalene	nc	8.60E-04	1i,2	2.00E-02	1i					1.30E-01	6.90E-02	5.30E-01	2.20E+00	2.00E-01	6	1.98E-04
Pyrene	nc	3.00E-02	3	3.00E-02	1a					1.30E-01	5.32E-01	1.49E+00	7.15E+00	1.51E+01	7	2.54E-03
MTBE (methyl t-butyl ether)	c	8.60E-01	1a,2	8.60E-01	1a	3.50E-04		3.30E-03		5.00E-04	1.93E-03	3.01E-01	7.23E-01	5.79E-04	6	5.01E-06
EDB (1,2-dibromoethane)	c	0.000057		0.000057		7.70E-01	1d	8.50E+01	1g	3.00E-02	3.35E-03	1.23E+00	2.94E+00	9.12E-03	6	1.45E-05
EDC (1,2-dichloroethane)	c	0.0014		0.03		9.10E-02	3	9.10E-02	1c	3.00E-02	5.30E-03	3.50E-01	8.40E-01	3.00E-03	6	1.43E-05
Lead	NA	NA	9	NA	9	NA	9	NA	9	NA	NA	NA	NA	NA	9	NA
iso-propylbenzene	nc	1.10E-01	3	1.00E-01	4					3.00E-02	2.24E-01	4.70E-01	3.83E+00	8.90E-01	7	5.99E-04
n-propylbenzene	nc	4.00E-02	3	4.00E-02	4					3.00E-02	2.84E-01	4.70E-01	3.50E+00	1.24E+00	7	7.61E-04
1,2,4-trimethylbenzene	nc	1.70E-03	4	5.00E-02	4					3.00E-02	3.74E-01	4.70E-01	2.70E+00	1.83E+00	7	1.00E-03
1,3,5-trimethylbenzene	nc	1.70E-03	4	5.00E-02	4					3.00E-02	8.45E-02	4.70E-01	2.14E+00	2.30E-01	7	2.26E-04
1,1-Dichloroethene	nc	5.70E-02		5.00E-02						5.00E-04	1.60E-02	3.40E-01	8.20E-01	1.30E-02		4.27E-05
cis-1,2-Dichloroethene	nc	1.00E-02		1.00E-02						5.00E-04	1.00E-02	3.40E-01	8.20E-01	7.20E-03		2.68E-05
trans-1,2-Dichloroethene	nc	2.00E-02		2.00E-02						5.00E-04	1.00E-02	3.40E-01	8.20E-01	7.20E-03		2.68E-05
Tetrachloroethene	c	1.70E-01		1.00E-02		2.10E-02		5.20E-02		3.00E-02	4.80E-02	9.00E-01	4.30E+00	2.50E-01		1.78E-04
1,1,1-Trichloroethane	nc	6.30E-01		2.80E-01						5.00E-04	1.70E-02	5.70E-01	1.40E+00	3.10E-02		5.35E-05
Trichloroethene	c	1.00E-02		3.00E-04		4.00E-01		4.00E-01		5.00E-04	1.60E-02	5.50E-01	1.30E+00	2.80E-02		4.97E-05
Vinyl chloride - Residential	c	2.90E-02		3.00E-03		7.20E-02		3.50E+00		5.00E-04	7.30E-03	2.10E-01	5.10E-01	2.30E-03		1.76E-05
Vinyl chloride - Occupational	c	2.90E-02		3.00E-03		1.60E-02		7.50E-01		5.00E-04	7.30E-03	2.10E-01	5.10E-01	2.30E-03		1.76E-05
1,4-Dioxane	c					1.10E-02		1.10E-02		3.00E-02	3.60E-04	3.00E-01	7.20E-01	5.40E-05		9.36E-07
1,2-Dichlorobenzene	nc	5.70E-02		9.00E-02						3.00E-02	6.10E-02	6.90E-01	3.20E+00	2.40E-01		1.98E-04

Toxicological Data Notes:

The symbols and numbers in the "Note" columns are explained below. The references can be found in *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* (DEQ, 1999).

c This chemical is a known or suspected carcinogen.

nc This chemical is a noncarcinogen.

1. U. S. EPA, Office of Research and Development, Integrated Risk Information System (IRIS)

- 1a. IRIS, 1987
- 1b. IRIS, 1990
- 1c. IRIS, 1991
- 1d. IRIS, 1992
- 1e. IRIS, 1993
- 1f. IRIS, 1994
- 1g. IRIS, 1997
- 1h. IRIS, 1997, Withdrawn
- 1i. IRIS, 1998

2. Converted from inhalation reference concentration (RfC in mg/m3) by the following relationship: RfDi = RfC * 15.2 m3/day / 70 kg

3. Route extrapolation, RfDi assumed to be equivalent to RfDo.

4. U.S. EPA, Office of Research and Development, National Center for Environmental Assessment (NCEA).

5. DAF values are from Table 4-5 in EPA (1998b).

6. Kp, τ, t*, and B are from Table 5-8 in EPA (1992a).

7. Kp, τ, t*, and B are calculated from equations given in EPA (1992a).

8. DAwe is calculated from equations given in EPA (1992a) (see Section B.3.3.5).

9. NA: These data are not applicable since the lead RBCs are not calculated by the Department. See Section B.3.4.

Appendix E
Soil Management Plan

ATOFINA Chemicals, Inc.

*Soil and Groundwater
Management Plan*

*Lots 1 and 2
ATOFINA Chemicals, Inc.
Portland, Oregon*

23 July 2003

5204.00

Environmental Resources Management
915 118th Avenue SE, Suite 130
Bellevue, Washington 90005
(425) 462-8591
www.erm.com

ATOFINA Chemicals, Inc.

*Soil and Groundwater
Management Plan*

*Lots 1 and 2
ATOFINA Chemicals, Inc.
Portland, Oregon*

23 July 2003

5204.00



Erik C. Ipsen, P.E.
Project Manager



Timothy S. McCormack, R.G.
Principal

Environmental Resources Management
915 118th Avenue SE, Suite 130
Bellevue, Washington 98005
(425) 462-8591
www.erm.com

1.0	INTRODUCTION	1
1.1	GENERAL SITE BACKGROUND	1
1.2	DDT TRENCH BACKGROUND	2
1.3	RHONE-POULENC GROUNDWATER PLUME	3
1.3.1	<i>Volatile Organic Compounds</i>	4
1.3.2	<i>Dioxins/Furans</i>	5
1.3.3	<i>Pesticides/Herbicides</i>	5
2.0	CONTAMINATED MEDIA MANAGEMENT PLAN	6
2.1	SUBSURFACE SOIL	6
2.1.1	<i>Health and Safety Requirements</i>	6
2.1.2	<i>Soil Management Protocol</i>	6
2.2	GROUNDWATER	8
2.2.1	<i>General Conditions</i>	8
2.2.2	<i>Protocol for Handling Groundwater During Construction</i>	8
2.3	STORM WATER	9
2.4	CONSTRUCTION EQUIPMENT DECONTAMINATION	9
3.0	SOIL CLASSIFICATION, REUSE, AND DISPOSAL	10
4.0	PROJECT CLOSEOUT REPORT	11
5.0	REFERENCES	12

LIST OF FIGURES

- Figure 1-1 Site Location Map
- Figure 1-2 Site Layout Map
- Figure 1-3 Former DDT Trench Detail

LIST OF TABLES

- Table 1-1 Summary of Soil Verification Data
- Table 1-2a Historical Summary of Groundwater Analytical Results - Shallow Aquifer - VOCs, SVOCs, and Petroleum Hydrocarbons
- Table 1-2b Historical Summary of Groundwater Analytical Results - Shallow Aquifer - Dioxins/Furans And Herbicides/Pesticides
- Table 1-3a Historical Summary of Groundwater Analytical Results - Intermediate Aquifer - VOCs and Petroleum Hydrocarbons
- Table 1-3b Historical Summary of Groundwater Analytical Results - Intermediate Aquifer - Dioxins/Furans And Herbicides/Pesticides
- Table 1-4a Historical Summary of Groundwater Analytical Results - Deep Aquifer - VOCs and Petroleum Hydrocarbons
- Table 1-4b Historical Summary of Groundwater Analytical Results - Deep Aquifer - Dioxins/Furans And Herbicides/Pesticides
- Table 1-5a Historical Summary of Groundwater Analytical Results - Basalt Aquifer - VOCs and Petroleum Hydrocarbons
- Table 1-5b Historical Summary of Groundwater Analytical Results - Basalt Aquifer - Dioxins/Furans And Herbicides/Pesticides
- Table 2-1 Soil Management Options - On-Site Use
- Table 2-2 Soil Management Options - Off-Site Use

1.0

INTRODUCTION

This Soil and Groundwater Management Plan (SGMP) has been prepared to support the development of Lots 1 and 2 (the Site) of the current ATOFINA Chemicals, Inc., (ATOFINA Chemicals) property at 6400 N.W. Front Avenue in Portland, Oregon (Figure 1-1). This SGMP describes how select soils and groundwater should be characterized and managed if these soils and groundwater are generated and/or handled as part of the property development. The following paragraphs provide background information regarding the ATOFINA Chemicals property and environmental conditions which exist at the Site.

The Site represents the two northernmost lots (i.e., Lots 1 and 2) of the property currently owned by ATOFINA Chemicals. The summary of operations and history described below is applicable to the ATOFINA Chemicals facility in general. It is included for completeness and to provide general background regarding the historical impacts to the Site.

1.1

GENERAL SITE BACKGROUND

The following paragraphs provide a general description of the entire ATOFINA Chemicals property (i.e., Lots 1 through 4) and historical operations. The majority of this information was obtained from the *Preliminary Assessment* (PA), dated 31 August 1999 (Elf Atochem 1999) and the *Phase II Preliminary Assessment* (Phase II PA), dated 17 April 2000 (Elf Atochem 2000), both prepared by ATOFINA Chemicals (formerly Elf Atochem North America).

The ATOFINA Chemicals facility is a former inorganic chemical manufacturing plant. The property is located along the west bank of the Willamette River at approximately river mile 7.5. A site location map is included as Figure 1-1. The ATOFINA Chemicals property is located on approximately 55 acres in the Northwest Portland Industrial Sanctuary, zoned and designated IH for heavy industrial use. The plant is bordered on the east by the Willamette River, on the south by CertainTeed Group, and on the north and west by N.W. Front Avenue. The nearest residential structures are located approximately 0.3 miles southwest and upgradient of the facility. The plant's northern most acreage (i.e., Lots 1 and 2, the Site) is currently undeveloped. These two lots account for approximately 15 acres of the ATOFINA Chemicals property (Figure 1-2).

Various chemicals have been historically produced at the facility since 1941, including sodium chlorate, potassium chlorate, chlorine, sodium

hydroxide, DDT, sodium orthosilicate, sodium hydroxide, magnesium chloride hexahydrate, ammonia, ammonium perchlorate, and hydrochloric acid. Most recently, the facility was an operating chloro-alkali plant until 2001 when the entire facility was shut down due to escalating electricity costs. No manufacturing operations have historically taken place on Lots 1 and 2.

1.2 DDT TRENCH BACKGROUND

In 1992, a trench identified on the northern property was found to contain what appeared to be pesticide residues (Figure 1-3). Tests confirmed this trench held soils which contained residue from a DDT manufacturing process. A review of prior operations at the plant indicated that Pennwalt had manufactured DDT for a brief period of time, and confirmed that the material in one of the trenches came from a former manufacturing process waste pond which was located in the southern portion of the ATOFINA Chemicals property (Elf Atochem 1999).

In the fall of 1992, ATOFINA Chemicals conducted a soil exploration program to assess the horizontal and vertical extent of the affected soil in the trench. The investigation determined that the trench was approximately 30 feet wide by 80 feet long and approximately 10 to 11 feet deep. The chemical of concern identified in the soils was DDT residue in concentrations exceeding ODEQ simple soil cleanup rules. These cleanup levels were developed by ODEQ to provide conservative, residential standards for the cleanup of contaminated soil while protecting human health. The only chemicals detected in the soils in the trench were DDT and monochlorobenzene (MCB). MCB concentrations were well below any of Oregon's simple soil cleanup levels and Toxicity Characteristic Leaching Procedure levels were below the leachate reference concentration. Therefore, MCB was not a targeted constituent of concern during the cleanup activities (CH2M Hill 1995).

Because the trench was a clearly defined, discrete unit, the trench was completely excavated during the summer of 1994. Approximately 1,700 tons of soil were removed and disposed at an approved off-site facility. Post-excavation confirmation sampling showed that surrounding soils met Oregon's residential soil cleanup levels. After verification sampling was performed, the excavation was backfilled with clean fill (CH2M Hill 1995) and marked with yellow identification tape beneath the surface to allow future location of the area. Three feet of clean fill were then placed over the entire trench area. This soil removal action was documented in the *Remedial Action Report, North Plant Area*, dated April 1995 (CH2M Hill 1995).

The verification sampling confirmed that all soils exceeding ODEQ residential standards had been removed, and that only traces of DDT remained in soil along the former trench sidewalls. Table 1-1 presents the results of the 1994 confirmation sampling and comparison to Environmental Protection Agency (EPA) Region 9 Residential and Industrial Preliminary Remediation Goals (PRGs)¹. This soil is located deeper than 3 feet below the current ground surface. The DDT trench was originally located 3 feet beneath clean surface soil. When the trench was excavated, the trench was backfilled to ground surface with clean fill. The DDT concentrations detected were all below the industrial PRG value (developed for protection of future site workers' health), and only one detection was slightly above the residential PRG value (developed for protection of hypothetical residents' health). Therefore, these soils do not present a significant risk to human health. However, excavated or exposed residual trench soils could present a potential ecological impact via the storm water runoff pathway.

1.3

RHONE-POULENC GROUNDWATER PLUME

Rhone-Poulenc is located west (and hydraulically upgradient) of the ATOFINA Chemicals facility, at 6200 NW St. Helens Road. Rhone-Poulenc formulated and manufactured pesticides at East Doane Lake from 1943 to 1991. During that time, an unknown quantity of chemicals entered the environment through spills and leaks from a variety of sources and direct discharge of wastewater to the former East Doane Lake.

Rhone-Poulenc began soil and groundwater investigations in the early 1980s in cooperation with and under the direction of ODEQ. In 1989, Rhone-Poulenc and ODEQ signed a consent order to develop a plan to address contaminated soil, groundwater, and surface water.

ODEQ is continuing to work with Rhone-Poulenc on the site investigation. The company and ODEQ will collect information to evaluate the extent of the contamination; future land and water uses; assess risks associated with contamination; and evaluate the range of cleanup options. On-going semi-annual groundwater monitoring is currently performed by AMEC Earth and Environmental, Inc. (AMEC).

¹ PRGs are risk-based concentrations that are intended to assist risk assessors in initial screening-level evaluations of environmental measurements. These levels are more applicable to the Site than the Oregon's residential soil cleanup levels due to the exposure assumptions used in developing the concentrations. The industrial PRG is applicable to the Site due its location in the Northwest Industrial Sanctuary (Section 1.1).

Contaminants associated with the Rhone-Poulenc facility have been detected at low concentrations in the shallow, intermediate, deep, and basalt groundwater aquifers on Lots 1 and 2. These constituents include VOCs, dioxins/furans, and herbicides/pesticides. Limited data available for semi-volatile organic compounds do not reveal any detections at the Site.

Tables 1-2, 1-3, 1-4, and 1-5 present select historical groundwater monitoring data for the Rhone-Poulenc monitoring wells located on Lots 1 and 2 and several wells located immediately upgradient of the Site for the shallow, intermediate, deep, and basalt groundwater aquifers, respectively. This data is not complete, but is intended to illustrate typical historical groundwater concentrations associated with the Rhone Poulenc plume. The locations of the wells located on the Site are depicted on Figure 1-2. The following sections discuss the specific constituents detected in groundwater at the Site. Shallow groundwater beneath the subject Site is located at approximately 25 feet below ground surface.

1.3.1 *Volatile Organic Compounds*

VOCs have been detected at low concentrations on the Site and upgradient. The VOCs that have been historically detected in groundwater on the Site are summarized in Table 4-6. Generally, detections of VOCs have been in the intermediate, deep, and basalt aquifers, with the highest detections in the deep and basalt aquifers. Detections of VOCs in the shallow aquifer above laboratory quantitation limits have been limited to one direct-push sample collected in 1999 (Cable Huston 1999). These detections were only slightly above the respective laboratory quantitation limits. Similar, or higher, concentrations of all of these constituents have been detected in the shallow aquifer upgradient from the Site. The available data indicates there have been no detections of VOCs above laboratory quantitation limits in either of the shallow groundwater monitoring wells located on the Site (i.e., wells RP-02-31 and W-19-S).

Figure 4-6 presents select VOC data for the shallow aquifer Rhone Poulenc wells on the Site and upgradient. The VOCs presented on Figure 4-6 (i.e., benzene, 1,2-dichlorobenzene [1,2-DCB], and trichloroethene [TCE]) are the three of the major constituents of concern for the Rhone Poulenc plume (AMEC 2002).

Based on the analytical results presented in Tables 4-2, 4-3, 4-4, and 4-5, all of the VOCs detected in the intermediate, deep, and basalt aquifers were either (or both):

- Detected at similar or higher concentrations upgradient of the Site (either same or higher aquifer);
- Not detected in the shallow aquifer on the Site.

Both of these observations imply an upgradient source of contamination. The majority of the VOCs detected on Lots 1 and 2 are known contaminants of potential concern associated with the Rhone Poulenc groundwater plume and have been detected across the Rhone Poulenc site, in all four investigated aquifers (AMEC 2002).

1.3.2 *Dioxins/Furans*

Dioxins have been detected in the shallow, intermediate, deep, and basalt aquifers on the Site and upgradient. The dioxins/furans that have been historically detected in groundwater on the Site are listed in Tables 4-2, 4-3, 4-4, and 4-5. For every dioxin/furan detected on the Site, similar or higher concentrations of that constituent have been detected upgradient of the Site. This observation implies an upgradient source of contamination. Dioxins/furans are known contaminants of potential concern associated with the Rhone Poulenc groundwater plume and have been detected across the Rhone Poulenc site, in all four investigated aquifers (AMEC 2002).

1.3.3 *Pesticides/Herbicides*

Pesticides and herbicides have been detected on a limited basis in the deep and basalt aquifers on the Site and in all four aquifers upgradient. The pesticides that have been historically detected in groundwater on the Site are listed in Tables 4-2, 4-3, 4-4, and 4-5. The lack of presence of these constituents in the shallow and intermediate groundwater aquifers on the Site implies an upgradient source of contamination. All of the detected pesticides/herbicides are known contaminants of potential concern associated with the Rhone Poulenc groundwater plume and have been detected across the Rhone Poulenc site, in all four investigated aquifers (AMEC 2002).

2.0 *CONTAMINATED MEDIA MANAGEMENT PLAN*

2.1 *SUBSURFACE SOIL*

In order to address the handling of soils potentially containing trace concentrations of DDT, a conservative area has been defined that outlines a soil contingency management zone. Because the former DDT Trench resided on Lot 1 only, this management zone and associated soil handling protocols apply to Lot 1 only. The final dimensions of the excavated trench measured 40 feet wide by 90 feet long by approximately 10 to 11 feet deep. A 10-foot wide buffer strip has been established around the perimeter of the trench area. The disturbance of soil within this buffer (e.g., soils excavated for foundations or utilities) must be managed as described in this section of the Plan. However, because the trench was located under 3 feet of clean fill, the special handling procedures only come into effect when soils are disturbed at a depth of 3 feet or greater.

It is expected that all soils that are disturbed outside of the buffer identified in Figure 1-3 (including Lot 2 soils) will be managed using traditional Best Management Practices to include, but not be limited to, proper compaction, erosion control, and dust control as necessary.

2.1.1 *Health and Safety Requirements*

Soil potentially containing DDT may be excavated during planned construction activities at the Site. Since concentrations of DDT in Site soils do not exceed risk-based levels for protection of worker health, no personal protective equipment or special handling procedures will be required during handling of the soils.

2.1.2 *Soil Management Protocol*

The process for managing soil excavated from the former DDT trench buffer zone during development, if necessary, includes:

- Excavation of soil as required for the construction of buildings and utilities;
- Erosion control associated with stockpiled soils;
- Soil characterization (if required; see below), which includes collecting and analyzing samples;

- Soil classification for reuse or disposal using the data from the soil characterization as described in Section 3.0;
- Reuse or disposal of excavated soil; and
- Documentation of soil management.

Based on extensive verification sampling performed in the trench area following removal of contaminated soil, characterization sampling is not required if soil is to be managed on site as subgrade or in lots with institutional controls (Table 2-1). Use of excavated soil as subgrade backfill means that the backfill is beneath pavement, buildings, or placed below a minimum of 3 feet of clean soil.

Characterization sampling is only required for unrestricted on- or off-site use (1A or 2A on Tables 2-1 and 2-2), or for disposal at a Subtitle C or D landfill in accordance with Table 2-2. If such characterization is to be performed, soil samples will be collected, according to laboratory and analytical method specifications, to identify appropriate methods for managing the soil following excavation.

Soil stockpiles will be managed according to ODEQ and City of Portland guidelines, and in accordance with the Site 1200 C Permit.

Soil classification for future earthwork will be tailored to the particular activity. For smaller excavations (i.e., less than 1 to 2 cubic yards), the cost of disposing the soil at a permitted facility or re-burying the soil on site (rather than reusing the soil on site as unrestricted fill) may be less significant than the effort required to collect and analyze samples to classify the soil. Pre-excavation classification is advised for larger excavations (i.e., greater than 5 cubic yards) to facilitate soil management during construction.

All samples will be analyzed for:

- DDT by USEPA Method 8081A;
- DDD by USEPA Method 8081A; and
- DDE by USEPA Method 8081A.

To classify excavated soils for reuse or disposal, measured concentrations will be compared to the site-specific standards in Tables 2-1 and 2-2 as described in Section 3.0. Table 2-1 presents options for managing soil on site. Soil which does not contain any detectable pesticides is suitable for

unrestricted on-site use (1A). Soil containing detectable pesticides, or soil that is not tested, is suitable for placement under concrete building foundations or re-burial below 3 feet below ground surface (1B).

Table 2-2 presents options for managing soil off site. Soil which does not contain any detectable pesticides is suitable for unrestricted off-site use (2A). In accordance with Oregon Administrative Rule 340-109-0010(4)(b), disposal options for soil containing detectable pesticides will be based on comparison to the land disposal concentration-based standards defined in 40 CFR 268.40. Soil with detections less than these concentrations will be suitable for disposal at a Subtitle D facility (2B). Soil with detections greater than these concentrations will require disposal at a Subtitle C facility (2C).

If soil from the management zone is excavated and re-buried on-site in accordance with the protocols in this section, the new burial area will be surveyed and this SGMP will be updated with the new documented soil location. The results of characterization testing and the disposition of soil excavated during construction will be documented in the Project Closeout Report.

2.2 **GROUNDWATER**

2.2.1 *General Conditions*

Previous studies at the Site have indicated the presence of volatile organic compounds and herbicides at low levels in groundwater as a result of off-site sources. The average depth to the water table at the Site, 25 feet, is much deeper than the maximum depth of foundation and sewer line excavations anticipated to be built at the Site. Therefore, groundwater should not typically be encountered during future construction activities at the Site. The water table may be encountered however, due to the presence of shallow seasonally perched groundwater, or if deep excavation occurs during periods of seasonally high water table conditions.

2.2.2 *Protocol for Handling Groundwater During Construction*

If encountered, groundwater must be collected and contained in temporary storage containers for off-site disposal at an approved facility in accordance with applicable Federal and State regulations. These protocols apply to groundwater beneath both Lots 1 and 2.

2.3 *STORM WATER*

During construction activities and following development of the Site, storm water will be managed in accordance with the Site's 1200 C Permit and National Pollutant Discharge Elimination System Permit. Best management practices should also be employed at the Site and may include, but not be limited to, the use of silt fencing during construction, storm drain filters, and clean fill near storm water drains.

2.4 *CONSTRUCTION EQUIPMENT DECONTAMINATION*

Earthwork equipment and other vehicles working in the buffer must be washed prior to leaving the Site to prevent spreading of Site soil to the surrounding public streets. Temporary wheel-wash stations will be used to clean the tires and exteriors of vehicles leaving the Site. The earthwork contractor in charge of each construction phase of the project will be responsible for assuring that soil is not tracked onto city streets during future construction phases. Wheel-wash water may be used in water trucks on unpaved areas on site for dust control sprinkling.

3.0

SOIL CLASSIFICATION, REUSE, AND DISPOSAL

Soil classifications have been established for on-site reuse and off-site reuse or disposal. The soil classifications are:

- On-site, unrestricted use (1A).
- On-site, restricted subgrade use (1B).
- Off-site use as clean fill (2A).
- Off-site disposal at a Subtitle D landfill (2B).
- Off-site disposal at a Subtitle C landfill (2C).

Soil excavated during Site development that meets 1A and 2A requirements may be reused on- or off-site without restriction. The 1A and 2A classifications are defined as soil with concentrations of DDT, DDD, and DDE below the laboratory Method Detection Limits.

Soil that does not meet the requirements for the 1A and 2A classifications will be used on site, if possible, based on contaminant concentrations, and soil site grade and fill limitations. Soil with detectable concentrations of DDT, DDD, and DDE, or soil that is not tested, will be classified as 1B. Excavated 1B soils may be reused anywhere on site deeper than 3 feet below final grade or at any depth beneath roads or structures. The depth restriction is a function of the future industrial exposure scenario and is based on the potential for workers to be exposed to the top 3 feet of soil.

Soil with detections less than land disposal concentration-based standards defined in 40 CFR 268.40 will be suitable for disposal at a Subtitle D facility (classified as 2B). Soil with detections greater than these concentrations will require disposal at a Subtitle C facility (classified as 2C). The use of industrial and municipal landfills is subject to the terms and conditions of their respective solid waste permits. Landfill requirements for soil disposal may be more restrictive than those listed above. The owner/operator of the landfill should be contacted for prior approval and specific requirements for soil disposal.

4.0

PROJECT CLOSEOUT REPORT

Upon completion of the soil management activities, a draft project closeout report shall be submitted to ODEQ for review. A final project closeout report shall be submitted for ODEQ approval addressing ODEQ's comments on the draft report. The project closeout report shall include a description of construction activities completed, identifying the approximate volumes of soil excavated by reuse/disposal classification, the disposition of excavated soil, the location of geotextile markers, the results of testing performed during construction, and the nature of deviations, if any, from this SGMP.

REFERENCES

AMEC 2001a. *Final Spring and Fall 2000 Groundwater Data and Evaluation*. AMEC Earth & Environmental, Inc. 31 July 2001.

AMEC 2001b. *Focused Spring 2001 Groundwater Characterization Event, Groundwater Monitoring Report, RPAC - Portland Site*. AMEC Earth & Environmental, Inc. 4 October 2001.

AMEC 2002. *Focused Spring 2002 Groundwater Characterization Event, Groundwater Monitoring Report, RPAC - Portland Site*. AMEC Earth & Environmental, Inc. 31 July 2002.

Ater Wynne 1996. Letter from Ater Wynne Hewitt Dodson & Skerritt to Larry Patterson/ ATOFINA Chemicals. Re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results). 12 February 1996.

Cable Huston 1999. Letter from Cable Huston Benedict Haagensen & Lloyd LLP to Larry Patterson/ ATOFINA Chemicals. Re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results). 20 December 1999.

CH2M Hill 1995. *Remedial Action Report, North Plant Area*. CH2M Hill. April 1995.

Elf Atochem 1999. *Preliminary Assessment for Elf Atochem North America, 6400 N.W. Front Avenue, Portland, Oregon*. Elf Atochem. 31 August 1999.

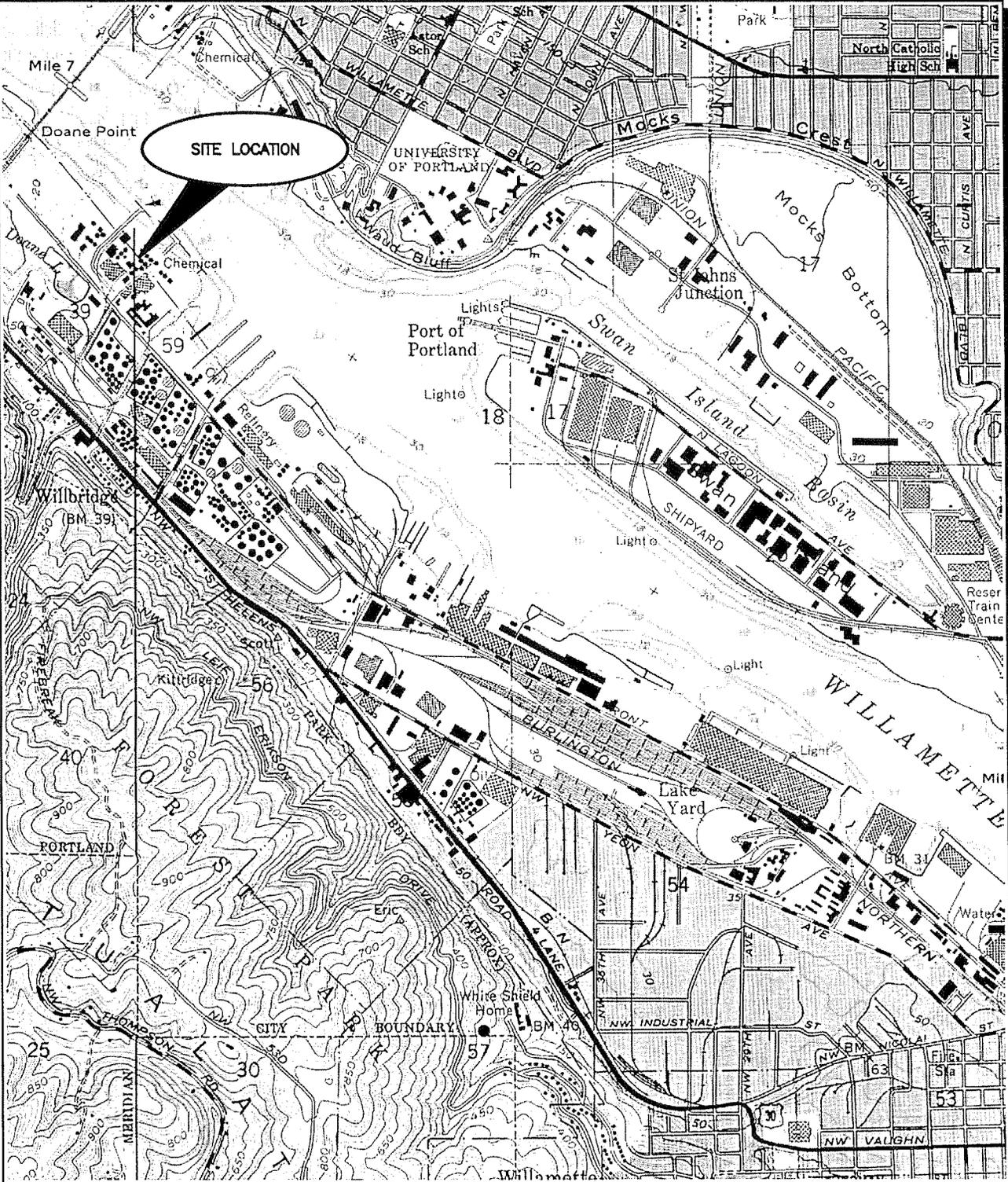
Elf Atochem 2000. *Phase II Preliminary Assessment for Elf Atochem North America, 6400 N.W. Front Avenue, Portland, Oregon*. Elf Atochem. 17 April 2000.

Geraghty & Miller 1991. *Hydrological Investigation of the Doane Lake Area, Portland, Oregon*. Geraghty & Miller. 22 February 1991.

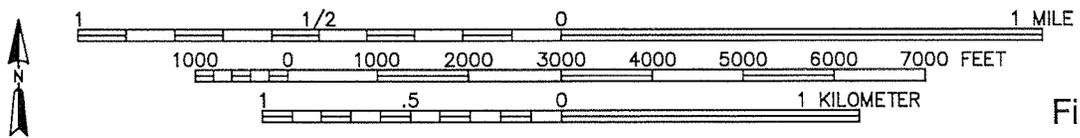
ODEQ 2000. *Managing Waste Pesticide*. ODEQ. 7 November 2000.

Figures

Project No. 5136.00
 Date: 02/07/03
 Drawn By: R. Olson
 CAD File: C:\5136\00\51360001.dwg



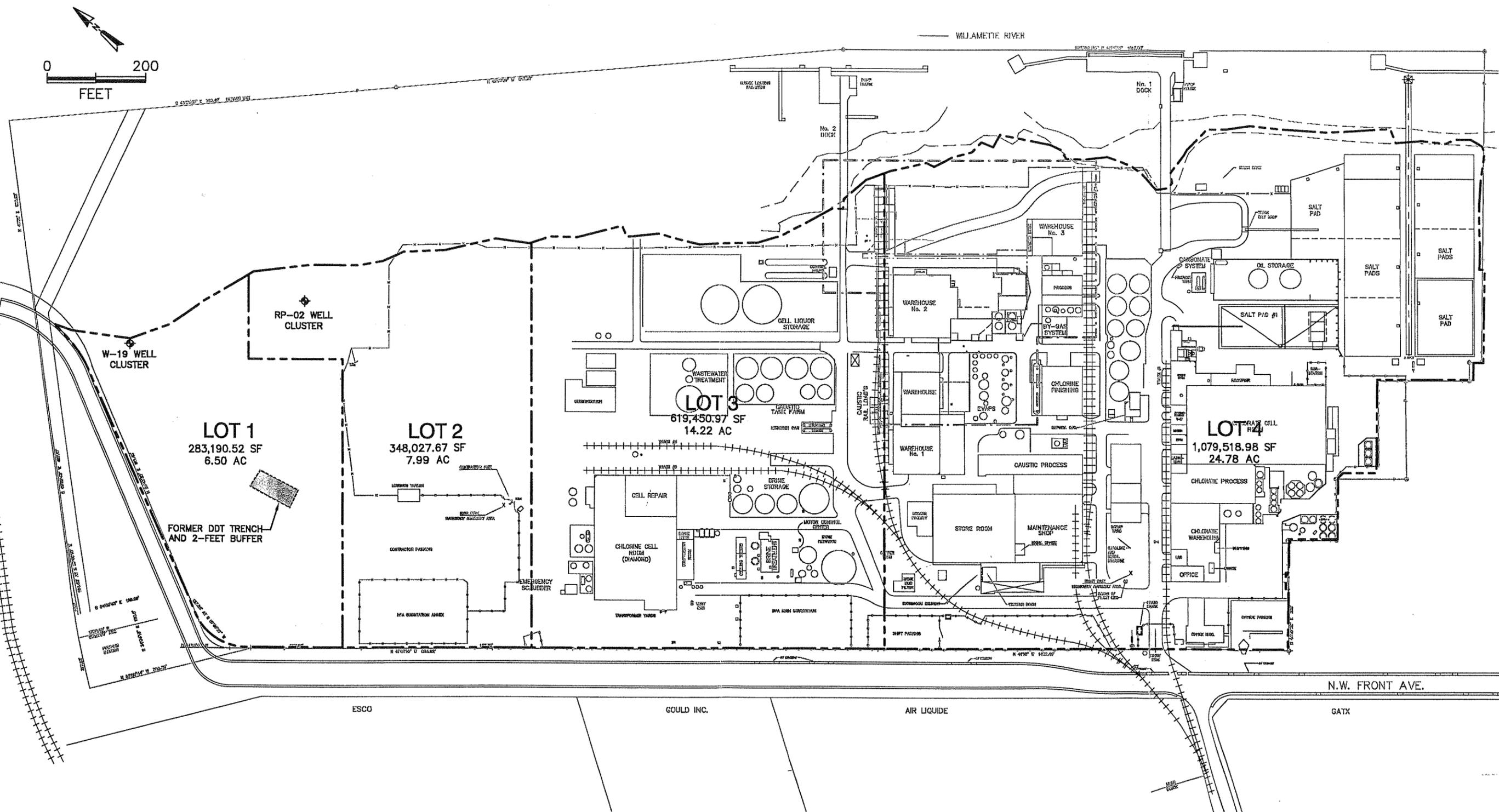
SCALE 1:24,000



References:
 U.S.G.S. 7.5 Minute Series (Topographic Portland,
 Oregon-Washington)
 Dated: 1961; Photorevised 1970 and 1977

Figure 1-1
 Site Location Map
 ATOFINA Chemicals, Inc.
 Portland, Oregon

CAD File: G:\5136\00\51360002.dwg
 Drawn By: R. Olson
 Date: 02/07/03
 Project No: 5136.00



- LEGEND**
- MONITORING WELL CLUSTER
 - FORMER DDT TRENCH
 - 2-FEET BUFFER
 - APPROXIMATE LOT BOUNDARIES

Figure 1-2
 Site Layout Map
 ATOFINA Chemicals, Inc.
 Portland, Oregon

CAD File: G:\5136\00\51360003.dwg
 Drawn By: R. Olson
 Date: 02/10/03
 Project No. 5136.00

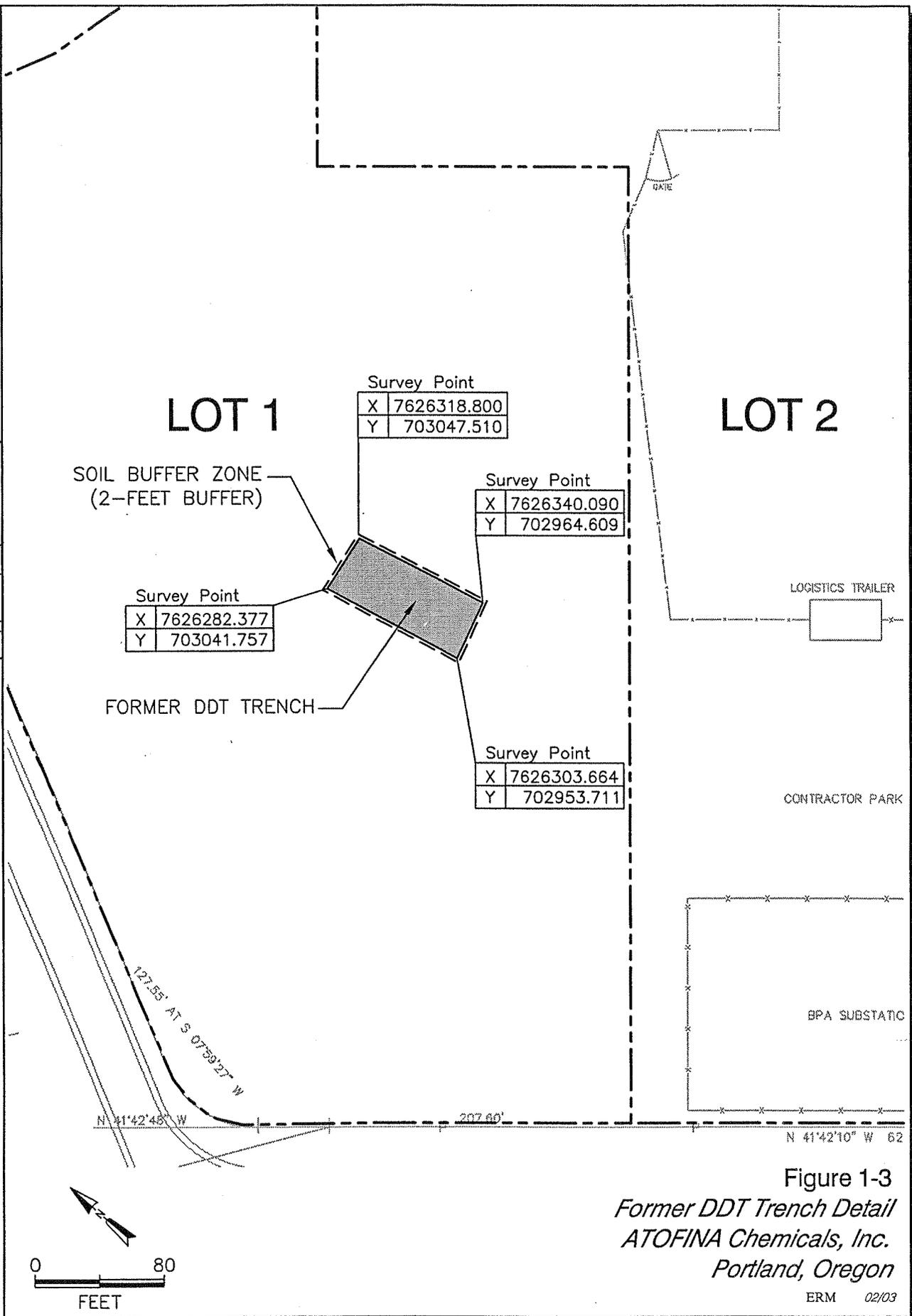


Figure 1-3
 Former DDT Trench Detail
 ATOFINA Chemicals, Inc.
 Portland, Oregon
 ERM 02/03

Tables

Table 1-1
 Summary of Soil Verification Data
 ATOFINA Chemicals Inc.
 Portland, OR

Sample ID	Location Description	Approximate Depth ^a ft	Analyte		
			DDD mg/kg	DDE mg/kg	DDT mg/kg
1	West wall	4	0.039	ND	0.11
2-2	West wall	9	ND	ND	ND
3	Center west bottom	11	0.19	0.014	0.48
4-2	South wall	4.5	ND	ND	1.4
5-3	South wall	4.5	ND	ND	ND
6	South wall	8.5	0.015	ND	0.018
7	Southeast bottom	10.5	0.33	0.052	0.97
8	Southwest bottom	11	0.91	0.29	0.17
9	Center east bottom	10.5	ND	ND	ND
10-2	East wall	9.5	ND	ND	ND
11-2	East wall	4.5	ND	ND	0.9
12	East wall	9	ND	ND	ND
13	East wall	4	ND	ND	ND
AC-01-A	West wall	4	ND	ND	0.016
AC-02-A	West wall	9	ND	ND	ND
AC-03	Center bottom	11.5	0.014	0.063	ND
AC-04-2	West wall	4.5	ND	ND	ND
AC-05-A	West wall	9.5	0.056	ND	0.76
AC-06	West bottom	11.5	ND	ND	0.03
AC-07-2	West bottom	12.5	0.3	ND	0.25
AC-08-2	West wall	4	ND	ND	0.69
AC-09-A	West wall	9.5	ND	ND	ND
AC-10-2	Northwest bottom	13	0.19	ND	0.15
AC-11-2	North wall	4.5	ND	ND	1.0
AC-12-3	North wall	9.5	ND	ND	1.8
AC-13-3	North wall	9.5	ND	ND	ND
AC-14	Northeast bottom	11	ND	ND	ND
AC-15-2	East wall	4.5	ND	ND	ND
AC-16-A	East wall	9.5	ND	ND	0.13
AC-17-2	East bottom	12.5	ND	ND	ND
AC-18-A	East wall	4.5	ND	ND	0.74
AC-19-A	East wall	9.5	ND	ND	ND
AC-20	Center east bottom	11.5	0.058	ND	ND
USEPA Region 9 PRG; Industrial Soil			10	7.0	7.0
USEPA Region 9 PRG; Residential Soil			2.4	1.7	1.7

Results based on confirmation sampling results presented in *Remedial Action Report*,
 North Plant Area (CH2M Hill 1995)

ND = Not detected
 PRG = Preliminary Remediation Goals (October 2002)
 USEPA = United States Environmental Protection Agency
 a = Depths listed are in feet below original ground surface prior to excavation
 Shaded cells indicate exceedance of the residential PRG

Table 1-2a
 Historical Summary of Groundwater Analytical Results
 Volatile Organic Compounds, Semi-Volatile Organic Compounds, and Petroleum Hydrocarbons
 Shallow Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref	Volatile Organic Compounds (ug/l)																				Semivolatile Organic Compounds (ug/l)					Hydrocarbons (mg/l)					
			Acetone	Benzene	Chloro benzene	1,2-DCB	1,4-DCB	1,1-DCA	1,1-DCE	1,2-DCE	cis-1,2-DCE	Ethyl-benzene	Hexachloro-butadiene	Isopropyl-benzene	p-isopropyl-toluene	Napthalene	n-propyl-benzene	PCE	Toluene	TCE	1,2,4-TMB	1,3,5-TMB	m,p-xylene	o-xylene	total xylene	Vinyl Chloride	2-methyl phenol	4-methyl phenol	Phenol	2,4-DCP	2,4-DMP	Diesel	Fuel Oil #6
ONSITE WELLS																																	
CGW-010 (27-30')	10/28/1999	3	<25.0	<1.0	<1.0	<1.0	<1.0	NR	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	<1.0	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	NR	NR	NR	NR	NR	NR
CGW-015 (30-33')	10/28/1999	3	<25.0	1.39	<1.0	<1.0	<1.0	NR	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	3.02	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	NR	NR	NR	NR	NR	NR
CGW-016 (27-30')	10/28/1999	3	27.9	1.41	1.29	11.5	1.83	NR	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	3.73	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	NR	NR	NR	NR	NR	NR
RP-02-31	4/16/2000	6	<25.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	<25.0	<25.0	<25.0	<25.0	NS	NS	
RP-02-31	10/16/2000	6	<25.0	<1.0	<1.0	(0.30) U	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	NR	<1.0	NS	NS	<25.0	<25.0	<25.0	NS	NS	
RP-02-31	6/19/2001	1	<5.0	<1.21	<0.14	<0.087	<0.176	<0.214	<5.0	<0.087	<0.187	<0.143	0.31 J	<0.175	<0.134	<0.104	<0.114	<5.0	0.28 J,U,T,B	<5.0	<0.119	<0.171	<0.262	<0.091	NR	<0.310	NS	NS	NS	NS	NS	NS	NS
RP-02-31	4/4/2002	5	<25.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NS	NS	NS	NS	<0.25	NS	
W-19-S	3/28/1995	4	NR	<0.5	<0.5	<1.0	<1.0	NR	NR	NR	NR	<0.5	NR	NR	NR	NR	NR	<0.50	NR	NR	NR	NR	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	
W-19-S	4/18/2000	6	<25.0	<1.0	<1.0	(0.51) J	<1.0	NR	<1.0	NR	<1.0	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	(0.34) J	<1.0	NR	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NS	NS	
W-19-S*	6/19/2001	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
W-19-S	4/5/2002	5	<25.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
OFFSITE WELLS																																	
GM-1-S	10/1/1990	2	NS	1 J	5 U	2 J	10 U	NS	5 U	5 U	NS	1 J	NS	NS	NS	10 U	NS	5 U	170	5 U	ND	ND	NR	NR	3 J	NS	10	10	10 U,J	10 U	10 U	NR	NR
RP-01-31	4/17/2000	6	NR	<1.0	<1.0	3.74	1.28	NR	<1.0	NR	<1.0	<1.0	NR	<1.0	<1.0	<1.0	NR	<1.0	<1.0	<1.0	NR	<1.0	<2.0	<1.0	NR	<1.0	NS	NS	NR	NR	NR	NR	NR
RP-01-31	6/26/2001	1	<5.0	<1.21	<0.14	<0.087	<0.176	<0.214	<5.0	<0.087	<0.187	<0.143	<0.263	<0.175	<0.134	0.57 J,B,U,N,MB,SB	<0.114	<5.0	<0.115	<5.0	<0.119	<0.171	<0.262	<0.091	NR	NR	NS	NS	NR	NR	NR	<0.125	<0.250
RP-01-31	4/1/2002	5	NR	<1.0	NR	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NS	NS	NR	NR	NR	NR	<0.25	NR
W-03-S	4/12/2000	6	<25.0	<1.0	<1.0	2.81	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	
W-03-S	10/9/2000	6	<25.0	<1.0	<1.0	3.23	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	
W-04-S	4/12/2000	6	NR	<1.0	<1.0	1.86	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	
W-04-S	10/9/2000	6	NR	<1.0	<1.0	1.9	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	
W-11-S	10/10/2000	6	NR	1.11	<1.0	<1.0	<1.0	NR	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	
W-11-S	6/21/2001	1	5.91 J,LC	1.03	<0.14	<0.087	<0.176	<0.214	<5.0	<0.087	<0.187	<0.143	<0.263	<0.175	0.15 J	0.78 J,B,U,MB	<0.114	<5.0	0.98 J	<5.0	0.29 J	0.19 J,J,CH	0.4 J	0.3 J	NR	NR	NS	NS	NR	NR	NR	1.08	0.505
W-11-S	4/9/2002	5	<25.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NR	<1.00	<1.00	<2.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00					0.475	NR	
W-12-S	10/1/1990	2	NS	2 J	5 U	10 U	10 U	NS	5 U	5 U	NS	5 U	NS	NS	NS	10 U	NS	5 U	1 J	5 U	ND	ND	NR	NR	5 U	NS	20 U	20 U	8 J	25	11	NR	NR
W-12-S	4/11/2000	6	NR	1.98	<1.0	<1.0	<1.0	NR	<1.0	NR	5.44	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	
W-12-S	10/10/2000	6	NR	1.79	<1.0	<1.0	<1.0	NR	<1.0	NR	6.57	<1.0	NR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	NS	NR	NR	NR	NR	NR	NR	
W-15-S	10/1/1990	2	NS	ND J	ND	10 U	10 U	NS	ND U	ND U	NS	ND U	NS	NS	NS	10 U	NS	ND U	ND J	ND U	ND	ND	NR	NR	ND	NS	10 U	10 U	14	10 U	10 U	<0.25	NR
W-16-31	6/22/2001	1	6.35 J	7.69	3.59	0.96 J	0.31 J	1.12	<5.0	<1.0	<0.187	0.56 J	<0.263	0.2 J,N,SB	<0.134	1.08	0.12 J	<5.0	3.65	<5.0	0.82 J	0.27 J	2.61	1.9	NR	<1.0	NS	NS	NR	NR	67.4	<0.125	<0.250
W-16-31	4/1/2002	5	NR	2.66	NR	1.61	NR	1.13	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	1.85	NR	NR	NR	NR	NR	NR	NS	NS	NR	NR	30.1			

1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 1-2b
 Historical Summary of Groundwater Analytical Results
 Dioxins/Furans and Herbicides/Pesticides
 Shallow Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Dioxins/Furans (pg/l)																							Herbicides/Pesticides (ug/l)							
			1,2,3,4,6,7,8,9-OCDD	EMPC-PeCDF	EMPC-TCDD	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF	1,2,3,4,6,7,8,9-OCDF	1,2,3,7,8-PeCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	EMPC-TCDF	Total HpCDD	Total HpCDF	Total HxCDD	Total HxCDF	Total PeCDF	Total TCDD	Total TCDF	delta-BHC	2,4-D	2,4-DB	2,4,5-T	2,4,5-TP (Silvex)	
ONSITE WELLS																																	
RP-02-31	4/18/2000	6	<11.67	NR	NR	<8.79	<5.36	<7.55	<7.28	<6.35	<6.31	<5.31	<3.99	<4.66	<14.65	<6.23	<6.3	<7.77	<6.89	NR	<8.79	<5.36	<6.35	<3.99	<8.73	<7.77	<6.89	NS	<1.0	<4.0	<1.0	<1.0	
RP-02-31	10/16/2000	6	31.7	NR	NR	3.8 J	1.9 J	<2.0	<1.8	<1.8	<1.7	2 J	<1.2	<1.7	4.5 J	<0.3	<1.3	0.9 J	1.9 J	NR	3.8	1.9	<1.8	2	2.4	0.9	5	NS	<1.0	<4.0	<1.0	<1.0	
RP-02-31	6/19/2001	1	<23.1	<7.08	5.2 M	<8.46	<7.46	<7.66	<11.3	<8.46	<15.3	(3.40) U,N	<3.68	<5.97	<22.2	<4.28	<5.57	<2.0	<5.43	<7.57	NR	<12.4	NR	NR	NR	NR	NR	NS	<0.179	<0.266	<0.150	<0.133	
RP-02-31	4/4/2002	5	67 J	4.5 N	NR	12.5	7 J	6.7 J,N	4.4	4.9	7.9	7.7 J,U	4.1 J,N	4.1	11 J,N	8.5 J	5.6	3.1	6.5 J	19.1 J,N	12.5	10.5 J	17.2 J	22.5 J	18.3 J	3.1	16.5 J	NS	<1.0	<4.0	<1.0	<1.0	
W-19-S	4/18/2000	6	<0.8	NR	NR	<0.7	<0.4	<2.0	<1.8	<1.8	<1.7	<0.3	<1.2	<1.7	<0.7	<0.3	<1.3	<2.0	<0.4	NR	<2.6	<1.8	<1.8	<1.5	<1.3	<1.5	188.3	NS	<1.0	<4.0	<1.0	<1.0	
W-19-S*	10/16/2000	6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
W-19-S*	6/19/2001	1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
W-19-S	4/5/2002	5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
OFFSITE WELLS																																	
GM-1-S	10/1/1990	2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
RP-01-31	10/11/2000	6	10.9 B,J	NR	NR	<0.7	<0.4	<2.0	<1.8	<1.8	<1.7	1.4 J	<1.2	<1.7	<0.7	<0.3	<1.3	<2.0	<0.4	NR	<2.6	<1.8	<1.8	<1.5	<1.3	<1.5	<10.0	NS	<1.0	NR	NR	NR	
RP-01-31	6/26/2001	1	<23.1	<7.08	A	NR	NR	NR	NR	NR	NR	<11.3	NR	NR	<22.2	NR	<27.1	<2.0	<5.43	<7.57	NR	<12.4	NR	NR	NR	<6.44	<7.72	NS	<0.179	<0.266	0.811 J,N,H,T,S,C	NR	
RP-01-31	4/1/2002	5	252	NR	NR	41.8 J	<0.6	NR	<0.7	<0.6	7.8	NR	NR	1.9	NR	3.6	2.9	4.5	5 J	NR	95.6	<0.7	7.8	5.4	6.6	10.4	10.9	NS	<1.0	NR	NR	NR	
W-11-S	4/11/2000	6	<0.8	NR	NR	<0.7	<0.4	<2.0	<1.8	<1.8	<1.7	<0.3	<1.2	<1.7	<0.7	<0.3	<1.3	<2.0	<0.4	NR	<2.6	<1.8	<1.8	<1.5	<1.3	<1.5	70.53	NS	<1.0	NR	NR	NR	
W-11-S	10/10/2000	6	4130	NR	NR	549	125	11.7 J	5.6 J	30.6 J	14 J	13.1 J	5.6	8.7 J	499	3.9 J	6.5 J	16.9	<0.4	NR	981	509	120	145	136	26.4	227	NS	<1.0	NR	NR	NR	
W-11-S	6/21/2001	1	72.1 J,B,U,MB	22.2 N,EM	A	NR	NR	NR	NR	NR	NR	<11.3	NR	NR	<22.2	NR	<27.1	<2.0	10.6	64.5 N,E,M	NR	<12.4	NR	NR	19.2	<6.44	31.6	NS	1.13 J,H,T	0.728 J,HT	<0.150	NR	
W-11-S	4/9/2002	5	9.6 J	NR	NR	<1.2	<0.6	NR	<0.7	<0.6	<2.5	NR	NR	<1.5	NR	<1.3	<1.3	<0.4	<1.0	NR	<4.0	<0.7	<2.4	<1.6	<1.3	<1.4	<1.0	NS	<1.0	NR	NR	NR	
W-12-S	4/11/2000	6	<0.8	NR	NR	<0.7	<0.4	<2.0	<1.8	<1.8	<1.7	<0.3	<1.2	<1.7	<0.7	<0.3	<1.3	<2.0	<0.4	NR	<2.6	<1.8	<1.8	<1.5	<1.3	<1.5	<10.0	NS	4.17 J	NR	NR	NR	
W-15-S	4/1/2002	5	3.8 J	NR	NR	<1.2	<0.6	NR	<0.7	<0.6	<2.5	NR	NR	<1.5	NR	<1.3	<1.3	<0.4	<1.0	NR	<4.0	<0.7	<2.4	<1.6	<1.3	<1.4	<1.0	NS	2.64	NR	NR	NR	
W-16-31	6/22/2001	1	<23.1	<7.08	A	NR	NR	NR	NR	NR	NR	<11.3	NR	NR	<22.2	NR	<27.1	<2.0	<5.43	<7.57	NR	<12.4	NR	NR	NR	<6.44	13.2	NS	<0.179	<0.266	<0.150	NR	

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
- 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
- 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
- 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
- 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
- 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 1-3a
 Historical Summary of Groundwater Analytical Results
 Volatile Organic Compounds and Petroleum Hydrocarbons
 Intermediate Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Volatile Organic Compounds (ug/l)																							Hydrocarbons (mg/l)				
			Benzene	sec-Butylbenzene	Chlorobenzene	4-Chloro-3-methylphenol	1,2-DCB	1,3-DCB	1,4-DCB	1,1-DCE	cis-1,2-DCE	1,2-DCE	Ethylbenzene	2-Hexanone	p-isopropyltoluene	Napthalene	n-propylbenzene	PCE	Toluene	1,1,2-TCA	1,2,3-TCB	TCE	TCFM	1,2,4-TMB	1,3,5-TMB	Total Xylene	Vinyl Chloride	Diesel	Fuel Oil #6	
ONSITE WELLS																														
CGW-010 (36-39)	10/27/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
CGW-013 (36-39)	10/27/1999	3	2.94	NR	NR	NR	1	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
RP-02-49	4/18/2000	6	<1.0	NR	<1.0	NR	3.41 J	<1.0	<2.0	<1.0	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
RP-02-49	10/16/2000	6	<1.0	NR	<1.0	NR	2.74	<1.0	<2.0	<1.0	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
RP-02-49	6/19/2001	1	<0.121	<0.092	0.19 J,U,TB	NR	1.27	<0.125	0.26 J	<0.151	0.2 J	NR	NR	<0.572	<0.134	<0.104	<0.114	0.37 J	<0.115	<0.246	<0.081	<0.359	1.12	<0.119	<0.171	NR	<0.31	<0.125	<0.25	
RP-02-49	4/1/2002	5	NR	NR	<2.0	NR	2.27	<2.0	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
W-19-1	10/1/1990	2	1 J	NR	13	10 U	190	7 J	62	5 U	NR	1 J	5 U	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
W-19-1	3/28/1995	4	1.0	NR	16	NR	96 D	8.9	60 D	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
W-19-1	4/18/2000	6	1.1 J	NR	39.4 J	NR	329 D	11.3 J	98.4 J	1.8 J	5.2	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	3.9 J	<1.0	NR	NR	NR	NR	12.7 J	NR	NR
W-19-1	10/16/2000	6	1.02 J	NR	39.2 D	NR	312 D	9.2 D	89.3 D	<1.0	4.82 D	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	3.16 D	<1.0	NR	NR	NR	NR	24.7 D	NR	NR
W-19-1	6/20/2001	1	0.22 J,U,TB	0.4 J	6.84	NR	43.8	2.03	13.2	0.38 J	1.47	NR	NR	1.92 J	0.72 J	0.58 J,U,N,MB,SB	0.37 J	<0.27	<0.115	0.73 J	<0.081	1.11	<0.245	0.16 J,U,TB	0.46 J,U,CH	NR	1.57	<0.125	<0.25	
W-19-1	4/1/2002	5	NR	NR	33.6	NR	188	6.38	57.1	NR	3.88	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	2.36	NR	NR	NR	NR	9.42	NR	NR	
OFFSITE WELLS																														
RP-01-51	4/17/2000	6	1.12	NR	17.4	NR	227 D	6.61	66.6	<1.0	2.83	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	4.72	<1.0	NR	NR	NR	NR	3.52	NR	NR
RP-01-51	10/11/2000	6	<1.0	NR	13.2	NR	150	5.7	50.4	<1.0	2.7	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	2.9	<1.0	NR	NR	NR	NR	2.29	NR	NR
RP-01-51	6/26/2001	1	0.18 J	<0.092	10.6	NR	124	3.63	36.1	0.4 J	2.44	NR	NR	<0.572	<0.134	<0.104	<0.114	<0.27	<0.115	<0.246	<0.081	2.51	<0.245	<0.119	<0.171	NR	2.44	0.305	0.63	
RP-01-51	4/1/2002	5	NR	NR	19.9	NR	197	6.78	59.7	NR	4.1	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	4.36	NR	NR	NR	NR	NR	4.94	NR	NR
W-03-I	6/26/2001	1	<0.121	<0.092	2.72	NR	10.6	<0.125	0.54 J,U,TB	<0.151	<0.187	NR	NR	<0.572	<0.134	<0.104	<0.114	<0.27	<0.115	<0.246	0.11 J,U,MB	<0.359	<0.245	<0.119	<0.171	NR	<0.31	<0.125	<0.25	
W-03-I	4/1/2002	5	NR	NR	1.77	NR	9.76	<2.0	<1.0	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	NR	NR	NR	NR	NR	<2.0	NR	NR
W-04-I	4/12/2000	6	<1.0	NR	<1.0	NR	1.15	<1.0	<2.0	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	<1.0	NR	NR	NR	NR	<1.0	NR	NR
W-04-I	10/9/2000	6	<1.0	NR	<1.0	NR	2.38	<1.0	<2.0	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	<1.0	NR	NR	NR	NR	<1.0	NR	NR
W-15-I	10/1/1990	2	2 J	NR	5 U	21	21 J	10 J	3 J	5 U	NR	5 U	5 U	NR	NR	10	NR	5 U	5 U	NR	NR	5 U	NR	NR	NR	NR	NR	5 U	NR	NR
W-15-I	4/10/2000	6	<1.0	NR	1.73	NR	25.6	<1.0	3.38	<1.0	<1.0	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	<1.0	NR	NR	NR	NR	1.29	NR	NR
W-15-I	9/29/2000	6	1.14	NR	1.26	NR	20.1	<1.0	3.42	<1.0	1.16	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	<1.0	NR	NR	NR	NR	1.05	NR	NR
W-15-I	6/20/2001	1	0.17 J,U,TB	<0.092	0.98 J	NR	12.1	0.47 J	2.11	<0.151	0.89 J	NR	NR	<0.572	<0.134	<0.104	<0.114	<0.27	<0.115	<0.246	<0.081	<0.359	<0.245	<0.119	<0.171	NR	0.62 J	0.215 J	<0.25	
W-15-I	4/1/2002	5	NR	NR	1.1	NR	12.8	<2.0	1.91	NR	1.11	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	NR	NR	NR	NR	NR	<2.0	NR	NR
W-16-I	6/22/2001	1	<0.121	<0.092	<0.14	NR	<0.087	<0.125	<0.176	<0.151	<0.187	NR	NR	<0.572	<0.134	<0.104	<0.114	<0.27	0.6 J	<0.246	<0.081	<0.359	<0.245	<0.119	<0.171	NR	<0.31	<0.125	<0.25	

1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 1-3b
 Historical Summary of Groundwater Analytical Results
 Dioxins/Furans and Herbicides/Pesticides
 Intermediate Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Dioxins/Furans (pg/l)										Herbicides/Pesticides (ug/l)				
			1,2,3,4,6,7,8,9-OCDD	EMPC-HxCDD	EMPC-TCDD	2,3,7,8-TCDD	2,3,7,8-TCDF	EMPC-TCDF	Total HpCDF	Total HxCDF	Total PeCDF	Total TCDF	Dichloroprop	2,4-D	2,4-DB	2,4,5-T	2,4,5-TP (Silvex)
ONSITE WELLS																	
GGW-010 (36-39)	10/27/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
GGW-013 (36-39)	10/27/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
RP-02-49	10/16/2000	6	9.7 J	NR	NR	<0.5	NR	NR	<0.5	2.1 (as 1,2,3,4,7,8-HxCDF)	<1.0	<10.0	<1.0	<1.0	<4.0	<1.0	<1.0
RP-02-49	4/18/2000	6	ND	NR	NR	ND	ND	NR	ND	ND	ND	ND	<1.0	<1.0	<4.0	<1.0	<1.0
RP-02-49	6/19/2001	1	22.5 J	<31.3	16 Q,N	NR	NR	<7.72	A	3	A	A	<0.173	<1.0	<4.0	<0.15	<0.133
RP-02-49	4/4/2002	5	ND	2.3 U,N	NR	<1.8	<1.4	NR	2.7 (as 1,2,3,4,6,7,8-HpCDF)	2.4 (as 1,2,3,4,7,8-HxCDF)	<1.2	<1.4	<1.0	<1.0	<4.0	<1.0	<1.0
W-19-I	4/18/2000	6	<2.8	NR	NR	<0.5	NR	NR	<0.5	<1.0	<1.0	<10.0	<1.0	<1.0	4.97 J	NR	6.13 J
W-19-I	10/16/2000	6	3.9	NR	NR	0.55 J	NR	NR	2.2 (as 1,2,3,4,7,8-HpCDF)	1.3 (as 1,2,3,4,7,8-HxCDF)	<1.0	<10.0	<1.0	<1.0	<4.0	NR	2.52 J
W-19-I	6/20/2001	1	<15.2	<31.3	A	NR	NR	<7.72	A	A	A	<7.72	<0.173	NR	NR	<0.15	4.22 J, HT
W-19-I	4/1/2002	5	NR	NR	NR	NR	<1.0	NR	NR	NR	NR	<1.0	3.61 J	NR	NR	NR	13.1 J
OFFSITE WELLS																	
RP-01-51	4/17/2000	6	<3.5	<0.7	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	<1.3	<1.0	1.49 J	<1.0	<4.0	NR	7.92 J
RP-01-51	10/11/2000	6	<3.5	<0.7	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	1.2 (as 2,3,4,7,8-PeCDF)	<1.0	<1.0	<1.0	<4.0	NR	<1.0
RP-01-51	6/26/2001	1	<15.2	39.7 Q,N,J, EM, MI	A	NR	NR	<7.72	A	A	A	A	5.57 J,N, HT, SC	NR	NR	0.161 J,J,N, HT, SC	9.07 J, HT
RP-01-51	4/1/2002	5	NR	NR	NR	NR	<1.0	NR	NR	NR	NR	<1.0	4.04	NR	NR	NR	16.7
W-03-I	6/26/2001	1	<15.2	<31.3	A	NR	NR	<7.72	A	A	A	A	0.189 J, HT	NR	NR	0.439 J,J,N, HT, SC	0.839 J,J,N, HT, SC
W-04-I	4/12/2000	6	<3.5	<0.7	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	<1.3	17.662	<1.0	<1.0	<4.0	NR	<1.0
W-12-I	4/11/2000	6	<3.5	<0.7	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	<1.3	<1.0	<1.0	3.12 J	<4.0	NR	<1.0
W-15-I	4/10/2000	6	<3.5	<0.7	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	<1.3	<1.0	<1.0	<1.0	<4.0	NR	1.07 J
W-15-I	6/20/2001	1	<15.2	<31.3	A	NR	NR	8.3 N, EM	A	A	A	A	<0.173	NR	NR	<0.15	0.594 J, HT
W-15-I	4/1/2002	5	NR	NR	NR	NR	2.2 J	NR	NR	NR	NR	2.2	<1.0	NR	NR	NR	1.08
W-16-I	6/22/2001	1	<15.2	<31.3	A	NR	NR	<7.72	A	A	A	A	<0.173	NR	NR	<0.15	<0.133

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
- 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
- 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
- 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
- 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
- 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 1-4a
 Historical Summary of Groundwater Analytical Results
 Volatile Organic Compounds and Petroleum Hydrocarbons
 Deep Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Volatile Organic Compounds (ug/l)																				Hydrocarbons (mg/l)	
			Benzene	Chloro benzene	Chloro form	1,2-DCB	1,3-DCB	1,4-DCB	1,2-DCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,2-DCE	2,4-DCP	Ethylbenzene	Napthalene	PCE	Toluene	TCE	TCFM	m,p-xylene	total xylene	Vinyl Chloride	Diesel
ONSITE WELLS																								
GGW-010 (4750)	10/26/1999	3	<1.0	32.2	<1.0	<1.0	6.03	57.7	NR	1.51	6.07	NR	NR	NR	NR	NR	<1.0	4.05	<1.0	<2.0	NR	13.4	NR	
GGW-015 (4447)	10/26/1999	3	4.71	6.89	<1.0	20.9	<1.0	4.09	NR	<1.0	3.58	NR	NR	NR	NR	NR	12.1	<1.0	<1.0	2.35	NR	9.65	NR	
GGW-014 (4649)	10/27/1999	3	4.02	8.74	<1.0	30.7	<1.0	6.04	NR	<1.0	4.7	NR	NR	NR	NR	NR	8.92	1.05	<1.0	<2.0	NR	11.5	NR	
GGW-016 (4245)	10/28/1999	3	2.33	<1.0	1.62	<1.0	<1.0	<1.0	NR	<1.0	<1.0	NR	NR	NR	NR	NR	5.63	<1.0	26.4	<2.0	NR	<1.0	NR	
RP-02-66	4/18/2000	6	<1.0	5.35 J	NR	59.5 J	1.58 J	14.9 J	<1.0	<1.0	1.1 J	<1.0	NR	NR	NR	NR	<1.0	NR	1.19 J	3.28 J	<2.0	NR	1.87 J	NR
RP-02-66	10/16/2000	6	<1.0	6.27	NR	70.2	1.75	18.2	<1.0	<1.0	1.07	<1.0	NR	NR	NR	NR	<1.0	NR	1.12	2.7	<2.0	NR	4.77	NR
RP-02-66	6/19/2001	1	<0.605	6.3	0.76 J	60.2	1.64	15.9	<0.925	0.3 J	1.25	<0.194	NR	NR	NR	<0.104	<1.35	NR	1.09	1.64	NR	NR	2.28	<0.125
RP-02-66	4/1/2002	5	NR	8.43	NR	72.8	2.09	19.4	NR	NR	1.32	NR	NR	NR	NR	NR	NR	4.34	1.17	1.2	NR	NR	2.57	<0.25
W-19-D	10/1/1990	2	3 J	34	NR	370 E	20	140	NR	5 U	NR	NR	4 J	10	5 U	NR	5 U	2 J	10	NR	NR	5 U	NR	NR
W-19-D	3/28/1995	4	ND	2.7	NR	41	1.8	11	NR	NR	NR	NR	NR	NR	1.8	NR	NR	ND	NR	NR	NR	10	NR	NR
W-19-D	4/18/2000	6	3.13	110	NR	830 D	27.2	244 D	<1.0	4.75	12.9	1.21	NR	NR	NR	NR	<1.0	NR	9.84	<1.0	<2.0	NR	32.3	NR
W-19-D	10/16/2000	6	<1.0	117 D	NR	861 D	24.8 D	248 D	<1.0	<1.0	10.7 D	<1.0	NR	NR	NR	NR	<1.0	NR	7.5 D	<1.0	<2.0	NR	60.5 D	NR
W-19-D	6/20/2001	1	0.43 J,U,TB	18.9	<0.423	120	4.71	35.3	<0.925	0.93 J	3.71	0.27 J	NR	NR	NR	0.6 J,U,NM,BSB	<1.35	NR	2.46	<0.245	NR	NR	5.99	0.269
W-19-D	4/1/2002	5	NR	121	NR	657	22	201	NR	NR	11	NR	NR	NR	NR	NR	<1.0	NR	7.8	<1.0	<2.0	NR	21.6	0.349
OFFSITE WELLS																								
RP-01-65	10/11/2000	6	13.7 D	43.4 D	NR	537 D	20.7 D	<10.0	<1.0	<1.0	7 D	<1.0	NR	NR	NR	NR	<1.0	NR	12.7 D	<1.0	<2.0	NR	6.1 D	NR
RP-01-65	6/26/2001	1	41.4 D	55.4 D	<0.423	722 D	21.8 D	207 D	<0.925	1.85 D	9 D	<0.194	NR	NR	NR	<0.104	<1.35	NR	17.4 D	<1.22	NR	NR	9.05 D	0.448
RP-01-65	4/1/2002	5	NR	53.9	NR	546	19	171	NR	NR	9.1	NR	NR	NR	NR	NR	<1.0	NR	11.4	<1.0	NR	NR	11.8	0.363
W-04-89	6/26/2001	1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.125
W-12-D	10/1/1990	2	5 U	5 U	ND	ND	ND	ND	NR	5 U	NR	NR	5 U	ND	5 U	NR	5 U	4 J	5 U	NR	NR	5 U	NR	NR
W-15-D	10/1/1990	2	1 J	23	NR	200	11	61	NR	5 U	NR	NR	5 U	10	5 U	NR	2 J	1 J	5 U	NR	NR	5 U	NR	NR
W-15-D	4/10/2000	6	2.2	91.2	NR	606	24.6	150	1.54	<1.0	<1.0	<1.0	NR	NR	NR	NR	2.44	NR	1.06	<1.0	<2.0	NR	<1.0	NR
W-15-D	9/29/2000	6	<1.0	79 D	NR	593 D	28.3 D	165 D	<1.0	<1.0	<1.0	<1.0	NR	NR	NR	NR	<1.0	NR	<1.0	<1.0	<2.0	NR	<1.0	NR
W-15-D	6/22/2001	1	1.95 J,D	83.8 D	<0.423	606 D	23.5 D	152 D	4.35 D	<0.151	<0.187	<0.194	NR	NR	NR	<0.104	1.85 D	NR	<1.35	<0.245	NR	NR	<0.31	0.4
W-15-D	4/1/2002	5	<2.0	58.9	NR	342	16.6	94.5	5.64	<2.0	<2.0	<2.0	NR	NR	<2.0	<2.0	<2.0	<2.0	<2.0	<1.0	<4.0	NR	<2.0	0.325

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
- 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
- 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
- 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
- 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
- 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene

PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.

J = The analyte was positively identified, but the associated concentration is an estimate.

D = Compound identified in an analysis at a secondary dilution factor.

N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.

EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.

() = analyte was detected in the sample but the detection level was below the method reporting limit

* = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source

NS = Not sampled

ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 1-4b
Historical Summary of Groundwater Analytical Results
Dioxins/Furans and Herbicides/Pesticides
Deep Aquifer
ATOFINA Chemicals Property and Adjacent Properties
Portland, Oregon

Sample ID	Sample Date	Ref Report	Dioxins/Furans (pg/l)										Herbicides/Pesticides (ug/l)							
			1,2,3,4,6,7,8,9-OCOD	EMPC-HxCDD	EMPC-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	EMPC-TCDF	Total HpCDF	Total HxCDF	Total PeCDF	Total TCDD	Total TCDF	4,4'-DDT	Dicamba	Dichloroprop	2,4-DB	gamma-BHC (Lindane)	MCPP	2,4,5-TP (Silvex)
ONSITE WELLS																				
GGW-010 (4750')	10/26/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	10.6
GGW-014 (4649')	10/27/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	4.37
GGW-015 (4447')	10/26/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	6.31
GGW-016 (4245')	10/28/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<1.0
RP-02-66	4/18/2000	6	<1.3	NR	NR	<0.5	<0.5	NR	NR	NR	<3.3	<0.6	<1.2	NR	NR	<1.0	NR	NR	<250	1.58 J
RP-02-66	10/16/2000	6	5.7 J	NR	NR	<0.5	2.2 J	NR	NR	NR	<3.3	<0.6	2.2	NR	NR	<1.0	NR	NR	<250	1.66 J
RP-02-66	6/19/2001	1	<23.6	2.9 N, EM	<7.23	33.7 Q,N,J, EM, MI	<8.16	6.3 Q,N,J, EM, MI	5.7	8.3	<7.23	A	A	NR	0.194	<0.173	1.36 J,J,R, HT, SC	NR	NR	1.94 J, HT
RP-02-66	4/1/2002	5	NR	NR	NR	NR	NR	NR	NR	NR	10.3	NR	NR	NR	<1.0	3.18	NR	NR	NR	4.59
W-19-D	4/18/2000	6	<1.3	NR	NR	<0.5	<0.5	NR	NR	NR	<3.3	<0.6	86	NR	NR	3.62 J	NR	NR	324 D,J	31.9 D,J
W-19-D	10/16/2000	6	65.2 J	NR	NR	<0.5	<0.5	NR	NR	NR	<3.3	8.5	18.9	NR	NR	2.52	NR	NR	<250	22.8 D,J
W-19-D	6/20/2001	1	<23.6	A	<7.23	A	<8.16	A	A	A	<7.23	A	A	NR	<0.139	1.34 J, HT	<0.266	NR	NR	15.6
W-19-D	4/1/2002	5	NR	NR	NR	NR	NR	NR	NR	NR	<1.2	NR	NR	NR	<1.0	6.42	NR	NR	NR	34.6
OFFSITE WELLS																				
RP-01-65	10/11/2000	6	<1.3	NR	NR	<0.5	4.5 J	NR	NR	NR	<3.3	<0.6	10.1	NR	NR	<1.0	NR	NR	<250	<1.0
RP-01-65	6/26/2001	1	<23.6	A	<7.23	A	<8.16	A	A	A	<7.23	A	A	NR	<0.139	8.1 J,N, HT, SC	<0.266	NR	NR	30 D,J, HT
RP-01-65	4/1/2002	5	NR	NR	NR	NR	NR	NR	NR	NR	6.9	NR	NR	NR	1.29	10.2	NR	NR	NR	39.8
W-04-89	6/26/2001	1	<23.6	A	16 N, EM	A	<8.16	A	A	A	11.4	A	33	NR	<0.139	<0.173	<0.266	NR	NR	<0.133
W-15-D	10/1/1990	2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.95	NR
W-15-D	4/10/2000	6	<1.3	NR	NR	<0.5	<0.5	NR	NR	NR	<3.3	<0.6	36	NR	NR	3.74 J	NR	NR	<250	6.57 J
W-15-D	9/29/2000	6	<1.3	NR	NR	10.2	1.1 J	NR	NR	NR	13.4	22.6	110	NR	NR	4.22	NR	NR	<250	6.3
W-15-D	6/22/2001	1	<23.6	A	<7.23	A	<8.16	A	A	A	<7.23	A	A	NR	<0.139	7.03 J,N,U, HT, SC, R	<0.266	NR	NR	5.41 J, HT
W-15-D	4/1/2002	5	NR	NR	NR	NR	NR	NR	NR	NR	<1.2	NR	NR	NS	<1.0	5.2	<4.0	NR	<200	5.33
W-16-D	10/17/2000	6	4.9 J	NR	NR	0.84 J	2.4 J	NR	NR	NR	<3.3	0.84	2.4	NR	NR	<1.0	NR	NR	<250	<1.0

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
- 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
- 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
- 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
- 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
- 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
DCA = Dichloroethane
DCE = Dichloroethene
DMP = Dimethylphenol
TMB = trimethylbenzene
TCE = trichloroethene
PCE = tetrachloroethene
DCP = Dichlorophenol
TCB = trichlorobenzene
TCA = trichloroethane
TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.

J = The analyte was positively identified, but the associated concentration is an estimate.

D = Compound identified in an analysis at a secondary dilution factor.

N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.

EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.

() = analyte was detected in the sample but the detection level was below the method reporting limit

* = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source

NS = Not sampled

ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 1-5a
 Historical Summary of Groundwater Analytical Results
 Volatile Organic Compounds and Petroleum Hydrocarbons
 Basalt Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Volatile Organic Compounds (ug/l)																				
			Benzene	Chloro benzene	Chloro form	1,2-DCB	1,3-DCB	1,4-DCB	1,2-DCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,2-DCE	2,4-DCP	Ethylbenzene	Napthalene	PCE	Toluene	TCE	TCFM	m,p-xylene	total xylene	Vinyl Chloride
ONSITE WELLS																							
RP-02-66	4/18/2000	6	ND	5.35 J	(0.88) J	59.5 J	1.58 J	14.9 J	ND	(0.37) J	1.1 J	ND	NR	ND	ND	ND	ND	1.19 J	3.28 J	ND	ND	1.87 J	
RP-02-66	10/16/2000	6	(0.13)	6.27	(0.8)	70.2	1.75	18.2	ND	(0.32)	1.07	ND	NR	ND	ND	ND	ND	(0.14)	1.12	2.7	ND	ND	4.77
RP-02-66	6/19/2001	1	ND	6.3	0.76	60.2	1.64	15.9	ND	0.3	1.25	ND	NR	ND	ND	ND	ND	ND	1.09	1.64	ND	ND	2.28
RP-02-66	4/4/2002	5	ND	8.43	ND	72.8	2.09	19.4	ND	ND	1.32	ND	NR	ND	ND	ND	ND	4.34	1.17	1.2	ND	ND	2.57
OFFSITE WELLS																							
W-11-B	4/11/2000	6	33.4	13.9	ND	185	5.08	45.7	ND	(0.62)	5.84	ND	NR	ND	ND	ND	ND	1.5	ND	ND	(0.28)	ND	4.21
W-11-B	10/10/2000	6	24	60.5	ND	522	19.7	172	ND	(2.6)	23.8	(1.05)	NR	ND	ND	ND	ND	ND	5.25	ND	ND	ND	8.95
W-11-B	6/21/2001	1	21.4	60.2	ND	530	14.8	150	ND	(2.60)	21	ND	NR	ND	ND	ND	ND	0.65	2.2	ND	ND	ND	10.4
W-11-B	4/9/2002	5	16.6	64.8	ND	447	15.4	135	ND	ND	23.2	ND	NR	ND	ND	ND	ND	ND	2.2	ND	ND	ND	11.3 J
W-04-89	4/12/2000	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
W-04-89	10/9/2000	6	ND	ND	ND	(0.16)	ND	ND	ND	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RP-01-65	4/17/2000	6	27.4	49.9	1.63	640	19.6	187	ND	1.61	5.91	(0.56)	NR	ND	ND	ND	ND	(0.25)	16.1	ND	(0.37)	ND	6.9
RP-01-65	10/11/2000	6	13.7	43.4	ND	537	20.7	180	ND	(1.55)	7	ND	NR	ND	ND	ND	ND	ND	12.7	ND	ND	ND	6.1
RP-01-65	6/26/2001	1	41.4	55.4	ND	722	21.8	207	ND	1.85	9	ND	NR	ND	ND	ND	ND	ND	17.4	9.05	ND	ND	ND
RP-01-65	4/5/2002	5	ND	53.9	ND	546	19	171	ND	ND	9.1	ND	NR	ND	ND	ND	ND	ND	11.4	ND	ND	ND	11.8

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
- 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
- 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
- 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
- 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
- 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene
 DCA = Dichloroethane
 DCE = Dichloroethene
 DMP = Dimethylphenol
 TMB = trimethylbenzene
 TCE = trichloroethene
 PCE = tetrachloroethene
 DCP = Dichlorophenol
 TCB = trichlorobenzene
 TCA = trichloroethane
 TCFM = trichlorofluoromethane

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 1-5b
 Historical Summary of Groundwater Analytical Results
 Dioxins/Furans and Herbicides/Pesticides
 Basalt Aquifer
 ATOFINA Chemicals Property and Adjacent Properties
 Portland, Oregon

Sample ID	Sample Date	Ref Report	Dioxins/Furans (pg/l)								Herbicides/Pesticides (ug/l)						
			EMPC-PeCDF	2,3,7,8-TCDF	Total HpCDF	Total HxCDD	Total HxCDF	Total PeCDD	Total PeCDF	Total TCDF	4,4'-DDT	Dicamba	Dichloroprop	2,4-DB	BHC (Lindane)	MCP	2,4,5-TP (Silvex)
ONSITE WELLS																	
RP-02-66	4/18/2000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.58 J
RP-02-66	10/16/2000	ND	ND	2.2	ND	ND	ND	ND	0.66	N, EMPC	2.2	ND	ND	ND	ND	ND	1.66 J
RP-02-66	6/19/2001	ND	ND	(2.7)	5.7	ND	8.3	ND	ND	ND	ND	0.194 J	ND	1.36 J,R	ND	ND	1.94 J
RP-02-66	4/4/2002	ND	ND	3 N, EMPC	11.7 U	3.1 U	15.5 U	4 U	10.3	ND	ND	ND	3.18	ND	ND	ND	4.59
OFFSITE WELLS																	
RP-01-65	4/17/2000		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.4 J	ND	ND	ND	33.9 J
RP-01-65	10/11/2000		ND	4.5	ND	10.2	ND	ND	ND	10.1	ND	ND	ND	ND	ND	ND	1.58 J
RP-01-65	6/26/2001		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.1 J, N	ND	ND	ND	30 J
RP-01-65	4/5/2002		11.6 J,U,N,E MPC	ND	5.7 J,U	12.9 J,U	18.5 J,U	6 U	6.9	ND	ND	1.29 J	10.2 J	ND	ND	ND	39.8 J
W-04-89	4/12/2000	6	<0.3	<4.5	<1.8	<1.8	<1.3	<1.6	<1.3	6.28	ND	ND	ND	ND	ND	ND	ND
W-04-89	10/9/2000	6	<0.3	<4.5	9.3	6.2	17.6	4.4	10	4.1	ND	ND	ND	ND	ND	ND	ND
W-04-89	6/26/2001	1	16 N,EM	NR	NR	NR	NR	NR	11.4	33	NR	NR	NR	NR	NR	NR	NR
W-04-89	4/8/2002		10.4 N, EMPC	10.4	ND	ND	5.6 U	ND	5.5	20.1	NR	NR	NR	NR	NR	NR	NR
W-11-B	4/11/2000		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
W-11-B	10/10/2000		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	(0.85)	ND	ND	ND	23.3
W-11-B	6/21/2001		ND	ND	ND	ND	(1.8)	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.8 J
W-11-B	4/9/2002		ND	ND	ND	ND	ND	2.1	ND	ND	ND	ND	2.41 N	ND	ND	ND	17.8

- 1 = Focused Spring 2001 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 4 October 2001, AMEC
 2 = Hydrological Investigation of the Doane Lake Area, Portland, Oregon. Geraghty & Miller. 22 February 1991
 3 = Cable Huston Benedict Haagensen & Lloyd LLP letter dated 20 December 1999, re: Rhone-Poulenc Investigation Results and Notice of Additional Activities (cone penetrometer results)
 4 = Ater Wynne Hewitt Dodson & Skerritt letter dated 12 February 1996, re: Documents Regarding Monitoring Well Sampling, (Woodward Clyde March 1995 monitoring results)
 5 = Focused Spring 2002 Groundwater Characterization Event Groundwater Monitoring Report RPAC - Portland Site, 31 July 2002, AMEC
 6 = Final Spring and Fall 2000 Groundwater Data and Evaluation, 31 July 2001, AMEC

DCB = Dichlorobenzene PCE = tetrachloroethene
 DCA = Dichloroethane DCP = Dichlorophenol
 DCE = Dichloroethene TCB = trichlorobenzene
 DMP = Dimethylphenol TCA = trichloroethane
 TMB = trimethylbenzene ECFM = trichlorofluoromethane
 TCE = trichloroethene

U = The analyte was not detected above the method detection limit or quantitation limit. In the case of blank contamination, the analyte is considered to be less than the stated result.
 J = The analyte was positively identified, but the associated concentration is an estimate.
 D = Compound identified in an analysis at a secondary dilution factor.
 N = Presumptive evidence of analyte presence was detected, but not all identification criteria were met. The presence of the analyte and the associated numerical concentration are both uncertain.
 EMPC = (Estimated Maximum Possible Concentration) A chromatographic peak was detected at the proper retention time for the congener, but the ion abundance ratios did not meet method requirements. Congener identification is uncertain.
 () = analyte was detected in the sample but the detection level was below the method reporting limit
 * = W-19-S was dry during the sampling event, therefore the well was not sampled.

NR = Not Reported in source
 NS = Not sampled
 ND = Analyte not reported on data tables of "detected analytes." Information on actual analytes sampled was not provided in the tables.

Table 2-1
Soil Management Options
On-Site Use

Category	Soil Characteristics	Analytical Method	Results	Management Options
1A	No detected pesticides	EPA 8081A	DDD = ND DDE = ND DDT = ND	Unrestricted on-site reuse
1B	Pesticides detected or soil not tested	EPA 8081A	DDD > ND; or DDE > ND; or DDT > ND	On-site subgrade reuse beneath roads or in lots with institutional controls ¹

Notes:

ND = Concentration less than the laboratory Method Detection Limit (MDL).

¹ - Use of excavated soil as subgrade backfill means that the backfill is beneath pavement, buildings, or a minimum of 3 feet of clean fill.

Table 2-2
Soil Management Options
Off-Site Use

Category	Soil Characteristics	Analytical Method	Results	Management Options
2A	No detected pesticides	EPA 8081A	DDD = ND DDE = ND DDT = ND	Unrestricted off-site reuse as clean fill
2B	Pesticides detected above land disposal concentration-based standards (40 CFR 268.40) ¹	EPA 8081A	DDD < 0.087 mg/kg DDE < 0.087 mg/kg DDT < 0.087 mg/kg	Disposal in a Subtitle D Landfill
2C	Pesticides detected above land disposal concentration-based standards (40 CFR 268.40) ¹	EPA 8081A	DDD > 0.087 mg/kg DDE > 0.087 mg/kg DDT > 0.087 mg/kg	Disposal in a Subtitle C Landfill

Notes:

mg/L = milligrams per liter

¹ - In accordance with Oregon Administrative Rule (OAR) 340-109-0010 (4)(b)

- The use of industrial and municipal landfills is subject to the terms and conditions of their respective solid waste permits. Requirements for soil disposal may be more restrictive than those listed above. The owner/operator of the landfill should be contacted for prior approval and specific requirements for soil disposal.