Appendix A
Environmental Summary Report

FINAL

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
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ERM

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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 ($CaCO_3$) 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. Theses 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.

4.5.2.1 *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 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).

4.5.2.2 *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).

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.

6.2 *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 expose 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.

7.4 *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.

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Figures

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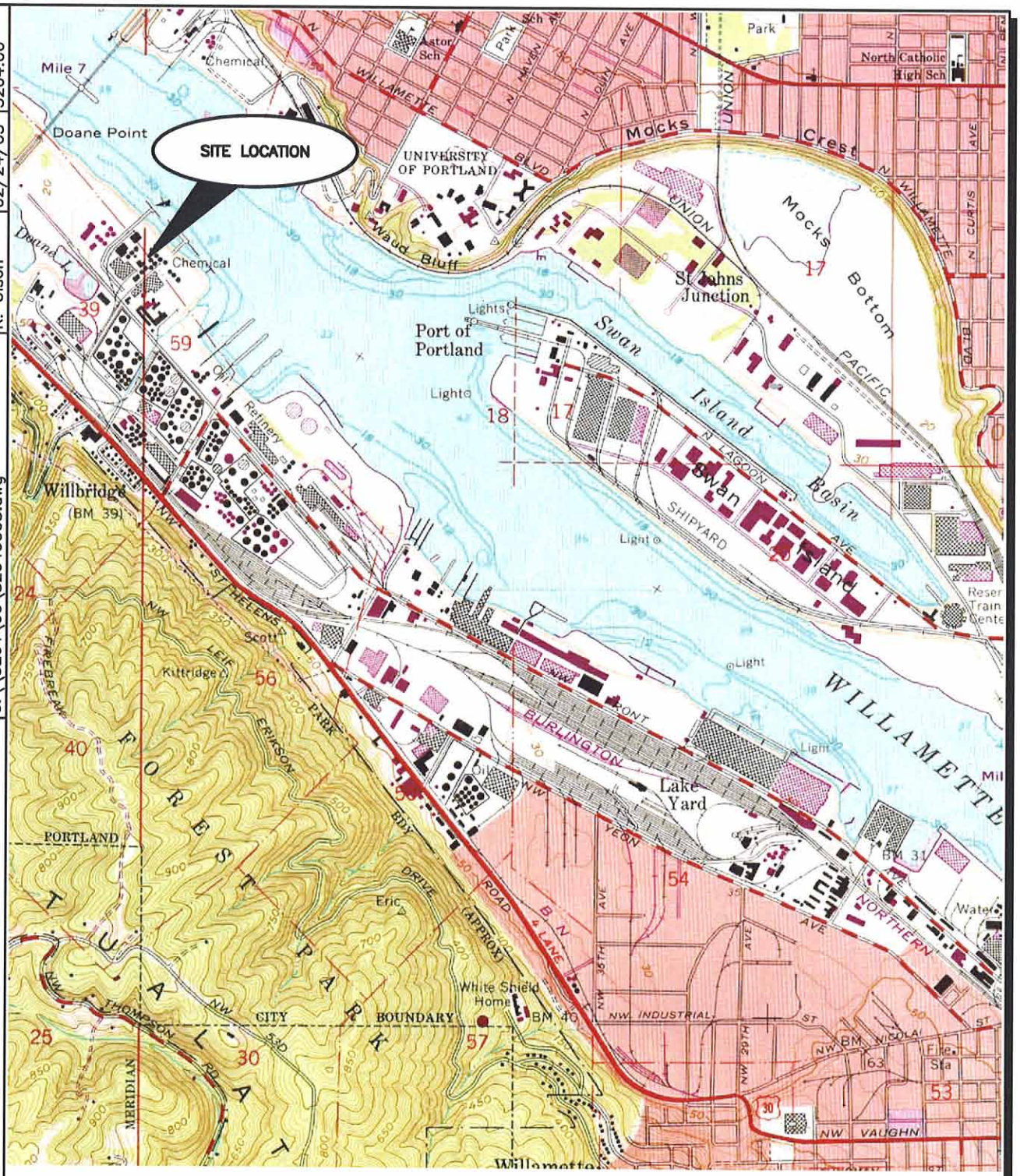

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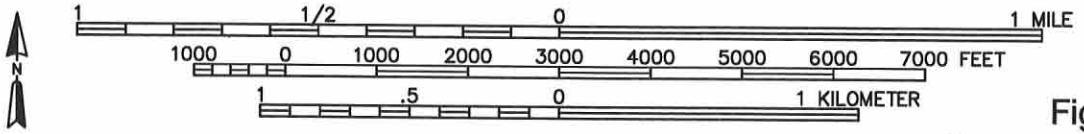

References:
U.S.G.S. 7.5 Minute Series (Topographic Portland, Oregon–Washington)
Dated: 1961; Photorevised 1970 and 1977

Figure 2-1
Site Location Map
ATOFINA Chemicals, Inc.
Portland, Oregon
ERM *02/03*

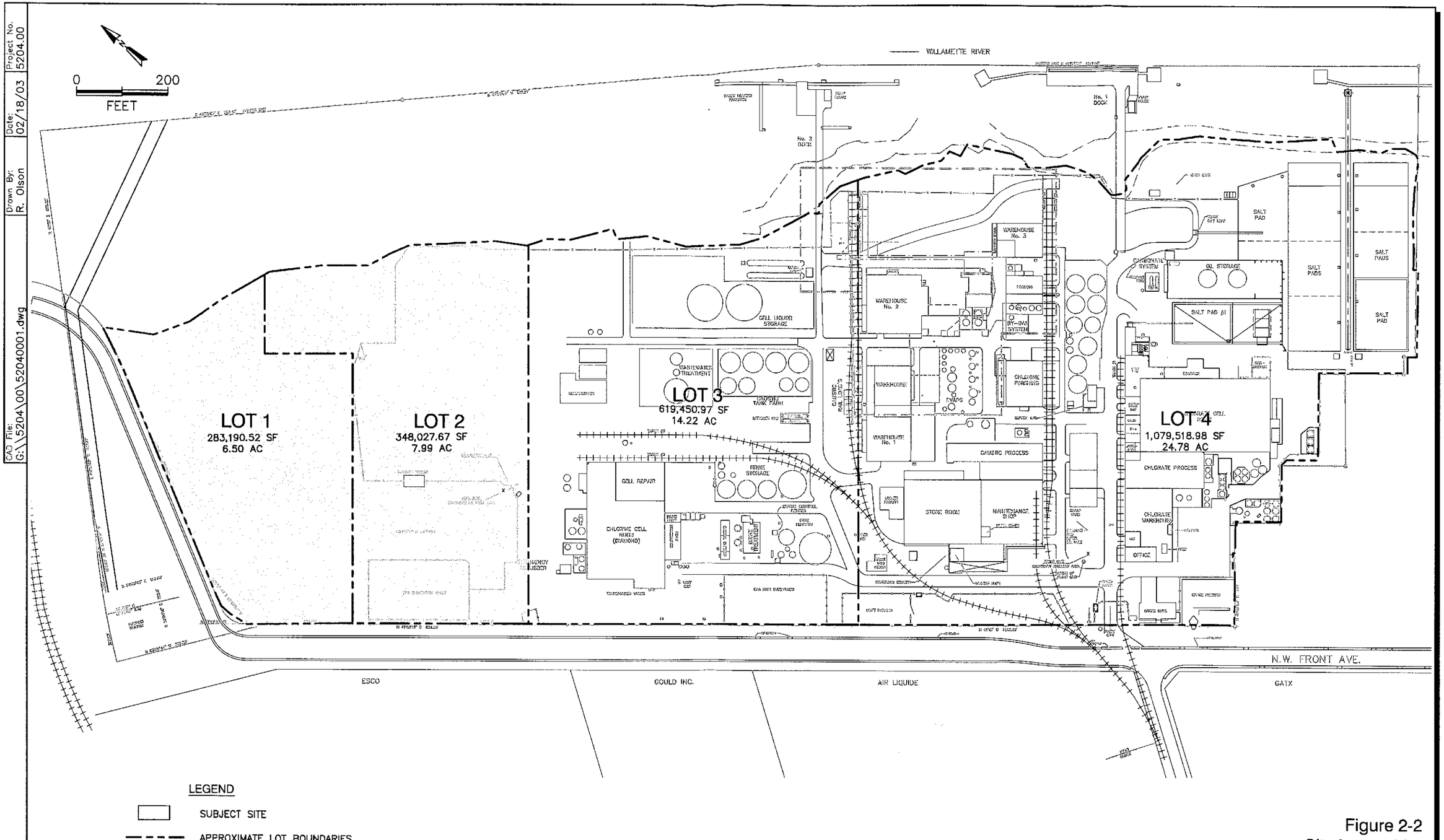

Figure 2-2
Site Layout Map
ATOFINA Chemicals, Inc.
Portland, Oregon
ERM 02/03

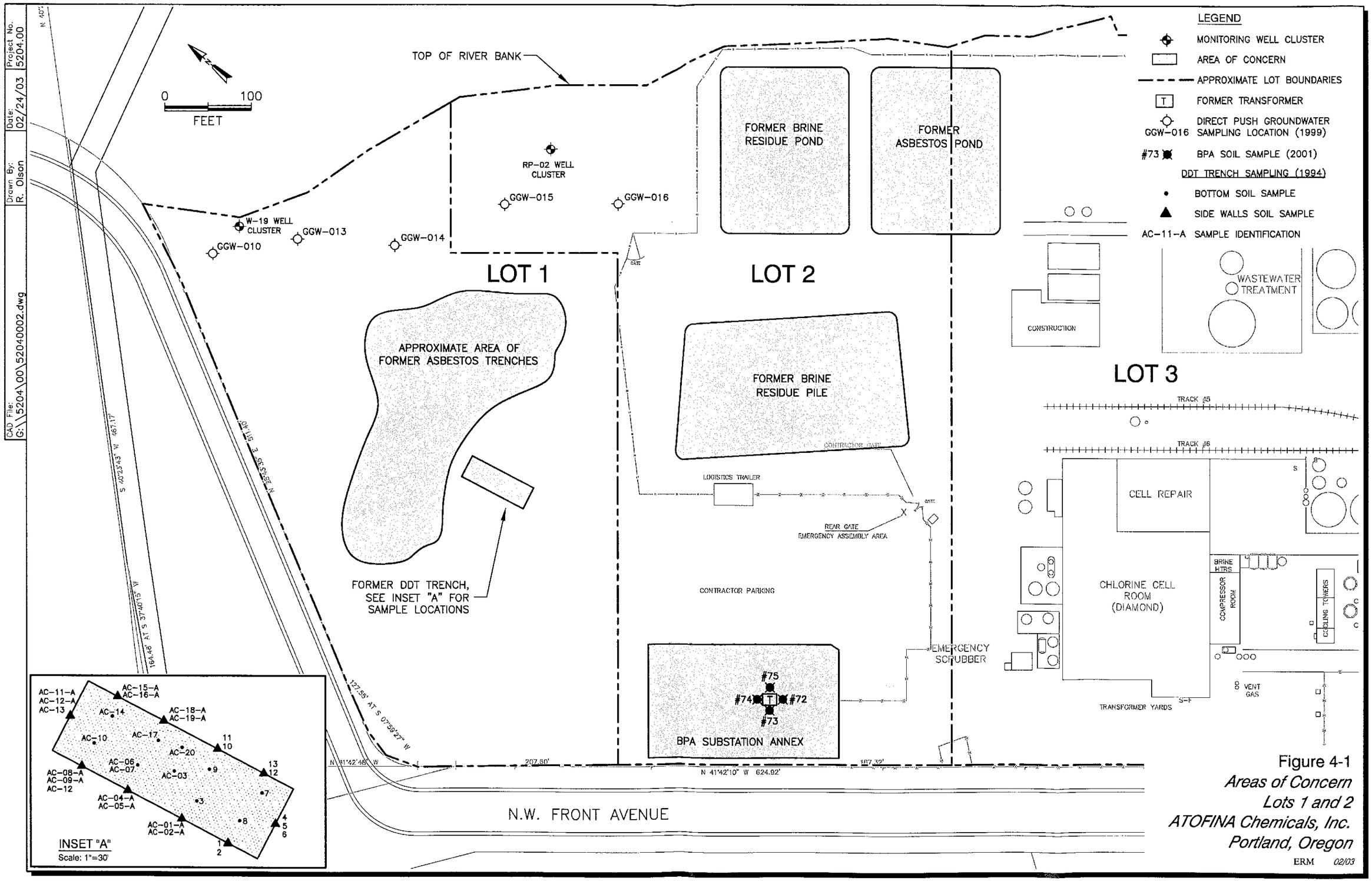

Figure 4-1
Areas of Concern
Lots 1 and 2
ATOFINA Chemicals, Inc.
Portland, Oregon
ERM 02/03

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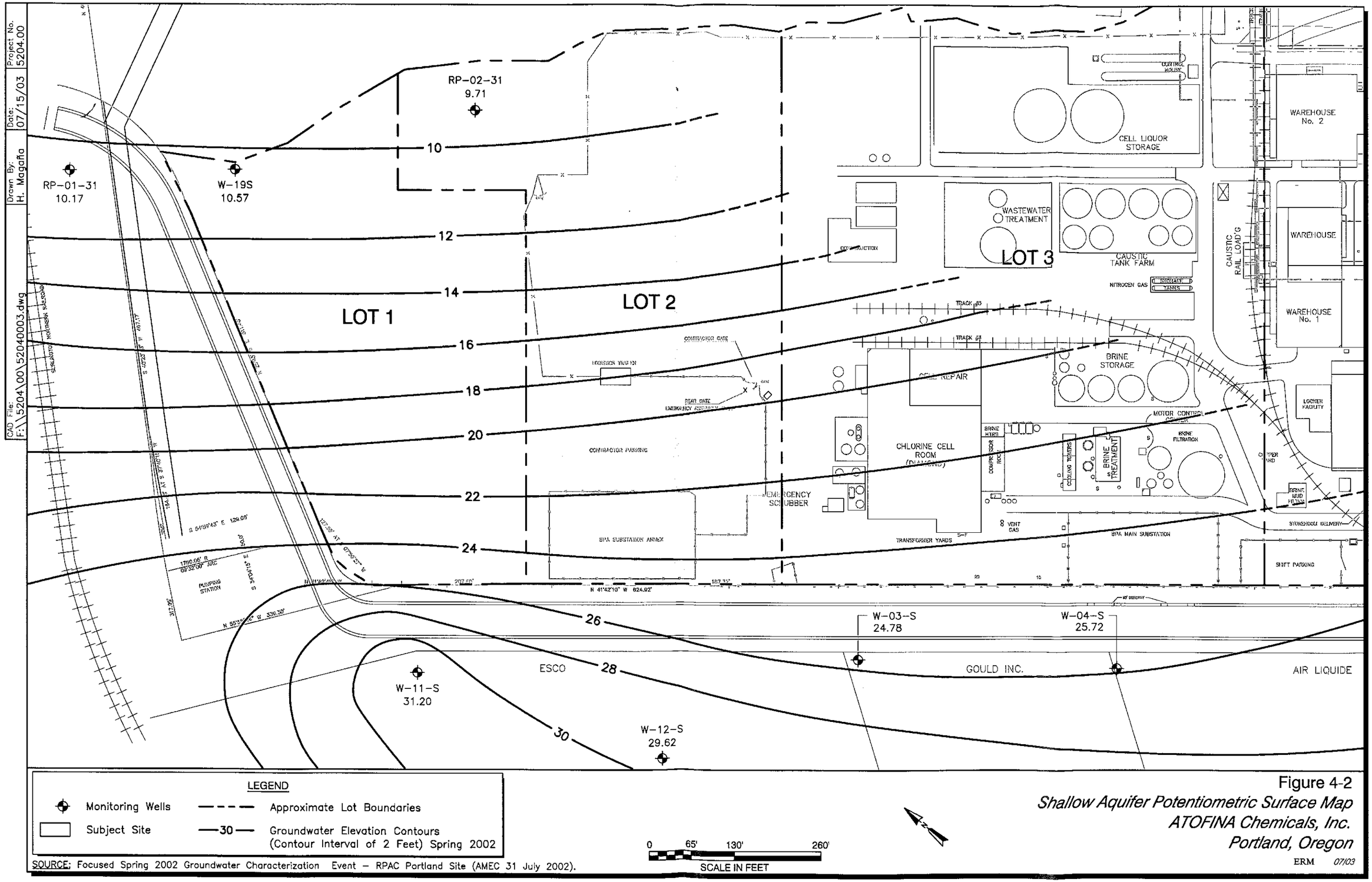
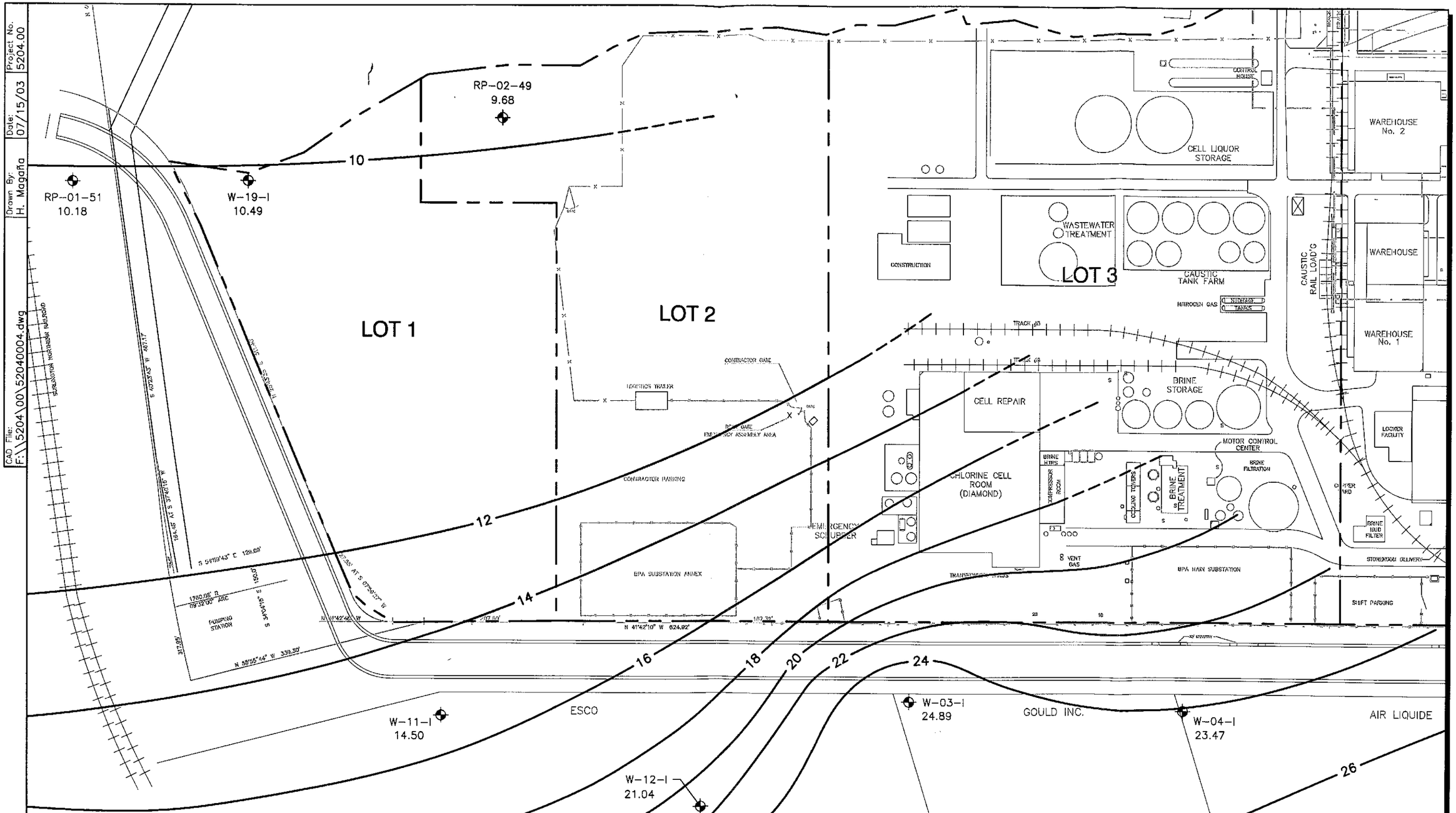
Project No. 5204.00



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

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

ERM 07/03



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

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

ERM 07/03

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Drawn By: H. Magaña
Date: 07/15/03
Project No. 5204.00

W-19-D
10.70

W-10
13.37

W-11-D
14.14

W-12-D
20.87

W-03-D
20.65

LOT 1

LOT 2

LOT 3

ESCO

GOULD INC.

AIR LIQUIDE

CONTRACTOR GATE

LOGISTICS TRAILER

REAR GATE
EMERGENCY ASSEMBLY AREA

CONTRACTOR PARKING

EMERGENCY SCRUBBER

BPA SUBSTATION ANNEX

PUMPING STATION

CONSTRUCTION

WASTEWATER TREATMENT

CAUSTIC TANK FARM

NITROGEN GAS STORAGE YARDS

CELL LIQUOR STORAGE

CONTROL HOUSE

WAREHOUSE No. 2

CAUSTIC RAIL LOAD'G

WAREHOUSE

WAREHOUSE No. 1

CELL REPAIR

BRINE STORAGE

MOTOR CONTROL CENTER

CHLORINE CELL ROOM (DIAMOND)

BRINE MUDS

COMPRESSOR ROOM

COOLING TOWERS

BRINE TREATMENT

BRINE FILTRATION

COPPER YARD

BRINE MUD FILTER

LOCKER FACILITY

STOREROOM DELIVERY

VENT GAS

TRANSFORMER YARDS

BPA MAIN SUBSTATION

SHIFT PARKING

SCHNITZER NORTHERN RAILROAD

10 12 14 16 18 20 22 24 26

LEGEND

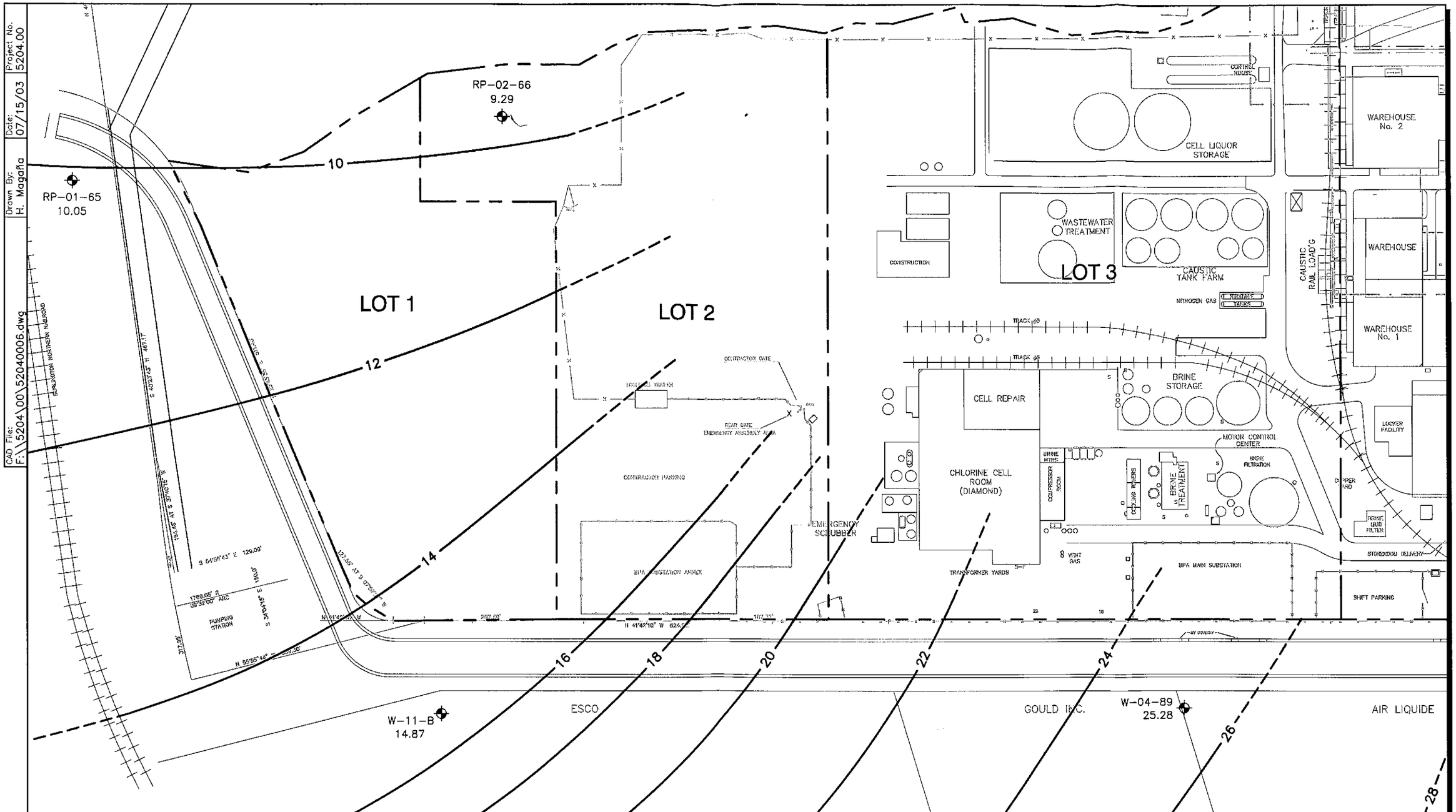
- Monitoring Wells
- Subject Site
- Approximate Lot Boundaries
- 16 — Groundwater Elevation Contours (Contour Interval of 2 Feet) Spring 2002

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

0 65' 130' 260'
SCALE IN FEET

N

Figure 4-4
Deep Aquifer Potentiometric Surface Map
ATOFINA Chemicals, Inc.
Portland, Oregon
ERM 07/03



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

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

ERM 07/03

Project No. 5204.00
Date: 07/16/03
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RP-01-31

Dates	Benzene	1,2-DCB	TCE
Apr-00	ND	3.74	ND
Jun-01	ND	ND	ND
Apr-02	ND	ND	ND

RP-02-31

Dates	Benzene	1,2-DCB	TCE
Apr-00	ND	ND	ND
Jun-01	ND	ND	ND
Apr-02	ND	ND	ND

MWA-5

Dates	Benzene	1,2-DCB	TCE
Apr-00	NS	NS	NS
Jun-01	ND	ND	ND
Apr-02	ND	ND	ND

W-19S

Dates	Benzene	1,2-DCB	TCE
Apr-00	ND	0.51J	ND
Jun-01	Dry	Dry	Dry
Apr-02	ND	ND	ND

LOT 1

LOT 2

LOT 3

CONTRACTOR GATE

LOGISTICS TRAILER

REAR GATE
EMERGENCY ASSEMBLY AREA

CONTRACTOR PARKING

EMERGENCY SCRUBBER

EPA SUBSTATION ANNEX

PUMPING STATION

CONSTRUCTION

WASTEWATER TREATMENT

CAUSTIC TANK FARM

NITROGEN GAS

CELL LIQUOR STORAGE

CAUSTIC RAIL LOAD'G

WAREHOUSE No. 2

WAREHOUSE

WAREHOUSE No. 1

TRACK #5

TRACK #3

CELL REPAIR

BRINE STORAGE

CHLORINE CELL ROOM (DIAMOND)

MOTOR CONTROL CENTER

BRINE FILTRATION

BRINE TREATMENT

COOLING TOWERS

COMPRESSOR ROOM

BRINE MUD

VENT GAS

TRANSFORMER YARDS

EPA MAIN SUBSTATION

SHIFT PARKING

LOCKER FACILITY

STORE R

COPPER LOG

STONE BED FILTER

SEDIMENTATION BASIN

ESCO

W-11-S

Dates	Benzene	1,2-DCB	TCE
Apr-00	0.74J	ND	ND
Jun-01	1.03	ND	ND
Apr-02	ND	ND	ND

Dates	Benzene	1,2-DCB	TCE
Apr-00	1.98	ND	ND
Jun-01	NS	NS	NS
Apr-02	NS	NS	NS

W-12-S

W-03-S

GOULD INC.

Dates	Benzene	1,2-DCB	TCE
Apr-00	ND	2.81	ND
Jun-01	NS	NS	NS
Apr-02	NS	NS	NS

W-04-S

Dates	Benzene	1,2-DCB	TCE
Apr-00	ND	1.86	ND
Jun-01	NS	NS	NS
Apr-02	NS	NS	NS

AIR LIQUIDE

W-16-31

Dates	Benzene	1,2-DCB	TCE
Apr-00	10.5	1.02	ND
Jun-01	7.69	0.96J	ND
Apr-02	2.66	1.61	ND

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 positvely identified, but the associated concentration is an estimate.

Dry Well was dry during sampling event; no sample collected.

0 65' 130' 260'
SCALE IN FEET

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]	Analyte		
			DDD	DDE	DDT
		ft	mg/kg	mg/kg	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

			Volatile Organic Compounds (ug/l)																							Semivolatile Organic Compounds (ug/l)					Hydrocarbons (mg/l)	
Sample ID	Sample Date	Ref. Report	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	Nap-thalene	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	NR	<1.0	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	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	NR	3.02	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	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	NR	3.73	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	<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	<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	<2.0	<1.0	NR	<1.0	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	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	NR	<1.0	(0.34) J	<1.0	NR	<1.0	<2.0	<1.0	NR	<1.0	NS	NS	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
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	<2.0	<1.0	NR	<1.0	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	<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	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	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 N	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	NR	<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	NR	<1.0	<1.0	<1.0	NR	<1.0	<2.0	2	NR	4.88	NS	NS	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	NR	<1.0	<1.0	<1.0	NR	<1.0	<2.0	1.72	NR	3.61	NS	NS	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	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 = tetrachlorothene
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) 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	Herbicides/Pesticides (ug/l) 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,EM	<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	1.2	1,000 U	NR	NR	100 U
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 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	10.6	64.5 N,E M	NR	<12.4	NR	NR	19.2	<6.44	31.6	NS	1.13 J,HT	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

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DCA = Dichloroethane
DCE = Dichloroethene
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PCE = tetrachlorothene
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TCB = trichlorobenzene
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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.
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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
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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
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	6.41	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	<1.0	NR	NR	<2.0	5.99 J	NR	NR	NR	<1.0	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	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	3.23	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	<1.0	NR	NR	NR	NR	NR	NR	NR	5.03	NR	NR	<2.0	NR	NR	NR	NR	<2.0	NR	NR
W-19-I	10/1/1990	2	1 J	NR	13	10 U	190	7 J	62	5 U	NR	1 J	5 U	NR	NR	10	NR	5 U	2 J	NR	NR	4 U	NR	NR	NR	5 U	NR	NR	NR
W-19-I	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	3.1	NR	NR	NR
W-19-I	4/18/2000	6	1.1 J	NR	39.4 J	NR	329 D, J	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	12.7 J	NR	NR
W-19-I	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	24.7 D	NR	NR
W-19-I	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,J, CH	NR	1.57	<0.125	<0.25
W-19-I	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	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	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	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,B, 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	<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	<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	<1.0		
W-15-I	10/1/1990	2	2 J	NR	5 U	21	21 J	10 U, 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	5 U	NR	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	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	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	<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

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

			Dioxins/Furans (pg/l)										Herbicides/Pesticides (ug/l)				
Sample ID	Sample Date	Ref Report	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,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,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,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

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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	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	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	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	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,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	NR	<1.0	7.8	<1.0	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 J, 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	NR	<1.0	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	
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 J, D	<0.151	<0.187	<0.194	NR	NR	NR	<0.104	1.85 J, 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

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

			Dioxins/Furans (pg/l)											Herbicides/Pesticides (ug/l)						
Sample ID	Sample Date	Ref Report	1,2,3,4,6,7,8,9-OCDD	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 (47-50')	10/26/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.1	NR	1.43	<4.0	NR	NR	10.6
GGW-014 (46-49')	10/27/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.1	NR	<1.0	4.54	NR	NR	4.37
GGW-015 (44-47')	10/26/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.1	NR	1	<4.0	NR	NR	6.31
GGW-016 (42-45')	10/28/1999	3	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	<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	0.95	NR	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

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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	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	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

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

			Dioxins/Furans (pg/l)								Herbicides/Pesticides (ug/l)						
Sample ID	Sample Date	Ref Report	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)	MCPP	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	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,EMPC	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,EMPC	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	ND	ND	ND	ND	ND	ND	19.2 J
W-11-B	10/10/2000		NR	NR	NR	NR	NR	NR	NR	NR	ND	ND	(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

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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 4-6
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
Deep	*VOCs*	Benzene	X	X	Yes	
		MCB	X	X	Yes	
		Chloroform		X	No	One detection in 1999 direct-push sample (GGW-016); very low detection; not detected in Site shallow aquifer
		1,2-DCB	X	X	Yes	
		1,3-DCB	X	X	Yes	Not detected in Site shallow aquifer
		1,4-DCB	X	X	Yes	
		1,1-DCE	X	X	Yes	Not detected in Site shallow aquifer
		1,2-DCE	X	X	Yes	Detected in intermediate aquifer upgradient; not detected in Site shallow aquifer
		Ethylbenzene	X		Yes	One detection in 1995; detected in shallow aquifer upgradient; not detected in Site shallow aquifer
		Toluene	X	X	Yes	Detected in shallower aquifers upgradient
		TCE	X	X	No	Not detected in Site shallow aquifer
		TCFM	X	X	No	Not detected in Site shallow aquifer
		Vinyl Chloride	X	X	Yes	Detected in shallower aquifers upgradient; not detected in Site shallow aquifer
	SVOCs	No Data				
	Dioxins/ Furans	Various	X		Yes	
	Pesticides/Herbicides	DDT		X	No Data	One detection in 1999 direct-push sample (GGW-016); not detected in Site shallow aquifer; limited upgradient data available
		Dichloroprop	X	X	Yes	Not detected in Site shallow aquifer
		2,4-DB		X	No	One detection in 1999 direct-push sample (GGW-014); not detected in Site shallow aquifer
		Silvex	X	X	Yes	Not detected in Site shallow aquifer
Basalt	*VOCs*	MCB	X		Yes	
		Chloroform	X		Yes	Not detected in Site shallow aquifer
		1,2-DCB	X		Yes	
		1,3-DCB	X		Yes	Not detected in Site shallow aquifer
		1,4-DCB	X		Yes	
		1,1-DCE	X		Yes	Not detected in Site shallow aquifer
		1,2-DCE	X		Yes	Not detected in Site shallow aquifer
		Toluene	X		Yes	
		TCE	X		Yes	Not detected in Site shallow aquifer
		TCFM	X		Yes	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	Dichloroprop	X		Yes	Not detected in Site shallow aquifer
		Silvex	X		Yes	Not detected in Site shallow aquifer

* - Detected in same or shallower aquifer.
2,4-DB = 4-(2,4-dichlorophenoxy)butyric acid
DCB = dichlorobenzene
DCE = dichloroethene
MCB = monochlorobenzene
TCE = trichloroethene
TCFM = trichlorofluoromethane

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)

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Appendix A

Boring Logs

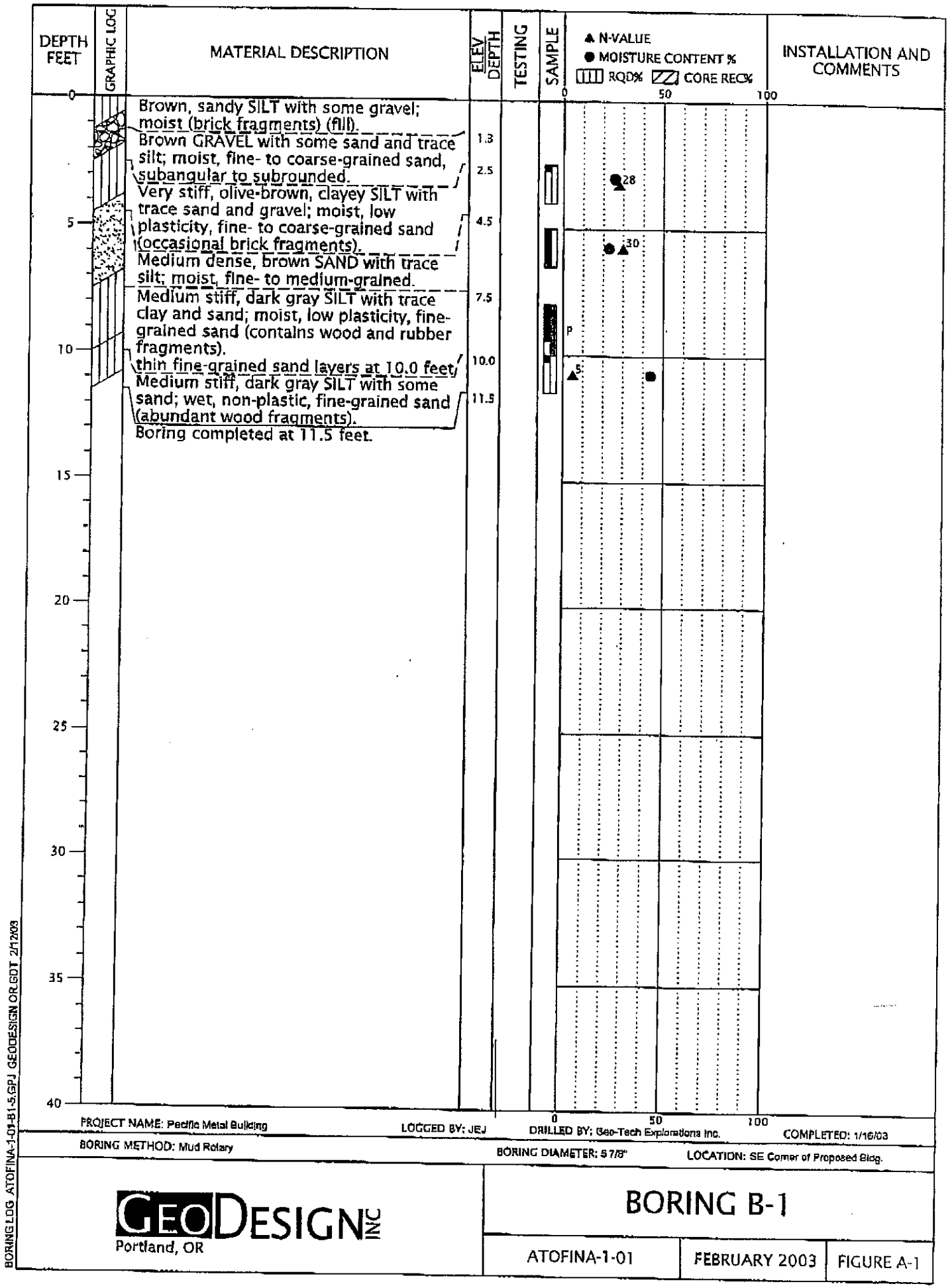
DRAFT

GEODESIGN INC

SITE PLAN

ATOFINA-1-01	FEBRUARY 2003	FIGURE 2

DRAFT



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.

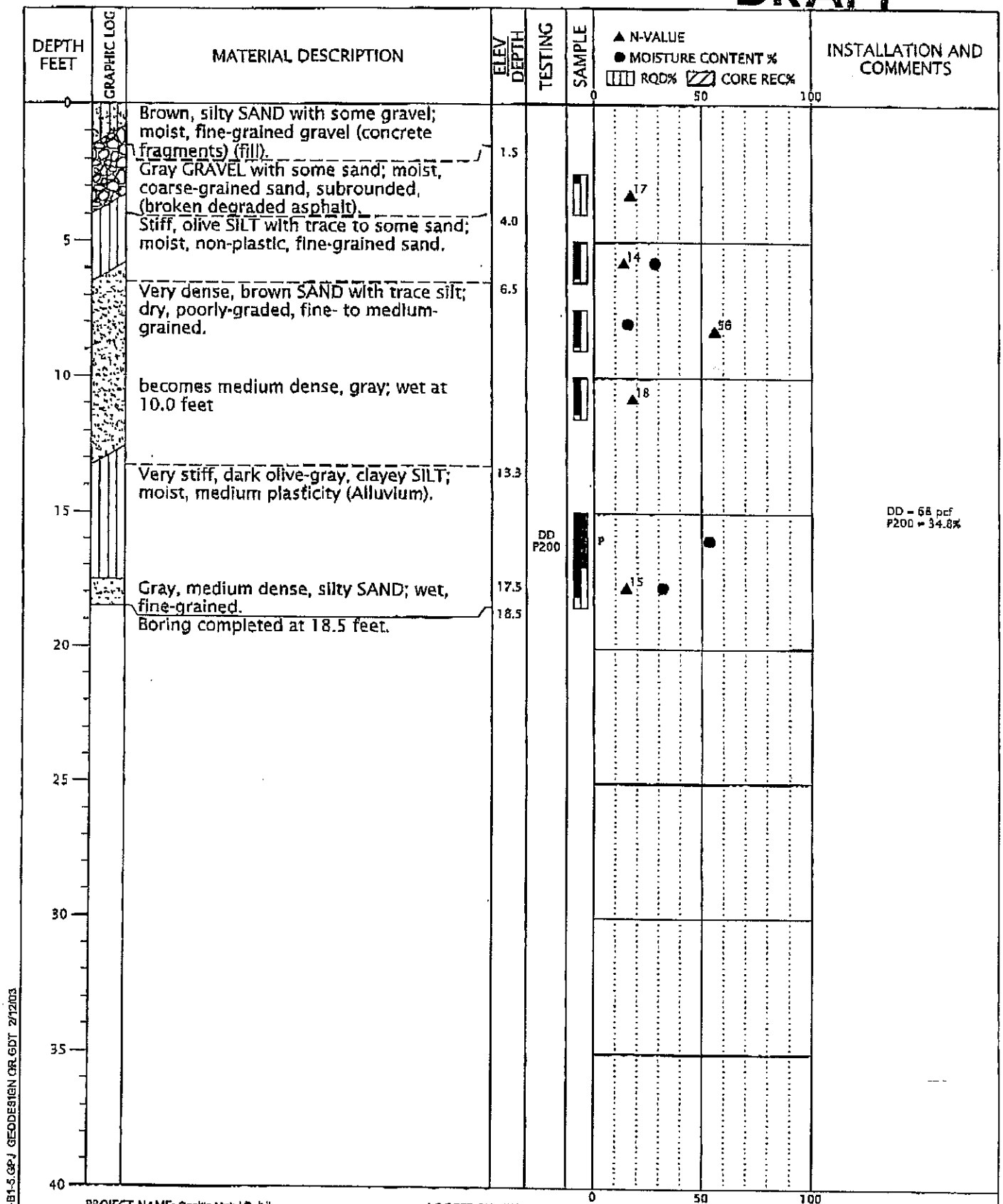
GEODESIGN INC
Portland, OR

BORING B-1

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

BORING LOG ATOFINA-1-01-B1-5.GPJ GEODESIGN.OR.GDT 2/1/2003

DRAFT



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.

GEODESIGN INC
Portland, OR

BORING B-2

ATOFINA-1-01	FEBRUARY 2003	FIGURE A-2

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

DRAFT

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEV DEPTH	TESTING	SAMPLE	▲ N-VALUE ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
0		Brown, sandy SILT with some clay; moist (fill).					
		Gray, sandy GRAVEL; moist (brick fragments).	1.5				
		Very stiff, olive-brown, sandy SILT with trace gravel; moist, non-plastic, fine-grained gravel, coarse-grained sand (occasional wood fragments).	2.4			19	
5		Medium dense, gray SAND; moist, poorly-graded, fine-grained.	5.0			15	
		becomes loose at 7.0 feet				5	
10		contains brick fragments at 10.0 feet				28	
		contains fine-grained gravel at 12.0 feet					
		Medium stiff, dark gray SILT with some clay and trace sand; wet, non-plastic, medium- to coarse-grained sand.	13.0				
15				DD		P	DD = 94 pcf
						5	
		Boring completed at 18.5 feet.	18.5				
20							
25							
30							
35							
40							

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

BORING METHOD: Mud Rotary BORING DIAMETER: 6 7/8" LOCATION: NE Corner of Proposed Bldg.

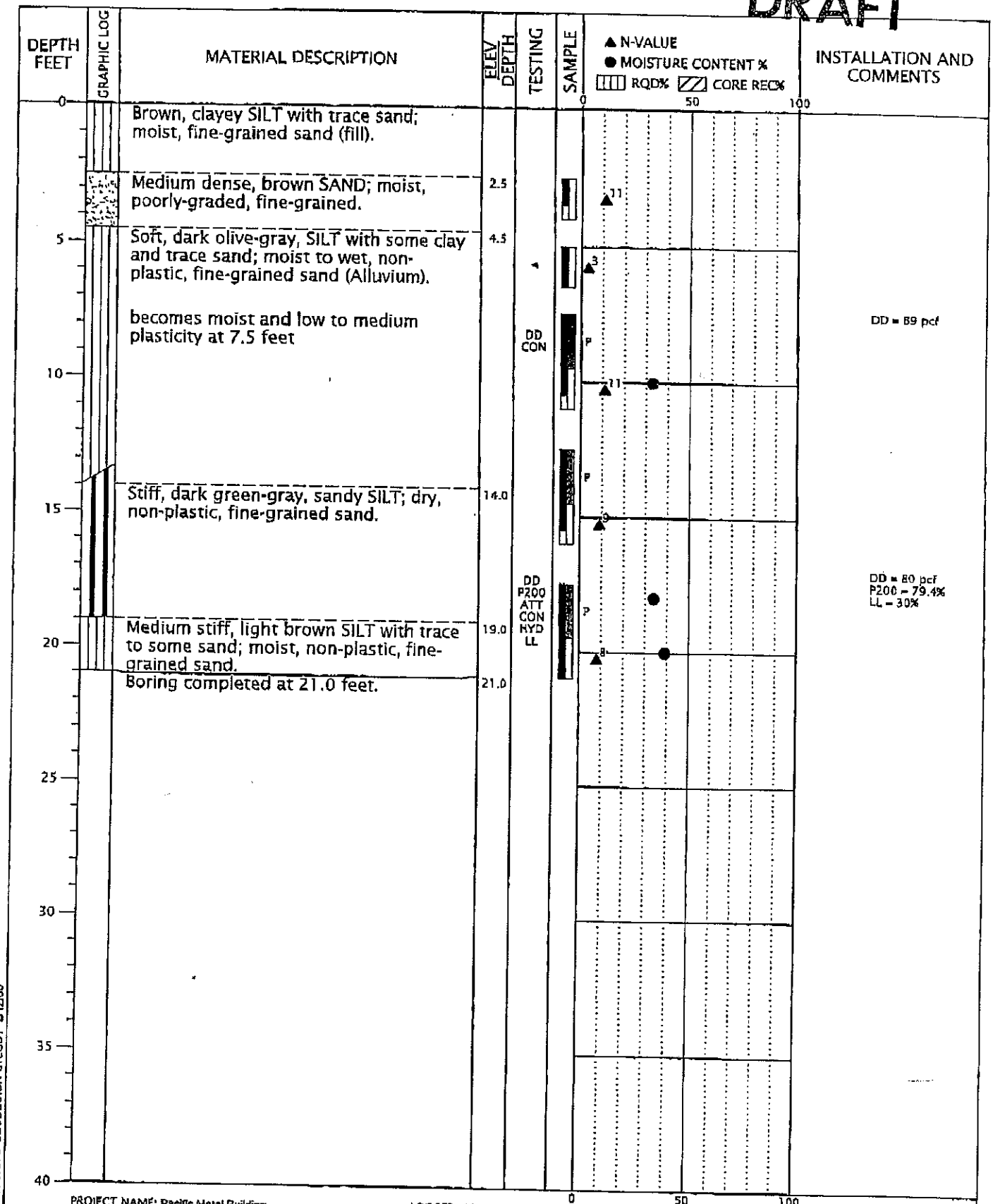
GEODESIGN INC
Portland, OR

BORING B-3

ATOFINA-1-01 | FEBRUARY 2003 | FIGURE A-3

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

DRAFT



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.

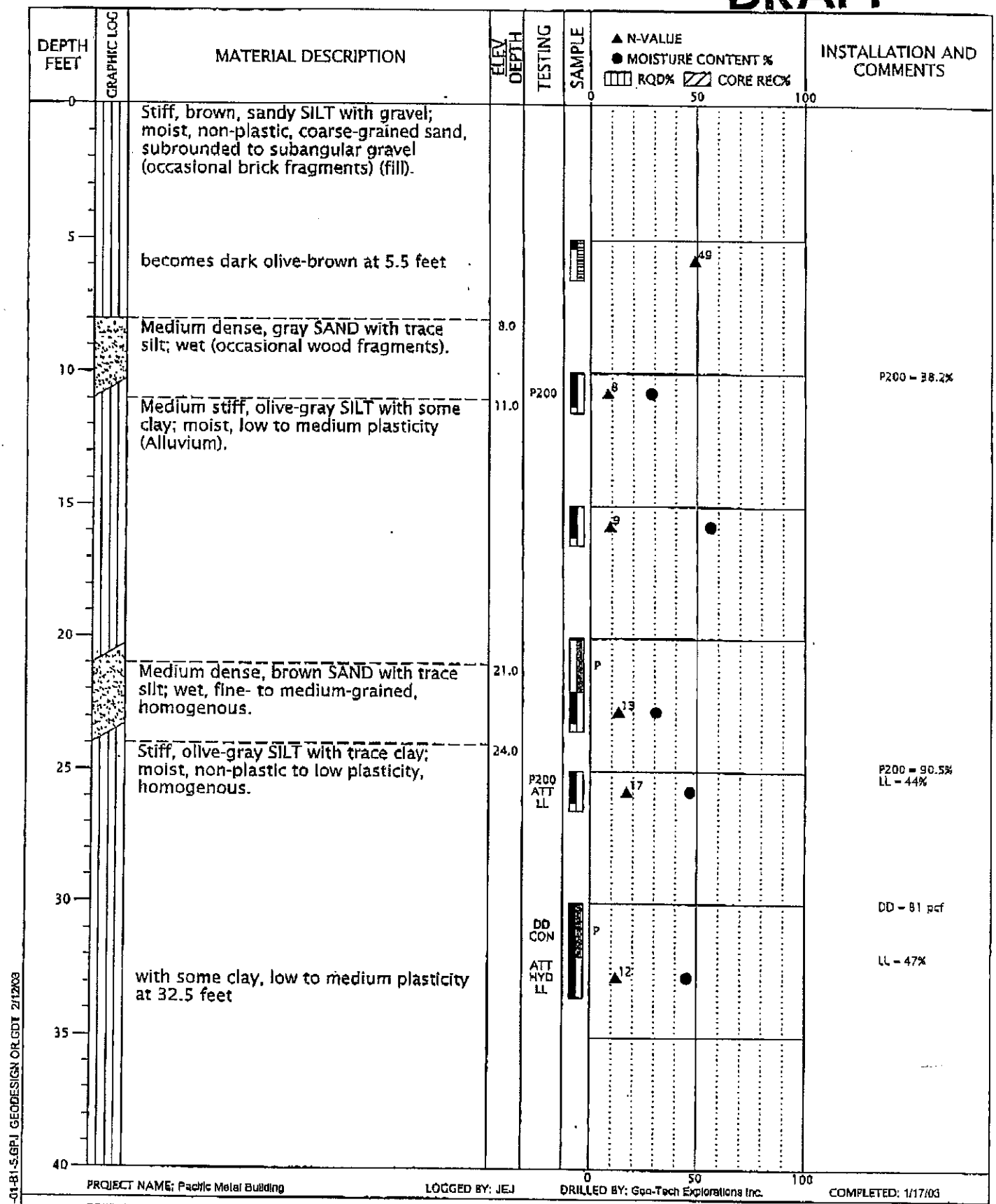
GEODESIGN INC
Portland, OR

BORING B-4

ATOFINA-1-01	FEBRUARY 2003	FIGURE A-4

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

DRAFT



PROJECT NAME: Pacific Metal Building | LOGGED BY: JEJ | DRILLED BY: Geo-Tech Explorations Inc. | COMPLETED: 1/17/03

BORING METHOD: Mud Rotary | BORING DIAMETER: 6 7/8" | LOCATION: Center of Proposed Bldg.

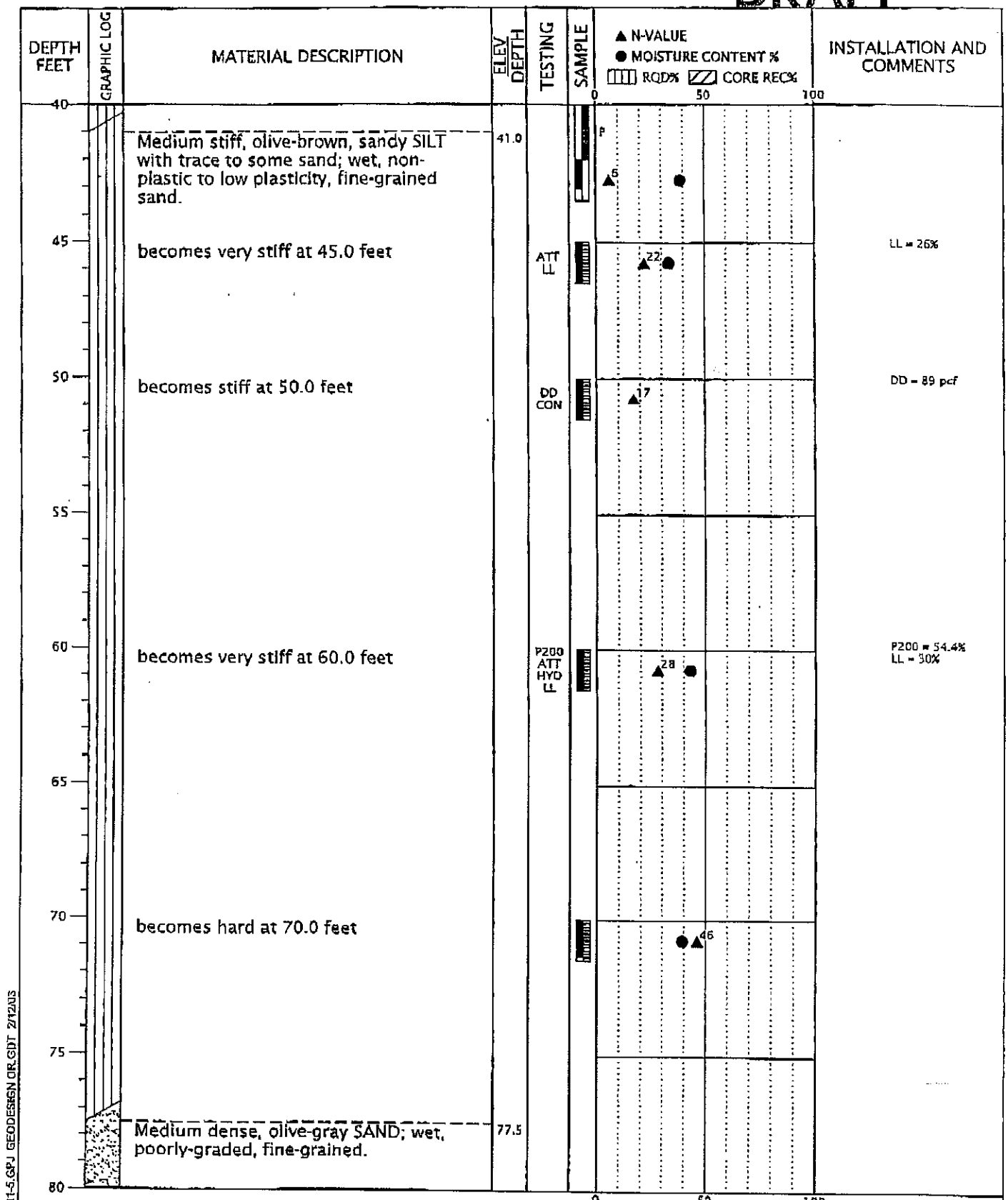
GEODESIGN INC
Portland, OR

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

DRAFT



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.

GEODESIGN INC
Portland, OR

BORING B-5
(continued)

ATOFINA-1-01 | FEBRUARY 2003 | FIGURE A-5

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

DRAFT

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEV DEPTH	TESTING	SAMPLE	▲ N-VALUE ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
80		Boring completed at 81.5 feet.	81.5			▲15 ●	
85							
90							
95							
100							
105							
110							
115							
120						0 50 100	

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 LOG ATOFINA-4-01-B1-5.GPJ GEODESIGN OR.GDT 2/12/03

GEODESIGN INC
Portland, OR

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	**Client Sample ID:**	PSS-72
Lab Order:	0111250	**Tag Number:**	
Project:	16291.018/Penwalt	**Collection Date:**	11/29/01
Lab ID:	0111250-73A	**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	**Client Sample ID:**	PSS-73
Lab Order:	0111250	**Tag Number:**	
Project:	16291.018/Penwalt	**Collection Date:**	11/29/01
Lab ID:	0111250-74A	**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	**Client Sample ID:**	PSS-74
Lab Order:	0111250	**Tag Number:**	
Project:	16291.018/Penwalt	**Collection Date:**	11/29/01
Lab ID:	0111250-75A	**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	Client Sample ID:	PSS-75
Lab Order:	0111250	Tag Number:	
Project:	16291.018/Penwalt	Collection Date:	11/29/01
Lab ID:	0111250-76A	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***		
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/102194
01837ICP.WM1 - Sample 4/4/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Elf Atochem North America, Inc.	**Service Request:**	K9602437
Project:	Brine Filter Press	**Date Collected:**	4/25/96
Sample Matrix:	Misc.	**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: _____ Date: 5-10-96

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 Method	MRL	Regulatory 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: _____ Date: 5-10-96

Appendix D

ODEQ Risk-Based Concentration Calculations

RISK-BASED CONCENTRATIONS

Contaminated Medium →		SOIL (mg/Kg)						SOIL (mg/Kg)				SOIL (mg/Kg)				SOIL (mg/Kg)			
Exposure Pathway →		Surface Soil Ingestion, Dermal Contact, and Inhalation RBC_{ss}						Volatilization to Outdoor Air RBC_{so}				Vapor Intrusion into Buildings RBC_{si}				Leaching to Groundwater RBC_{sw}			
Receptor Scenario →		Residential		Occupational		Excavation Worker		Residential		Occupational		Residential		Occupational		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	5.2E+00		2.3E+01		1.0E+03	>Csat	1.1E+01		2.1E+01		9.1E-02		5.0E-01		2.3E-02		5.4E-02	
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		5.4E+02	=Csat	3.9E+02		5.4E+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
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		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
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
Benz[a]anthracene	c, nv	2.1E-01		2.7E+00		2.7E+02	>Csat	1.9E+01	=Csat	1.9E+01	=Csat	1.9E+01	=Csat	1.9E+01	=Csat	8.6E+00		1.9E+01	=Csat
Benzo[b]fluoranthene	c, nv	2.1E-01		2.7E+00		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
Benzo[k]fluoranthene	c, nv	2.1E+00		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
Benzo[a]pyrene	c, nv	2.1E-02		2.7E-01		2.7E+01	>Csat	8.3E+00	=Csat	8.3E+00	=Csat	8.3E+00	=Csat	8.3E+00	=Csat	2.2E+00		5.2E+00	
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
Dibenz[a,h]anthracene	c, nv	2.1E-02		2.7E-01		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
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
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
Indeno[1,2,3-cd]pyrene	c, nv	2.1E-01		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
Naphthalene	nc, v	3.1E+01		3.6E+02	>Csat	1.4E+03	>Csat	3.1E+02		3.1E+02	=Csat	3.1E+02	=Csat	3.1E+02	=Csat	3.1E+02	=Csat	3.1E+02	=Csat
Pyrene	nc, nv	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
MTBE (methyl t-butyl ether)	c, v	1.1E+02		6.9E+02		5.4E+04	>Csat	9.4E+02		1.7E+03		1.3E+01		8.4E+01		1.6E-01		1.6E-01	
EDB (1,2-dibromoethane)	c, v	3.3E-03		3.0E-02		3.6E+00		4.3E-01		7.8E-01		2.6E-02		1.7E-01		7.9E-06		1.9E-05	
EDC (1,2-dichloroethane)	c, v	2.2E+00		9.0E+00		3.3E+02		3.6E+00		6.6E+00		3.9E-02		2.6E-01		5.7E-03		1.3E-02	
Lead	NA, nv	4.0E+02	L	1.0E+03	L	1.0E+03	L		NA		NA		NA		NA	4.0E-01	L	1.5E+00	L
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
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
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	4.8E+00	=Csat	4.8E+00	=Csat
1,3,5-trimethylbenzene	nc, v	4.7E+01		7.2E+02	>Csat	8.1E+02	>Csat	2.1E+02	=Csat	2.1E+02	=Csat	1.5E+01		6.5E+01		2.1E+02	=Csat	2.1E+02	=Csat
1,1-Dichloroethene	nc, v	8.9E+02		1.7E+04	>Csat	2.5E+04	>Csat	1.2E+03	=Csat	1.2E+03	=Csat	8.5E+01		3.0E+02		5.1E+01		7.1E+01	
cis-1,2-Dichloroethene	nc, v	1.7E+02		3.0E+03	>Csat	4.4E+03	>Csat	9.6E+02	=Csat	9.6E+02	=Csat	1.5E+01		5.2E+01		5.2E+00		7.3E+00	
trans-1,2-Dichloroethene	nc, v	3.3E+02		6.0E+03	>Csat	8.8E+03	>Csat	2.5E+03	=Csat	2.5E+03	=Csat	3.0E+01		1.0E+02		1.5E+01		2.1E+01	
Tetrachloroethene	c, v	4.6E+00		2.7E+01		1.3E+03	>Csat	1.6E+01		2.9E+01		1.3E-01		6.9E-01		5.8E-02		1.4E-01	
1,1,1-Trichloroethane	nc, v	6.8E+03	>Csat	1.4E+05	>Csat	2.5E+05	>Csat	9.7E+02	=Csat	9.7E+02	=Csat	9.4E+02		9.7E+02	=Csat	3.9E+02		5.4E+02	
Trichloroethene	c, v	5.9E-01		2.1E+00		7.7E+01		8.2E-01		1.5E+00		6.6E-03		4.3E-02		7.6E-03		1.8E-02	
Vinyl chloride - Residential	c, v	1.1E-01		7.8E-01		9.4E+01		4.6E+00		8.3E+00		3.7E-02		2.0E-01		3.0E-04		7.2E-04	
Vinyl chloride - Occupational	c, v	4.9E-01		3.6E+00		4.4E+02		2.0E+01		3.6E+01		1.7E-01		9.1E-01		1.4E-03		3.3E-03	
1,4-Dioxane	c, nv	2.6E+01		2.4E+02		3.0E+04		9.9E+01		2.2E+02		1.2E+02		8.0E+02		4.5E-02		1.1E-01	
1,2-Dichlorobenzene	nc, v	1.0E+03	>Csat	1.9E+04	>Csat	2.6E+04	>Csat	4.9E+02	=Csat	4.9E+02	=Csat	4.9E+02	=Csat	4.9E+02	=Csat	4.9E+02	=Csat	4.9E+02	=Csat

Contaminated Medium →		GROUNDWATER (mg/L)				GROUNDWATER (mg/L)				GROUNDWATER (mg/L)			
Exposure Pathway →		Groundwater Ingestion RBC_{dw}				Volatilization to Outdoor Air RBC_{wo}				Vapor Intrusion into Buildings RBC_{wi}			
Receptor Scenario →		Residential		Occupational		Residential		Occupational		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	9.6E-04		2.3E-03		3.2E+00		7.1E+00		1.8E-01		1.2E+00	
Toluene	nc, v	6.3E+00		8.9E+00		5.3E+02	=S	5.3E+02	=S	2.8E+02		5.3E+02	=S
Ethylbenzene	nc, v	3.2E+00		4.4E+00		1.7E+02	=S	1.7E+02	=S	1.7E+02	=S	1.7E+02	=S
Xylenes	nc, v	2.2E+01		3.1E+01		1.8E+02	=S	1.8E+02	=S	8.0E+01		1.8E+02	=S
Acenaphthene	nc, v	1.9E+00		2.7E+00		4.2E+00	=S	4.2E+00	=S	4.2E+00	=S	4.2E+00	=S
Anthracene	nc, v	9.5E+00	>S	1.3E+01	>S	4.3E-02	=S	4.3E-02	=S	4.3E-02	=S	4.3E-02	=S
Benz[a]anthracene	c, nv	7.2E-05		1.7E-04		9.4E-03	=S	9.4E-03	=S	9.4E-03	=S	9.4E-03	=S
Benzo[b]fluoranthene	c, nv	7.2E-05		1.7E-04		1.5E-03	=S	1.5E-03	=S	1.5E-03	=S	1.5E-03	=S
Benzo[k]fluoranthene	c, nv	7.2E-04		1.7E-03	>S	8.0E-04	=S	8.0E-04	=S	8.0E-04	=S	8.0E-04	=S
Benzo[a]pyrene	c, nv	7.2E-06		1.7E-05		1.6E-03	=S	1.6E-03	=S	1.6E-03	=S	1.6E-03	=S
Chrysene	c, nv	7.2E-03	>S	1.7E-02	>S	1.6E-03	=S	1.6E-03	=S	1.6E-03	=S	1.6E-03	=S
Dibenz[a,h]anthracene	c, nv	7.2E-06		1.7E-05		2.5E-04	=S	2.5E-04	=S	2.5E-04	=S	2.5E-04	=S
Fluoranthene	nc, nv	1.3E+00	>S	1.8E+00	>S	2.1E-01	=S	2.1E-01	=S	2.1E-01	=S	2.1E-01	=S
Fluorene	nc, v	1.3E+00		1.8E+00		2.0E+00	=S	2.0E+00	=S	2.0E+00	=S	2.0E+00	=S
Indeno[1,2,3-cd]pyrene	c, nv	7.2E-05	>S	1.7E-04	>S	2.2E-05	=S	2.2E-05	=S	2.2E-05	=S	2.2E-05	=S
Naphthalene	nc, v	6.3E-01		8.9E-01		3.1E+01	=S	3.1E+01	=S	3.1E+01	=S	3.1E+01	=S
Pyrene	nc, nv	9.5E-01	>S	1.3E+00	>S	1.4E-01	=S	1.4E-01	=S	1.4E-01	=S	1.4E-01	=S
MTBE (methyl t-butyl ether)	c, v	2.0E-02	M	2.0E-02	M	9.6E+02		2.1E+03		1.0E+02		6.9E+02	
EDB (1,2-dibromoethane)	c, v	6.2E-07		1.5E-06		9.9E-01		2.2E+00		1.3E-01		8.5E-01	
EDC (1,2-dichloroethane)	c, v	5.6E-04		1.4E-03		2.8E+00		6.2E+00		2.6E-01		1.7E+00	
Lead	NA, nv	4.0E-03	L	1.5E-02	L		NA		NA		NA		NA
iso-propylbenzene	nc, v	3.2E+00		4.4E+00		3.0E+01	=S	3.0E+01	=S	3.0E+01	=S	3.0E+01	=S
n-propylbenzene	nc, v	1.3E+00		1.8E+00		1.4E+01	=S	1.4E+01	=S	1.4E+01	=S	1.4E+01	=S
1,2,4-trimethylbenzene	nc, v	1.6E+00	>S	2.2E+00	>S	2.6E-01	=S	2.6E-01	=S	2.6E-01	=S	2.6E-01	=S
1,3,5-trimethylbenzene	nc, v	1.6E+00		2.2E+00		5.0E+01	=S	5.0E+01	=S	4.3E+00		1.8E+01	
1,1-Dichloroethene	nc, v	1.6E+00		2.2E+00		8.3E+02		1.2E+03		3.7E+01		1.5E+02	
cis-1,2-Dichloroethene	nc, v	3.2E-01		4.4E-01		6.9E+02		9.7E+02		4.7E+01		2.0E+02	
trans-1,2-Dichloroethene	nc, v	6.3E-01		8.9E-01		7.9E+02		1.1E+03		4.4E+01		1.8E+02	
Tetrachloroethene	c, v	1.0E-03		2.4E-03		2.1E+00		4.6E+00		9.6E-02		6.3E-01	
1,1,1-Trichloroethane	nc, v	8.9E+00		1.2E+01		1.3E+03	=S	1.3E+03	=S	7.0E+02		1.3E+03	=S
Trichloroethene	c, v	1.3E-04		3.1E-04		1.6E-01		3.6E-01		8.1E-03		5.3E-02	
Vinyl chloride - Residential	c, v	1.5E-05		3.6E-05		3.3E-01		7.2E-01		1.3E-02		8.8E-02	
Vinyl chloride - Occupational	c, v	7.0E-05		1.7E-04		1.5E+00		3.3E+00		6.0E-02		4.0E-01	
1,4-Dioxane	c, nv	4.8E-03		1.1E-02		4.8E+03		1.1E+04		8.1E+02		5.4E+03	
1,2-Dichlorobenzene	nc, v	2.9E+00		4.0E+00		1.6E+02	=S	1.6E+02	=S	1.6E+02	=S	1.6E+02	=S

Contaminated Medium →		GROUNDWATER (mg/L)				GROUNDWATER (mg/L)		AIR (see notes) (µg/m³)			
Exposure Pathway →		Ingestion & Inhalation from Tapwater RBC_{tw}				GW in Excavation RBC_{we}		Inhalation RBC_{air}			
Receptor Scenario →		Residential		Occupational		Excavation Worker		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note
Benzene	c, v	3.6E-04		8.2E-04		7.6E-01		3.0E-01		6.5E-01	
Toluene	nc, v	9.1E-01		1.3E+00		3.7E+01		5.3E+02		7.4E+02	
Ethylbenzene	nc, v	1.5E+00		2.1E+00		5.2E+01		1.4E+03		1.9E+03	
Xylenes	nc, v	2.8E-01		3.9E-01		1.1E+01		1.4E+02		1.9E+02	
Acenaphthene	nc, v	4.4E-01		6.2E-01		4.2E+00	=S	2.9E+02		4.0E+02	
Anthracene	nc, v	4.3E-02	=S	4.3E-02	=S	4.3E-02	=S	1.4E+03	>Pv	2.0E+03	>Pv
Benz[a]anthracene	c, nv		NA		NA	4.1E-03		1.2E-02		2.6E-02	
Benzo[b]fluoranthene	c, nv		NA		NA	1.5E-03	=S	1.2E-02		2.6E-02	
Benzo[k]fluoranthene	c, nv		NA		NA	8.0E-04	=S	1.2E-01	>Pv	2.6E-01	>Pv
Benzo[a]pyrene	c, nv		NA		NA	2.4E-04		1.2E-03		2.6E-03	
Chrysene	c, nv		NA		NA	1.6E-03	=S	1.2E+00		2.6E+00	
Dibenz[a,h]anthracene	c, nv		NA		NA	8.8E-05		1.2E-03	>Pv	2.6E-03	>Pv
Fluoranthene	nc, nv		NA		NA	2.1E-01	=S	1.9E+02	>Pv	2.7E+02	>Pv
Fluorene	nc, v	2.9E-01		4.1E-01		2.0E+00	=S	1.9E+02		2.7E+02	
Indeno[1,2,3-cd]pyrene	c, nv		NA		NA	2.2E-05	=S	1.2E-02	>Pv	2.6E-02	>Pv
Naphthalene	nc, v	8.2E-03		1.1E-02		3.2E-01		4.1E+00		5.8E+00	
Pyrene	nc, nv		NA		NA	1.4E-01	=S	1.4E+02	>Pv	2.0E+02	>Pv
MTBE (methyl t-butyl ether)	c, v	1.4E-02		1.7E-02		6.9E+01		2.4E+01		5.4E+01	
EDB (1,2-dibromoethane)	c, v	6.0E-07		1.4E-06		8.6E-03		1.1E-02		2.4E-02	
EDC (1,2-dichloroethane)	c, v	1.4E-04		3.2E-04		2.8E-01		9.4E-02		2.1E-01	
Lead	NA, nv		NA		NA		NA		NA		NA
iso-propylbenzene	nc, v	7.9E-01		1.1E+00		1.9E+01		5.3E+02		7.4E+02	
n-propylbenzene	nc, v	2.9E-01		4.1E-01		6.2E+00		1.9E+02		2.7E+02	
1,2,4-trimethylbenzene	nc, v	1.6E-02		2.3E-02		2.6E-01	=S	8.2E+00		1.1E+01	
1,3,5-trimethylbenzene	nc, v	1.6E-02		2.3E-02		6.3E-01		8.2E+00		1.1E+01	
1,1-Dichloroethene	nc, v	4.1E-01		5.7E-01		2.0E+01		2.7E+02		3.8E+02	
cis-1,2-Dichloroethene	nc, v	7.4E-02		1.0E-01		3.6E+00		4.8E+01		6.7E+01	
trans-1,2-Dichloroethene	nc, v	1.5E-01		2.1E-01		7.1E+00		9.6E+01		1.3E+02	
Tetrachloroethene	c, v	4.5E-04		1.0E-03		6.9E-01		4.1E-01		9.0E-01	
1,1,1-Trichloroethane	nc, v	3.6E+00		5.0E+00		1.9E+02		3.0E+03		4.2E+03	
Trichloroethene	c, v	3.2E-05		7.2E-05		6.0E-02		2.1E-02		4.7E-02	
Vinyl chloride - Residential	c, v	1.4E-05		3.3E-05		1.4E-01		1.2E-01		2.6E-01	
Vinyl chloride - Occupational	c, v	6.6E-05		1.5E-04		6.5E-01		5.3E-01		1.2E+00	
1,4-Dioxane	c, nv		NA		NA	1.4E+03		7.8E-01		1.7E+00	
1,2-Dichlorobenzene	nc, v	4.6E-01		6.4E-01		1.7E+01		2.7E+02		3.6E+02	

RBC Table Notes:

Although RBC values for air are included in this table, the Department does not routinely require that air (indoor or outdoor) be tested at UST cleanup sites due to the great temporal and spatial variability in air concentrations which makes it difficult to collect representative samples. However, in cases where soil gas or air samples are collected because of vapor problems, or to better assess site-specific risk from breathing airborne volatiles, the RBCs for air should be used as the acceptable air concentrations.

The symbols 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. The RBCs in this row were calculated using equations for carcinogens described in Appendix B.

>Csat This soil RBC exceeds the limit of three-phase equilibrium partitioning. Refer to Appendix D for the corresponding value of Csat. Soil concentrations in excess of Csat indicate that free product might be present. See Section B.2.2.3 for additional information.

=Csat This number is NOT a risk-based concentration. It can be assumed that this constituent can not create an unacceptable risk by this pathway. However, concentrations in excess of this value indicate that free product may be present. See Section B.2.2.3 for additional information.

L The values for lead reported in this table are not derived from the equations developed in Appendix B. See Section B.3.4.1 for the source of the lead numbers and information on applying them.

M Because there is no published oral reference dose (RfDo) for MTBE, the following modifications have been made:
(1) The RBCss and RBCwe values for MTBE are based solely on inhalation.
(2) An interim standard for groundwater ingestion (RBCdw) has been set at 20 ug/L (ppb) based on EPA guidance (EPA, 1997d).
(3) An interim leaching-to-groundwater concentration (RBCsw) has been calculated on the basis of the interim groundwater ingestion value.
See Section B.3.4.2 for more information about MTBE.

NA This pathway is not applicable to the chemical of interest.

nc This chemical is a noncarcinogen. The RBCs in this row were calculated using equations for noncarcinogens described in Appendix B.

nv This chemical is classified as "nonvolatile" for purposes of the exposure calculations in this document.

Pv The air concentration reported for the RBC exceeds the vapor pressure of the pure chemical. It can be assumed that this constituent can not create an unacceptable risk by this pathway. See Section B.2.2.3 for additional information.

>S This groundwater RBC exceeds the solubility limit. Refer to Appendix D for the corresponding value of S. Groundwater concentrations in excess of S indicate that free product may be present. See Section B.2.2.3 for additional information.

=S This number is NOT a risk-based concentration. It can be assumed that this constituent can not create an unacceptable risk by this pathway. However, concentrations in excess of this value indicate that free product might be present. See Section B.2.2.3 for additional information.

v This chemical is classified as "volatile" for purposes of the exposure calculations in this document.

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 Adherance Factor - Adult (mg/cm^2-day)	AF	0.08	5	0.08	5	1.00	5
Soil to Skin Adherance 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_{acrk}	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_{wcrk}	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	Note	Occupational	Note	Excavation Wrkr	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_{si}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.
1. Acceptable risk levels are specified in statute (ORS 465.315) and defined in rule (OAR 340-122-0115).
2. EPA (1989)
3. EPA (1991b)
4. EPA (1997c)
5. EPA (1998c)
6. DEQ (1998b)
7. Calculated from equations given in EPA (1998a).
8. ASTM (1995b)
   8a. f_{oc} is an average of ASTM (1995b) and EPA (1996b) defaults.
9. Calculated from $\rho_s = \rho_b/(1-n)$.
10. Calculated from $n_a=n-n_w$; $n_{acap}=n-n_{wcap}$; $n_{acrk}=n-n_{wcrk}$.
11. n_{wcrk} assumed = n_w.
12. Calculated from $L_v = L_w - L_{cap}$
13. EPA (1996b)
14. Estimated from data reported in Michigan DEQ (1998).
15. Derived from range of floor-wall seem gaps given in EPA (1997b).
16. Refer to Section B.3.2.1.
17. Refer to Section B.3.2.2.
18. Refer to Section B.3.2.3.
19. Refer to Section B.3.2.4.
20. Refer to Section B.3.3.4.
21. Refer to Section B.3.3.5.
22. 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/m³)	C_{sat} (mg/kg)	K_{oc} (cm³/g)		K_H (m³-atm/mol)		H	D_{air} (cm²/s)		D_w (cm²/s)	
	Note 1	Note 2		Note	Note 4a	Note 4b		Note		Note	Note 6		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	6.64E-03	3	2.76E-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	2.76E-02	4.92E+00	1.23E+06	5	8.29E-07	3	3.45E-05	2.26E-02	3	5.56E-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	5.11E-07	2.02E-02	3	5.18E-06	3
Fluoranthene	nv	202	2.06E-01	3	1.38E+02	1.10E+02	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	1.48E-03	3.82E-01	3.47E+06	5	1.60E-06	3	6.65E-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	1.98E+02	2.80E+03	9	1.30E-02	9	5.41E-01	7.60E-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-Dichloroethene	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-Dichloroethene	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-Dichloroethene	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	
Tetrachloroethene	v	166	2.00E+02		1.53E+08	1.93E+02	1.55E+02		1.84E-02		7.65E-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	
Trichloroethene	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-05	
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-05	
1,4-Dioxane	nv	88	1.00E+06		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} m^3-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/m^3 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 m^3-atm/mol, R is the ideal gas law constant (8.21 x 10^{-5} m^3-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 Type	RfD_i (mg/Kg-day)	Note	RfD_o (mg/Kg-day)	Note	SF_i (mg/Kg-day)$^{-1}$	Note	SF_o (mg/Kg-day)$^{-1}$	Note	RAF_d Note 5	K_p (cm/hr)	τ (hr)	t^* (hr)	B	Note	DA_{we} (L/cm^2-event) Note 8
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	6	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	1g					1.30E-01	2.62E-01	1.07E+00	5.45E+00	3.47E+00	7	1.06E-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	2.21E-02
Fluoranthene	nc	4.00E-02	3	4.00E-02	1e					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	8	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	1.96E-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	1e,2	8.60E-01	10	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	4.60E-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	2.60E-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

FINAL

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

FINAL

ATOFINA Chemicals, Inc.

Soil and Groundwater Management Plan

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

23 July 2003

5204.00

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Timothy S. McCormack, R.G.
Principal

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(425) 462-8591
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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.

5.0 REFERENCES

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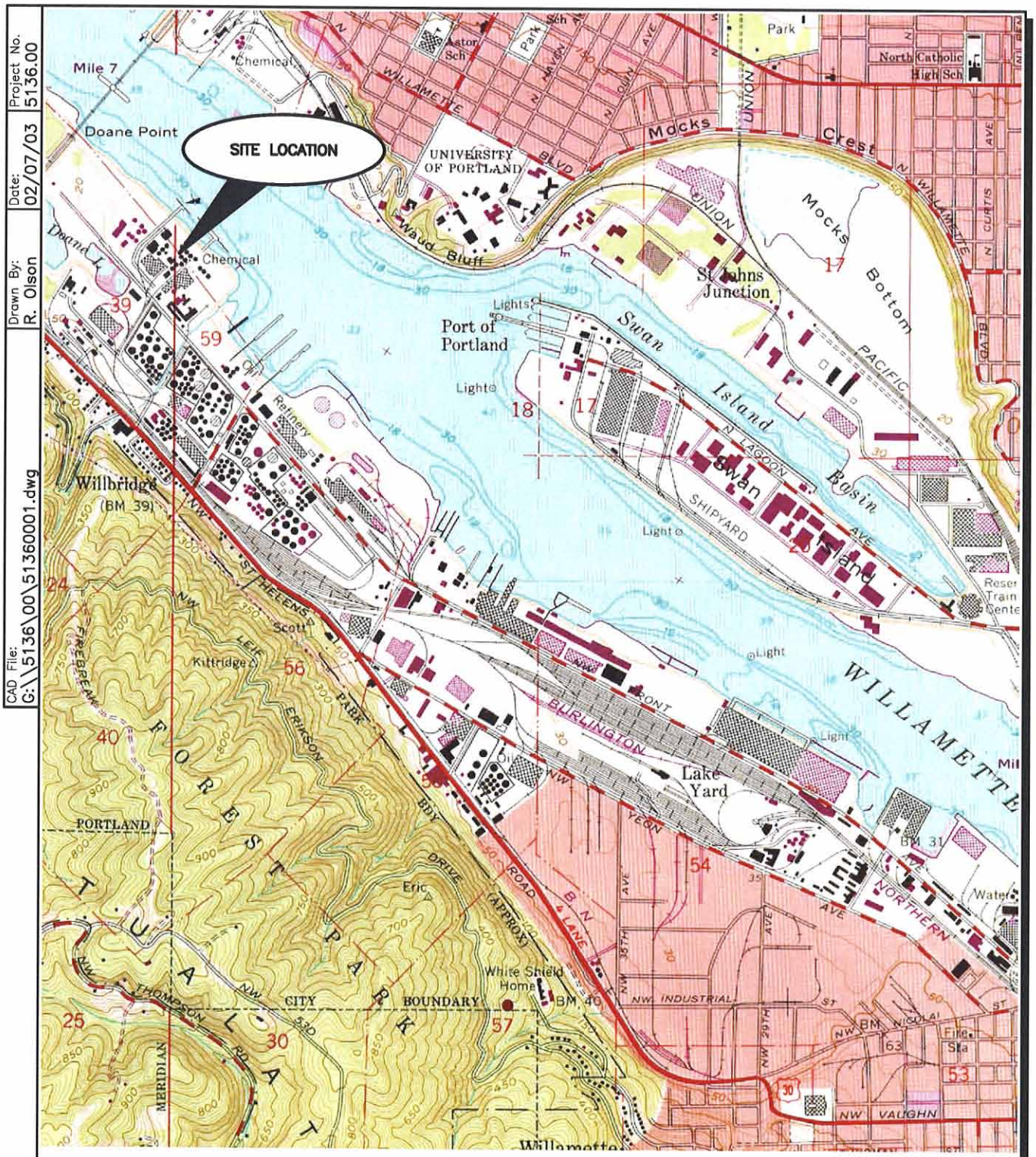
Figures



References:
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Dated: 1961; Photorevised 1970 and 1977

Figure 1-1
Site Location Map
ATOFINA Chemicals, Inc.
Portland, Oregon
ERM *02/03*

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

0 200
FEET

WILLAMETTE RIVER

RP-02 WELL CLUSTER

W-19 WELL CLUSTER

LOT 1
283,190.52 SF
6.50 AC

LOT 2
348,027.67 SF
7.99 AC

LOT 3
619,450.97 SF
14.22 AC

LOT 4
1,079,518.98 SF
24.78 AC

FORMER DDT TRENCH AND 2-FEET BUFFER

CELL LIQUOR STORAGE
WAREHOUSE No. 2
WAREHOUSE No. 3
No. 1 DOCK
No. 2 DOCK
SALT PAD
SALT PADS
CHROMATE SYSTEM
OIL STORAGE
SALT PAD #1
BY-GAS SYSTEM
WASTEWATER TREATMENT
CAUSTIC TANK FARM
CHLORINE FINISHING
WAREHOUSE
EVAPS
CAUSTIC PROCESS
WAREHOUSE No. 1
CELL REPAIR
BRINE STORAGE
CHLORINE CELL ROOM (DIAMOND)
STORE ROOM
MAINTENANCE SHOP
CHLORATE PROCESS
CHLORATE WAREHOUSE
OFFICE
EMERGENCY SCRUBBER
EPA OXIDATION AREA
CONTRACTOR PARKING

N.W. FRONT AVE.

ESCO
GOULD INC.
AIR LIQUIDE
GATX

LEGEND

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

Figure 1-2
Site Layout Map
ATOFINA Chemicals, Inc.
Portland, Oregon
ERM 02/03

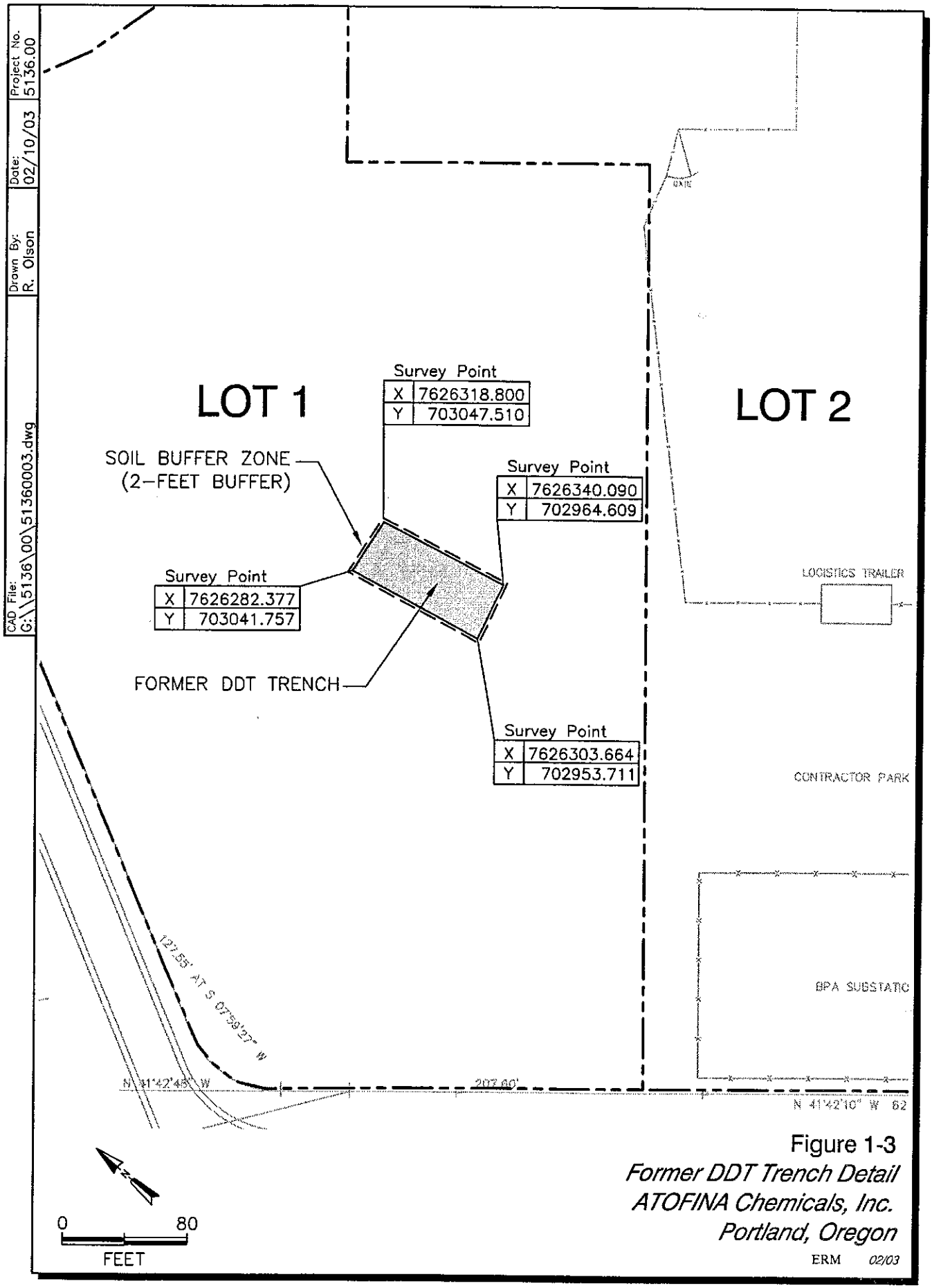

Figure 1-3
Former DDT Trench Detail
ATOFINA Chemicals, Inc.
Portland, Oregon
ERM 02/03

Tables

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

Sample ID	Location Description	Approximate Depth[a]	Analyte		
			DDD	DDE	DDT
		ft	mg/kg	mg/kg	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

			Volatile Organic Compounds (ug/l)																							Semivolatile Organic Compounds (ug/l)					Hydrocarbons (mg/l)	
Sample ID	Sample Date	Ref Report	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	Nap-thalene	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	NR	<1.0	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	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	NR	3.02	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	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	NR	3.73	<1.0	NR	NR	<2.0	NR	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	<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	<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	<2.0	<1.0	NR	<1.0	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	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	NR	<1.0	(0.34) J	<1.0	NR	<1.0	<2.0	<1.0	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	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	NR	<1.0	NR	NR	NR	NR	NR	NR	NR	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	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	<2.0	<1.0	NR	<1.0	NS	NS	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 N	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	NR	<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	NR	<1.0	<1.0	<1.0	NR	<1.0	<2.0	2	NR	4.88	NS	NS	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	NR	<1.0	<1.0	<1.0	NR	<1.0	<2.0	1.72	NR	3.61	NS	NS	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	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 = After 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 = tetrachlorothene
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) 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	Herbicides/Pesticides (ug/l) 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,EM	<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	<1.0	<4.0	<1.0	<1.0
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	1.2	1,000 U	NR	NR	100 U
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 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	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

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DCB = Dichlorobenzene
DCA = Dichloroethane
DCE = Dichloroethene
DMP = Dimethylphenol
TMB = trimethylbenzene
TCE = trichloroethene
PCE = tetrachlorothene
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.
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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-niethylphenol	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
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	6.41	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	<1.0	NR	NR	<2.0	5.99 J	NR	NR	NR	<1.0	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	NR	NR	NR	NR	NR	NR	NR	<1.0	NR	NR	<2.0	3.23	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	<1.0	NR	NR	NR	NR	NR	NR	NR	5.03	NR	NR	<2.0	NR	NR	NR	NR	<2.0	NR	NR
W-19-I	10/1/1990	2	1 J	NR	13	10 U	190	7 J	62	5 U	NR	1 J	5 U	NR	NR	10	NR	5 U	2 J	NR	NR	4 U	NR	NR	NR	5 U	NR	NR	NR
W-19-I	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	3.1	NR	NR	NR
W-19-I	4/18/2000	6	1.1 J	NR	39.4 J	NR	329 D, J	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	12.7 J	NR	NR
W-19-I	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	24.7 D	NR	NR
W-19-I	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,J, CH	NR	1.57	<0.125	<0.25
W-19-I	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	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	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	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,B, 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	<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	<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	<1.0		
W-15-I	10/1/1990	2	2 J	NR	5 U	21	21 J	10 U, 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	5 U	NR	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	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	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	<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

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

			Dioxins/Furans (pg/l)										Herbicides/Pesticides (ug/l)				
Sample ID	Sample Date	Ref Report	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,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,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,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

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Table 1-4a
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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	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	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	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	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,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	NR	<1.0	7.8	<1.0	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 J, 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	NR	<1.0	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	
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 J, D	<0.151	<0.187	<0.194	NR	NR	NR	<0.104	1.85 J, 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

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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 (47-50')	10/26/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.1	NR	1.43	<4.0	NR	NR	10.6
GGW-014 (46-49')	10/27/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.1	NR	<1.0	4.54	NR	NR	4.37
GGW-015 (44-47')	10/26/1999	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	<0.1	NR	1	<4.0	NR	NR	6.31
GGW-016 (42-45')	10/28/1999	3	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	<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	0.95	NR	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

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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	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	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

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

			Dioxins/Furans (pg/l)								Herbicides/Pesticides (ug/l)						
Sample ID	Sample Date	Ref Report	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)	MCPP	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	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,EMPC	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,EMPC	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	ND	ND	ND	ND	ND	ND	19.2 J
W-11-B	10/10/2000		NR	NR	NR	NR	NR	NR	NR	NR	ND	ND	(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

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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 labortoary 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.

Oregon
Theodore R. Kulongoski, Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
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TTY (503) 229-5471

November 7, 2003

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ERM-WEST, INC.
BELLEVUE, WA
FILE

Larry Patterson
ATOFINA Chemicals, Inc.
6400 N.W. Front Ave.
Portland, OR 97210

Re: Environmental Summary Report
Lots 1 and 2, ATIOFINA Chemicals, Inc.
ECSI No. 398

Dear Mr. Patterson:

The Oregon Department of Environmental Quality (DEQ) reviewed the July 23, 2003 report *Environmental Summary Report Lots 1 and 2 ATOFINA Chemicals, Inc. Portland, Oregon* prepared by Environmental Resources Management. In general, the revised final report adequately responded to our March 13, 2003 comments on the Draft Environmental Summary Report for Lots 1 & 2 and is accepted. The following are our review comments.

Lot 1

After reviewing the Lot 1 information and data, the DEQ project team agrees that:

- The DDT-trench cleanup conducted in 1992 was adequate to protect human health.
- The proposed soil management plan is an appropriate remedy that reasonably ensures protection of ecological receptors from the remaining low levels of DDT (less than 1.8 mg/kg) present beneath surface soils.
- The contaminants detected in groundwater are attributable to an off-site source, and application of DEQ's Contaminated Aquifer Policy is appropriate.

Lot 1 Soil Management Plan

Section 2.1 Subsurface Soil, Page 6 – This section states that a 10-foot wide buffer strip has been established around the perimeter of the trench area. However, Figures 1-2 and 1-3 identify a 2-foot buffer strip. This will need to be corrected for the final proposal.

Lot 2

The DEQ project team concluded the following after reviewing the Lot 2 information and additional data available in the DEQ Rhone- Poulenc (RPAC) Cleanup Program project files.

- Soil testing after decommissioning of the Bonneville Power Administration (BPA) Substation Annex does not indicate that releases of hazardous substances occurred from this operation and that no additional investigation associated with this potential hazardous substance source area is warranted.
- The past industrial activities conducted on Lot 2, identified in the report, are not likely to have hazardous substances associated with them and do not warrant additional investigation.
- With the following exceptions, contaminants detected in groundwater are attributable to an off-site source, and application of DEQ's Contaminated Aquifer Policy is appropriate
    1. DDT was detected in GGW-016 (42'-45') at 0.741ug/L. The DDT ambient water quality criteria (AWQC) for fish consumption is 0.000024 ug/L.
    2. Arsenic (dissolved) has been detected in monitoring well RP02-31 between 73.9 and 132 ug/L[1] which is approximately an order of magnitude higher than up gradient groundwater concentrations. The arsenic AWQC for fish consumption is 0.0175 ug/L.
    3. Chloride was detected in monitoring well RP02-49 at concentrations between 8,390 and 10,500 mg/L which is approximately an order of magnitude higher than up gradient groundwater concentrations. The chronic AWQC for chloride is 230 mg/L.

Additional investigation (e.g., resampling of existing monitoring wells and new push-probe sampling) and evaluation of the RP02 and GGW-016 areas is necessary before DEQ can determine the significance of these detections of groundwater contaminants. Enclosed for your reference are copies of the boring logs for RP-02-31, RP-02-49 and RP-02-66 and figures from the March 28, 2003, RPAC Final Groundwater Characterization Report which plot the distribution of arsenic, methane, DDT/DDE and chloride. The methane plot is included because it suggests that reducing conditions are present in the RP02 vicinity which may relate to the elevated arsenic.

The Next Steps

DEQ would like to meet with you to discuss groundwater issues at Lot 2, potential conceptual models for the contaminant detections and strategies to resolve the issues. Our preference is to resolve or clarify the Lot 2 issues before proceeding with approval of the Lot 1 cleanup remedy. However, we are open to discussing the alternative.

The following steps are required prior to approving the Lot 1 remedy.

1. Prepare a staff report for DEQ management summarizing the Lot 1 issues with recommendations that DEQ initiate the EPA concurrence process that the Lot 1 remedy adequately controls potential sources to the Willamette River.
2. After DEQ management concurrence and concurrence from the EPA technical consultation team, DEQ will issue public notice seeking comment on the proposed remedy.

[1] AMEC Earth & Environmental, Inc., March 28, 2003, Final Groundwater Characterization Report RPAC – Portland Site

3. Unless substantive comments are received, DEQ will approve the remedy and provide a conditional no further action (NFA) letter. Because the proposed remedy includes an institutional control (i.e., soil management plan implemented via an equitable servitude and easement), Lot 1 would remain on the DEQ Inventory (list of site requiring further action or long-term controls).

Provided we are able to resolve the Lot 2 groundwater issues, DEQ can issue a NFA for Lot 2 after successfully completing steps 1 and 2 above. However, public notice would not be required because a cleanup was not performed on the site and DEQ would not be approving a remedy.

Please contact me at (503) 229-5538 if you have any questions or to schedule a meeting regarding the next project steps.

Sincerely,

Matt McClincy
Project Manager
Voluntary Cleanup/Portland Harbor

cc: Jim Anderson, DEQ NWR
Rod Struck, DEQ NWR
Claudia Powers, Ater Wynne
Erik Ipsen, ERM

Oregon
Theodore Kulongoski, Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
FAX (503) 229-6945
TTY (503) 229-5471

November 5, 2004

Larry Patterson
ARKEMA, Inc.
6400 N.W. Front Ave.
Portland, OR 97210

Re: Lots 1 & 2 Characterization
ARKEMA, Inc. Facility
ECSI No. 398

Dear Mr. Patterson:

The purpose of this letter is to provide ARKEMA with additional comments on the previous characterization of Lots 1 and 2 of the ARKEMA facility. In correspondence dated November 7, 2003 (copy attached), DEQ provided review comments on the Environmental Summary Report for Lots 1 & 2 and identified the next regulatory and investigation steps necessary for the two lots.

Subsequent to DEQ issuing the November 7, ~~2004~~ 2003 letter, DEQ has the reevaluated the characterization of Lots 1 and 2 and has determined additional investigation and screening of surface soil will be necessary. Surface soil samples should be analyzed for contaminants of potential concern identified during the remedial investigation of Lots 3 and 4. As we discussed on the phone, I am raising this issue now so that it does not become an impediment to possible redevelopment or sale of the property.

Please call me at (503) 229-5538 to schedule a meeting or conference call to discuss the details of the surface soil characterization effort. During this meeting, DEQ would also like to discuss our comment (letter dated November 7, 2003) regarding Lot 2 groundwater.

Sincerely,

Rod Struck for

Matt McClincy
Project Manager
Portland Harbor Section

Enclosure
cc: Rod Struck, DEQ NWR
Jason Kraus, ERM
Jim Anderson, DEQ NWR
Claudia Powers, Ater Wynne

DEQ-EC1

ATO.COM

Oregon
Theodore R. Kulongoski, Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
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TTY (503) 229-5471

November 7, 2003

Larry Patterson
ATOFINA Chemicals, Inc.
6400 N.W. Front Ave.
Portland, OR 97210

Re: Environmental Summary Report
Lots 1 and 2, ATIOFINA Chemicals, Inc.
ECSI No. 398

Dear Mr. Patterson:

The Oregon Department of Environmental Quality (DEQ) reviewed the July 23, 2003 report *Environmental Summary Report Lots 1 and 2 ATOFINA Chemicals, Inc. Portland, Oregon* prepared by Environmental Resources Management. In general, the revised final report adequately responded to our March 13, 2003 comments on the Draft Environmental Summary Report for Lots 1 & 2 and is accepted. The following are our review comments.

Lot 1

After reviewing the Lot 1 information and data, the DEQ project team agrees that:

- The DDT-trench cleanup conducted in 1992 was adequate to protect human health.
- The proposed soil management plan is an appropriate remedy that reasonably ensures protection of ecological receptors from the remaining low levels of DDT (less than 1.8 mg/kg) present beneath surface soils.
- The contaminants detected in groundwater are attributable to an off-site source, and application of DEQ's Contaminated Aquifer Policy is appropriate.

Lot 1 Soil Management Plan

Section 2.1 Subsurface Soil, Page 6 – This section states that a 10-foot wide buffer strip has been established around the perimeter of the trench area. However, Figures 1-2 and 1-3 identify a 2-foot buffer strip. This will need to be corrected for the final proposal.

Lot 2

The DEQ project team concluded the following after reviewing the Lot 2 information and additional data available in the DEQ Rhone- Poulenc (RPAC) Cleanup Program project files.

- Soil testing after decommissioning of the Bonneville Power Administration (BPA) Substation Annex does not indicate that releases of hazardous substances occurred from this operation and that no additional investigation associated with this potential hazardous substance source area is warranted.
- The past industrial activities conducted on Lot 2, identified in the report, are not likely to have hazardous substances associated with them and do not warrant additional investigation.
- With the following exceptions, contaminants detected in groundwater are attributable to an off-site source, and application of DEQ's Contaminated Aquifer Policy is appropriate
    1. DDT was detected in GGW-016 (42'-45') at 0.741ug/L. The DDT ambient water quality criteria (AWQC) for fish consumption is 0.000024 ug/L.
    2. Arsenic (dissolved) has been detected in monitoring well RP02-31 between 73.9 and 132 ug/L[1] which is approximately an order of magnitude higher than up gradient groundwater concentrations. The arsenic AWQC for fish consumption is 0.0175 ug/L.
    3. Chloride was detected in monitoring well RP02-49 at concentrations between 8,390 and 10,500 mg/L which is approximately an order of magnitude higher than up gradient groundwater concentrations. The chronic AWQC for chloride is 230 mg/L.

Additional investigation (e.g., resampling of existing monitoring wells and new push-probe sampling) and evaluation of the RP02 and GGW-016 areas is necessary before DEQ can determine the significance of these detections of groundwater contaminants. Enclosed for your reference are copies of the boring logs for RP-02-31, RP-02-49 and RP-02-66 and figures from the March 28, 2003, RPAC Final Groundwater Characterization Report which plot the distribution of arsenic, methane, DDT/DDE and chloride. The methane plot is included because it suggests that reducing conditions are present in the RP02 vicinity which may relate to the elevated arsenic.

The Next Steps

DEQ would like to meet with you to discuss groundwater issues at Lot 2, potential conceptual models for the contaminant detections and strategies to resolve the issues. Our preference is to resolve or clarify the Lot 2 issues before proceeding with approval of the Lot 1 cleanup remedy. However, we are open to discussing the alternative.

The following steps are required prior to approving the Lot 1 remedy.

1. Prepare a staff report for DEQ management summarizing the Lot 1 issues with recommendations that DEQ initiate the EPA concurrence process that the Lot 1 remedy adequately controls potential sources to the Willamette River.
2. After DEQ management concurrence and concurrence from the EPA technical consultation team, DEQ will issue public notice seeking comment on the proposed remedy.

[1] AMEC Earth & Environmental, Inc., March 28, 2003, Final Groundwater Characterization Report RPAC – Portland Site

3. Unless substantive comments are received, DEQ will approve the remedy and provide a conditional no further action (NFA) letter. Because the proposed remedy includes an institutional control (i.e., soil management plan implemented via an equitable servitude and easement), Lot 1 would remain on the DEQ Inventory (list of site requiring further action or long-term controls).

Provided we are able to resolve the Lot 2 groundwater issues, DEQ can issue a NFA for Lot 2 after successfully completing steps 1 and 2 above. However, public notice would not be required because a cleanup was not performed on the site and DEQ would not be approving a remedy.

Please contact me at (503) 229-5538 if you have any questions or to schedule a meeting regarding the next project steps.

Sincerely,

Matt McClincy
Project Manager
Voluntary Cleanup/Portland Harbor

cc: Jim Anderson, DEQ NWR
Rod Struck, DEQ NWR
Claudia Powers, Ater Wynne
Erik Ipsen, ERM

ARKEMA

December 6, 2004

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

Subject: Response to OEDQ Review Comments on Final Environmental Summary Report, Lots 1 & 2, Arkema Inc. (ATOFINA Chemicals)
ESCI No. 398

Dear Mr. McClincy:

This letter has been prepared in response to DEQ's comment letter dated November 7, 2003 and a more recent letter dated November 5, 2004 regarding the *Final Environmental Summary Report, Lots 1 & 2*, dated July 23, 2003. Specifically, DEQ requested additional groundwater investigation for Lot 2 due to the following:

1. DDT was detected in direct-push groundwater sample GGW-016 (42'-45') at 0.741 ug/L on October 28, 1999;

2. Arsenic (dissolved) was detected in Rhone Poulenc monitoring well RP-02-31 at concentrations of 73.9 and 132 ug/L during 2000 and 2002; and

3. Chloride was detected in Rhone Poulenc monitoring well RP-02-49 at concentrations of 10,500 and 8,390 mg/L the spring and fall of 2000, respectively.

Each of these issues is discussed in the following paragraphs:

DDT

The following observations should be noted regarding the detection of DDT in groundwater (0.741 ug/L) from Rhone Poulenc's push sample GGW-016 (42'-45'):

1. DDT is a known constituent of concern for upgradient sources, and in accordance with Rhone Poulenc documents, was considered to be a major RPAC product.

2. A review of historic groundwater DDT/DDE/DDD (DDT) data available for the Rhone Poulenc site indicated DDT has been detected in numerous Rhone Poulenc wells upgradient from the Arkema property at concentrations at or above those found in the push sample result. The table below shows some of this data.

Well No.	Property	DDD ug/L	DDE ug/L	DDT ug/L
MW-08-64	RPAC	0.614	-	-
MW-09-42	METRO	0.187	-	-
MW-10-24.5	RPAC	0.73	-	0.74-3,9
MW-10-44	RPAC	0.3	-	0.27
MW-10-57.5	RPAC	-	-	0.08
MW-11-37	RPAC	0.0858	-	-
W-9	RPAC Lake Area	-	-	6
W-09-86	RPAC Lake Area	-	0.154	-
PZ-1-11.5	BNRR	<0.5	0.84	2.3
W-2	Gould	4.8	-	<2
RPW-02	RPAC	6.92	-	0.995

3. Rhone Poulenc sampled groundwater in the spring and fall of 2000, spring of 2001, and in April of 2002 and 2004. Throughout these sampling events, Rhone Poulenc wells on Arkema property (W-19-S, W-19-I, W-19-D, RP-02-31, RP-02-49, and RP-02-66) were not sampled for DDT. Even when push sample GGW-016 detected DDT at 0.741 ug/L in 1999, Rhone Poulenc was not required to include DDT in its list of analytes for these wells.

   Arkema's northern most wells (MWA-5 and MWA-14i) on the northern edge of the Acid Plant area are over 1000 feet south of GGW-016. Below is a table that displays recent groundwater data for these wells.

Well No.	Date	4,4-DDD ug/L	4,4-DDE ug/L	4,4-DDT ug/L
MWA-5	4/2002	<0.0096	<0.0096	<0.014
	6/2003	<0.0400	<0.0800	0.0916
MWA-14i	4/2002	0.091	<0.0098	0.078
	6/2003	0.0439	<0.0800	<0.0800

The DDT results in these wells are at least an order of magnitude less than the detection in GGW-016. This data tends to support the fact that any DDT present in groundwater near GGW-016 is most likely due to an upgradient source. Nevertheless, Arkema proposes to sample and evaluate groundwater from all three RP-02 wells that are approximately 100 feet true north of GGW-016. RP-02-49 is screened across the same groundwater zone as Rhone Poulenc's direct-push sample. If pesticides are not detected in these samples, it is assumed the issue can be put to rest.

Arsenic

The following observations should be noted regarding the arsenic detections (73.9 and 132 ug/L) at Well RP-02-31:

1. Arsenic is a known constituent of concern for upgradient sources, and in accordance with Rhone Poulenc documents, was used in their manufacturing processes.

2. A review of historic groundwater arsenic data available for the Rhone Poulenc site indicated arsenic has been detected in numerous Rhone Poulenc wells upgradient from the Arkema property at concentrations above those found in RP-02-31 on Arkema property. The table below shows some of this data.

Well No.	Property	Arsenic (ug/L)
W-2s	Gould	139-150
W-2i	Gould	130-610
W-7i	RPAC Lake Area	400-3,000
W-7d	RPAC Lake Area	200
PP-8	RPAC Lake Area	130
RP-04-16	RPAC Lake Area	185
ASW-05	METRO	160
W-16-S	Schnitzer	740

3. There is no known historical source of arsenic at the Arkema site, as indicated in the Preliminary Assessment and the Draft Remedial Investigation Report.

Based on the above information, it is likely the arsenic detections in well RP-02-31 are related to an upgradient source. Therefore, as in the case of other constituents detected in this well that have been linked to an upgradient source, Oregon's Contaminated Aquifer Policy should apply. Arkema does not feel it is our responsibility to conduct any additional sampling for arsenic related matters on Lot 2.

Chloride

Chloride detected in well RP-02-49 on Lot 2 could be associated with historical handling of salt (sodium chloride, NaCl) at the Arkema property. Although the plant received solid sodium chloride by ship, it was dissolved with water to form a brine solution. This brine solution was handled throughout the plant. It is important to note that all sources of solid salt and brine solution were removed from the plant in 2001 shortly after the manufacturing operations were shut down. It is also important to understand that chloride is highly soluble in water and is highly mobile. Therefore, concentrations should diminish relatively quickly in groundwater.

Based on a review of the Rhone Poulenc spring and fall groundwater data from 2000, spring of 2001, and data from April 2002 and April 2004 it appears that chloride concentrations upgradient of Arkema typically range from several hundred to several thousand milligrams per liter. The following data from these sampling events depict the chloride concentration (mg/L) in the RP-02 wells.

Well No.	Spring 2000	Fall 2000	Spring 2001	April 2002	April 2004
RP-02-31	1,980	2,200	NS[1]	NS	NS
RP-02-49	10,500	8,390	NS	NS	NS
RP-02-66	NS	NS	NS	NS	17,300

[1] NS = Not Sampled

Based on this information, there appears to be somewhat elevated chloride concentrations in RP-02-49 and RP-02-66. Arkema proposes to resample these wells to determine the current chloride concentrations. There are no commonly available *in situ* technologies for chloride reduction or removal. Groundwater would need to be extracted and treated *ex situ* using a desalination process which is extremely expensive and generally not considered cost-effective. Based on these points, natural attenuation is the proposed remedy at this time.

Summary

In summary, Arkema Inc. proposes the following:

1. Groundwater samples from wells RP-02-31, RP-02-49, and RP-02-66 will be collected and analyzed for DDT and metabolites.

2. Groundwater samples from wells RP-02-49 and RP-02-66 will be collected and analyzed for chloride.

If these proposed actions are acceptable to the Department, Arkema will initiate them within 30-days of DEQ approval.

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

Sincerely,
Arkema Inc.

Larry D. Patterson
Environmental Manager

cc: Doug Loutzenhiser
Jason Kraus

Lot1&2gw

December 22, 2004

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

Subject: Surface Soil Sampling, Lots 1 and 2
Acid Plant Area RI/FS, Arkema Inc. (formerly ATOFINA Chemicals)
Portland Plant

Dear Mr. McClincy:

Attached is the letter work plan for additional surface soil sampling on Lots 1 and 2. Arkema will initiate this work within 30 days of receipt of DEQ approval.

If you have any questions please contact me at (503) 225-7210.

Sincerely,
Arkema Inc.

Larry D. Patterson, P.E.
Environmental Manager

cc: Jason Kraus, ERM

ARKEMA Inc.
6400 NW Front Avenue
Portland, Oregon 97210
503-228-7655 Fax: 503-225-7279
www.arkemagroup.com

Oregon
Theodore Kulongoski, Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
FAX (503) 229-6945
TTY (503) 229-5471

January 20, 2005

Larry Patterson
ARKEMA, Inc.
6400 N.W. Front Ave.
Portland, OR 97210

Re: Response to ODEQ Review Comments on Final Environmental Summary Report, Lots 1 & 2, Arkema, Inc.
ARKEMA, Inc. Facility
ECSI No. 398

Dear Mr. Patterson:

The Oregon Department of Environmental Quality (DEQ) reviewed the December 6, 2004 response to DEQ's comment letter dated November 7, 2003 and the more recent letter dated November 5, 2004 regarding the *Final Environmental Summary Report, Lots 1 & 2,* dated July 23, 2003. In the response, ARKEMA suggests that the detection of DDT in the direct-push groundwater sample GGW-016 and the arsenic detected in the Rhone Poulenc monitoring well RP-02-31 are the result of migration onto the ARKEMA site from up-gradient DDT and arsenic plumes on the Rhone Poulenc site and that Oregon's Contaminated Aquifer Policy should apply. After reviewing the referenced data up-gradient of the ARKEMA site, DEQ concluded that the available data does not support the application of Oregon's Contaminated Aquifer Policy.

AMEC Earth & Environmental, Inc. states on Page 25 of the *Final Groundwater Characterization Report for the RPAC-Portland Site*, dated March 28, 2003 the following regarding the detection of dissolved arsenic in RP-02-31.

> *The distribution of dissolved arsenic concentrations demonstrates dissolved arsenic concentrations detected at monitoring well RP-02-31 does not appear to be associated with an RPAC source. Dissolved groundwater flow path from RP-02-31 were well below concentrations detected at monitoring well RP-02-31. The dissolved arsenic concentrations detected in the Spring 2002 event at monitoring well RP-02-31 reflect the highest concentrations from all of the RPAC Site wells tested during the event. Based upon a review of the RP-02 boring logs, approximately 15 feet of fill material was placed in this area, and the dissolved arsenic concentrations at this well may possibly be related*

DEQ-DCI

to historical fill activities. In general, distinguishable changes over time in dissolved arsenic concentration in groundwater have not been observed.

In order for DEQ to consider application of the Contaminated Aquifer Policy, groundwater data at the up-gradient site boundary which demonstrates arsenic and DDT plumes are migrating onto the ARKEMA site is necessary. Alternatively, ARKEMA could perform a more focused investigation in the GGW-016 and RP02-31 areas to evaluate if these detections are anomalous or whether additional investigation is necessary.

DEQ request that we meet or hold a conference call to discuss a path forward. Please call me at (503) 229-5538 if you have any questions regarding our review comments.

Sincerely,

Matt McClincy
Project Manager
Portland Harbor Section

Enclosure
cc: Rod Struck, DEQ NWR
Jason Kraus, ERM
Claudia Powers, Ater Wynne

Oregon
Theodore Kulongoski, Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
FAX (503) 229-6945
TTY (503) 229-5471

January 20, 2005
Larry Patterson
ARKEMA, Inc.
6400 N.W. Front Ave.
Portland, OR 97210

Re: Surface Soil Sampling and Analysis Work Plan
Lots 1 and 2
ARKEMA, Inc. Facility
ECSI No. 398

Dear Mr. Patterson:

The Oregon Department of Environmental Quality (DEQ) reviewed the December 20, 2004 *Surface Soil Sampling and Analysis Work Pan for Lot 1 and 2* prepared by ERM-West, Inc. DEQ's comments are provided below.

Comments

1. Page 2 – Scope of Work: DEQ requests that the sampling scheme be modified to more uniformly distribute the sampling locations and to provide information regarding potential sources to the Willamette River. One of the objectives of sampling is to assess potential contamination in soil at the top of the bank that may be eroded into the river. Therefore, DEQ is requesting two composite samples be added to assess top of bank soil. One composite should be collected from each lot.
2. Page 2 - Scope of Work: Please add arsenic and perchlorate to the list of analytes. Arsenic is requested because of the elevated arsenic detected in Rhone Poulenc monitoring well RP-02-31. Perchlorate is requested because it is a facility contaminant of potential concern. In lieu of testing Lot 1 and 2 soils for perchlorate, testing groundwater from W-19S and RP-02-31 for perchlorate is an alternative.
3. Page 3 – Scope of Work: Surface soil samples should be described using appropriate standards (e.g., ASTM D2488-00 Standard Practice for Description and Identification of Soils - Visual-Manual Procedure).
4. Figure 3. DEQ recommends redistributing the sampling points and that the figure be modified to illustrate which samples will be composited. See attached DEQ example. Note that the example redistribution includes the requested top of bank samples with no net increase in the original composite sample number.

DEQ-DC1

If ARKEMA finds the requested modifications and the suggested sampling points redistribution acceptable, the work plan is approved. Please contact me at (503) 229-5538 if you have any questions regarding our review comments.

Sincerely,

Matt McClincy
Project Manager
Portland Harbor Section

Enclosure
cc: Rod Struck, DEQ NWR
Jason Kraus, ERM
Claudia Powers, Ater Wynne

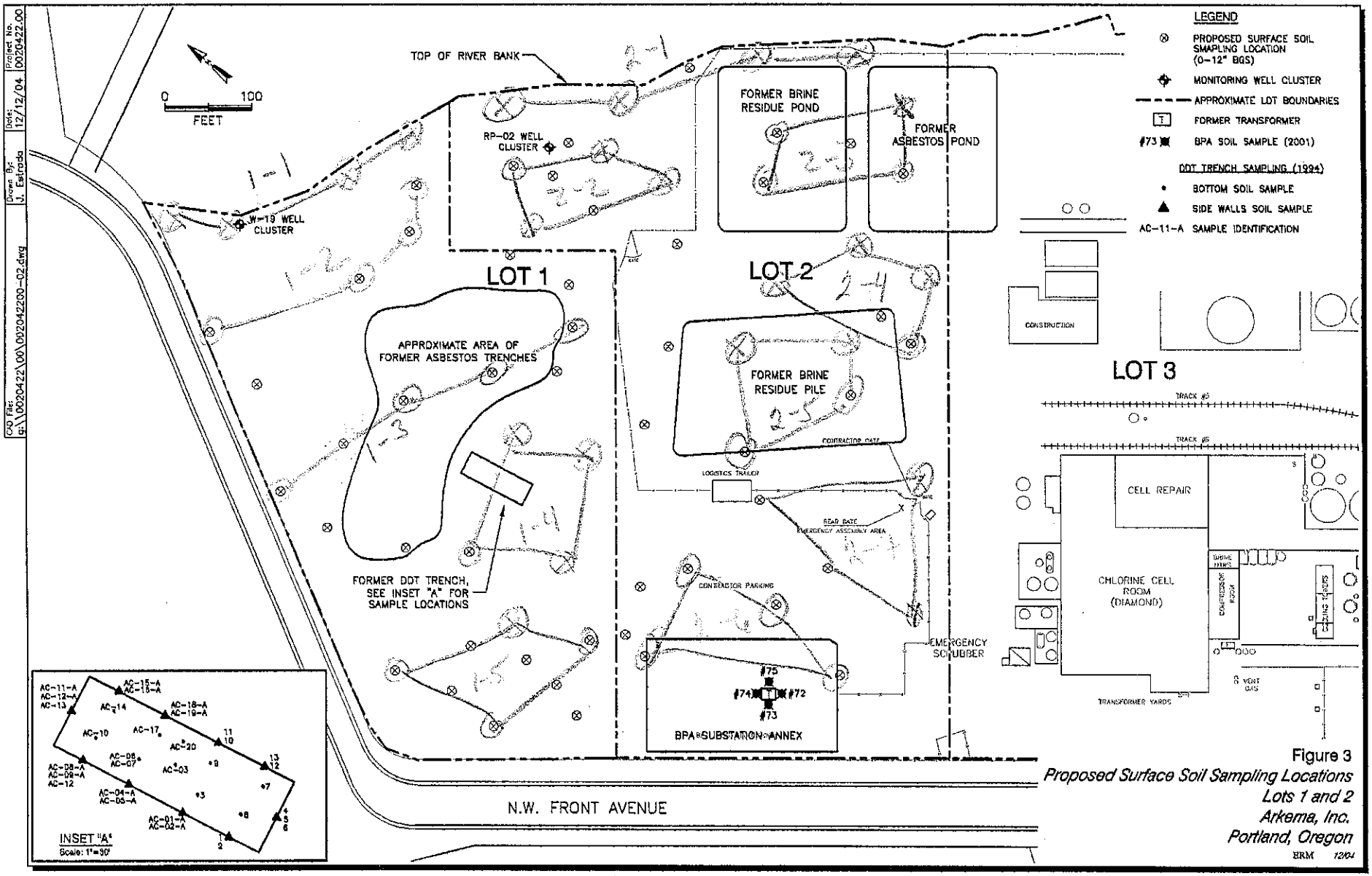
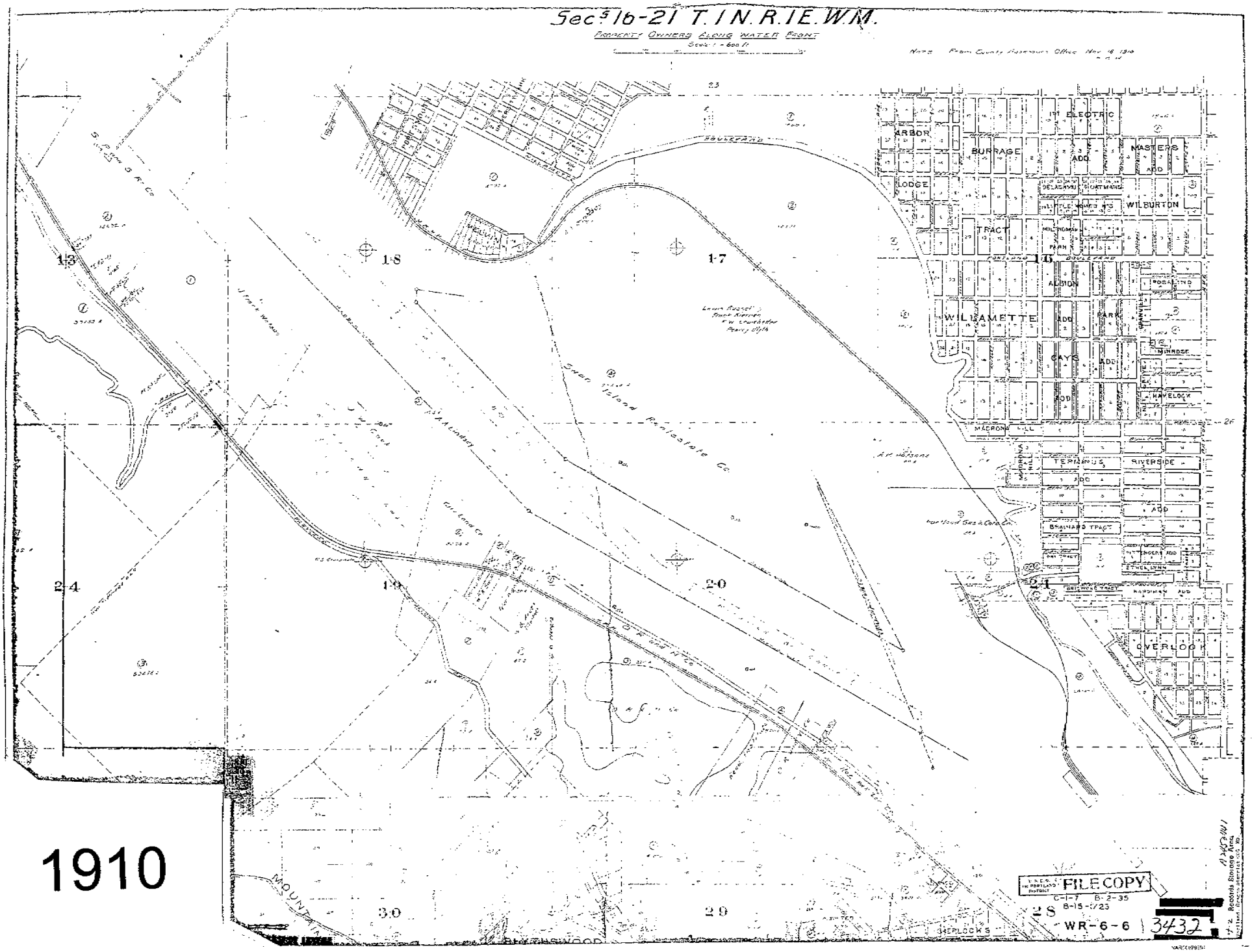


Figure 3
Proposed Surface Soil Sampling Locations
Lots 1 and 2
Arkema, Inc.
Portland, Oregon
ERM 12/04

Appendix B
Aerial Photographs of the Arkema Site


Sec^s 16-21 T.1N.R.1E.W.M.
PROPERTY OWNERS ALONG WATER FRONT
Scale 1 = 600 ft
Note From County Assessors Office Nov 16 1910
ARBOR
BURRAGE
ADD
1ST ELECTRIC
MASTERS
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LODGE
WILBURTON
TRACT
ALBION
WILLAMETTE
ADD
PARK
GAYS
ADD
ADD
MINROSE
HAVELOCK
MADRONA HILL
TERMINUS
ADD
RIVERSIDE
ADD
BRAINARD TRACT
ETHEL LYNN
OVERLOOK
Swan Island Realestate Co.
Lewis Russell
Frank Kiernan
F.W. Chamberlain
Peavey Blyth
A.H. Lindsey
Cary Land Co.
Portland Gas & Coke Co.
Portland Boulevard
Boulevard
Mountain
Sherlock's
1-3
1-8
1-7
1-6
2-4
1-9
2-0
2-1
3-0
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B-15-1/23
WR-6-6
3432

1910

1923
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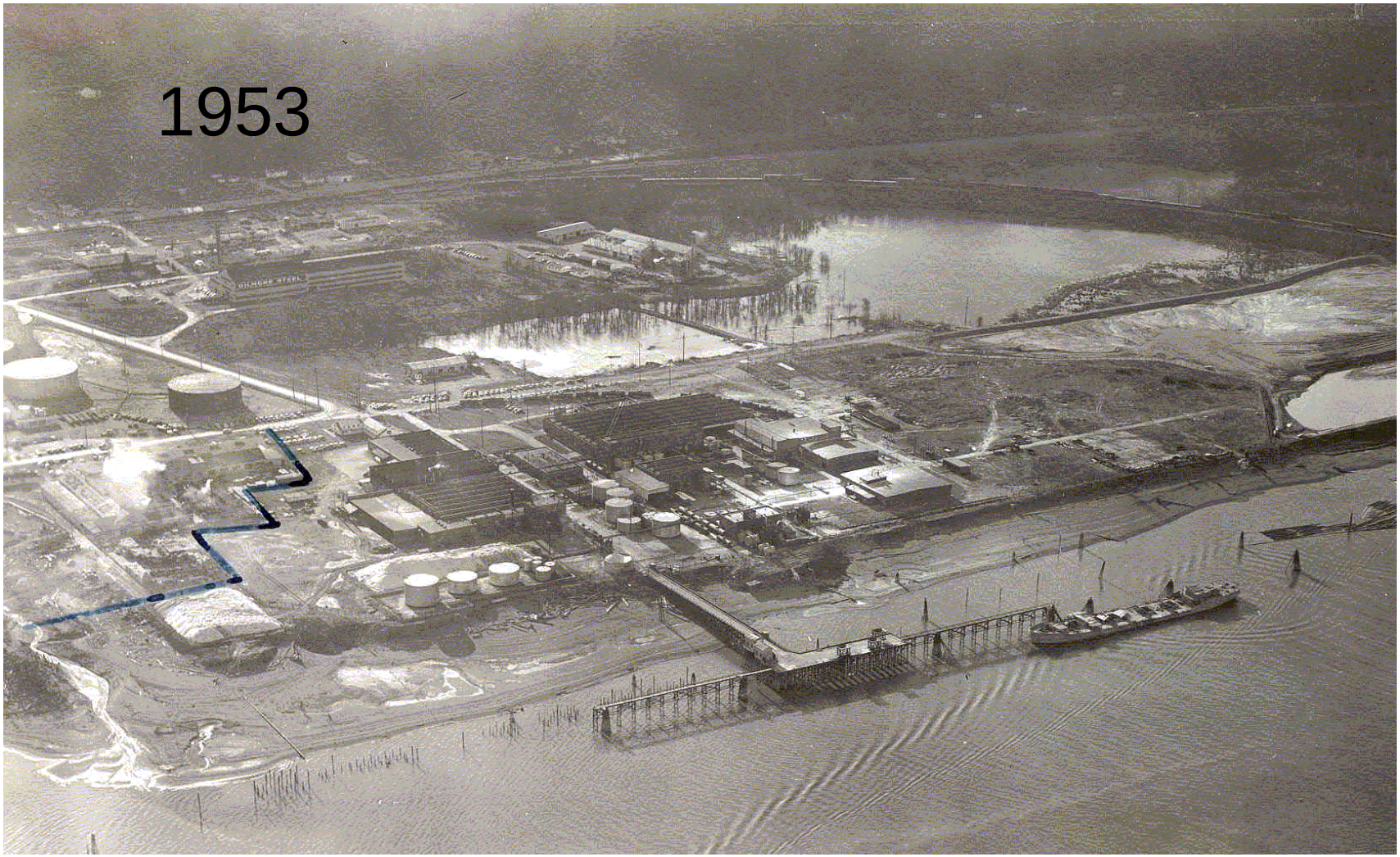
AERIAL PHOTOGRAPHS
OF
PORTLAND, ORE.
SCALE
0
500
1000
2000
3000 FT.
MADE BY AIR SERVICE, U.S. ARMY,
15TH PHOTO SECTION.
JULY 6, 1923.

36-5863
36-5863
1936
Site
64
36-5862

1941

Late 1940s


1953

1959

1962

1990s

2004

Appendix C
Preliminary Assessment

elf atochem

ATO

ELF ATOCHEM NORTH AMERICA, INC.
6400 N.W. Front Avenue
Portland, Oregon 97210

(503) 228-7655

August 31, 1999

Mr. Matt McClincy
Department of Environmental Quality
Northwest Region
2020 S.W. Fourth Avenue
Portland, Oregon 97201-4987

Dear Mr. McClincy:

Attached you will find the Preliminary Assessment (PA) for Elf Atochem North America Inc.'s plant located in Portland, Oregon. As requested in your letter dated May 14, 1999, we followed Sections 1 through 3, and Section 8 in DEQ's Preliminary Assessment Guidance as a guide for the preparation of Elf Atochem's PA.

If you have any questions or if we can be of any assistance during your review of the PA, please feel free to contact me at (503) 225-7210.

Sincerely,
Elf Atochem North America

Larry D. Patterson

Larry D. Patterson
Environmental Manager

c:sitepa

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

Prepared by

Elf Atochem North America

August 31, 1999

ESCI # 398

TABLE OF CONTENTS

Section 1: Preliminary Assessment

Section 2: Attachment No. 1-Site Plot Plan

Section 3: Attachment No. 2-Site Location Map

Section 4: Oregon DEQ Preliminary Assessment Guidance and Request Letter

General Site Information

1. Site Name and Address:	Elf Atochem North America, Inc. 6400 N.W. Front Ave. Portland, OR 97210
2. Current Owner:	Elf Atochem North America, Inc. 2000 Market St. Philadelphia, PA 19103-3222
3. Current Operator:	Same as #1 above.
4. Site Contacts:	Larry Patterson Environmental Manager (503) 225-7210
5. Latitude/Longitude	Lat: 45° 34' 15.0" Long: -122° 44' 30.0"
6. Legal Description:	County: Multnomah Township: 1.00N Range: 1.00W Section: 13 Tax Lot: 36
7. Directions to Site:	Proceed north on Front Avenue from downtown Portland. The front office of facility is located on the east side of Front Avenue at 6400 N.W. Front Ave.

1.0 Introduction

This Preliminary Assessment was conducted in response to a written request letter from the Oregon Department of Environmental Quality ("Department" or "DEQ") dated May 14, 1999.

2.0 Background

2.1 Site Description

1. Brief description of current site operations.

   Elf Atochem North America operates an inorganic chemical manufacturing facility at 6400 N.W. Front Avenue in Portland, Oregon. The plant processes are primarily electrochemical in which an electric current is passed through a sodium chloride solution. Finished products include chlorine, sodium hydroxide solution, hydrogen, hydrochloric acid, and sodium chlorate. Steam is required in these processes. Natural gas and hydrogen are used as the primary fuels, with petroleum oil as the auxiliary fuel when the gas supply is interrupted. Salt is the only raw product required for these processes. Electricity and water are required utilities.

2. Size of site in acres

   Elf Atochem's Portland plant is located on approximately 75 acres in the heart of 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 Genstar Roofing Products Co., and on the north and west by N.W. Front Avenue. The plant's northern most acreage (15-20 acres) is currently undeveloped.

3. Number, type and location of buildings, hazardous substances/waste storage, disposal and treatment areas

   Buildings on the property consist of office space, warehouses, laboratory facilities, and production areas. See the attached plot plan (Attachment No. 1) for the location of specific buildings and chemical containment storage areas. Table 5-1 which is included in Attachment No. 1 includes information pertaining to chemical storage tank contents, capacity, and containment. The only treatment and disposal system on the property is also noted on the plot plan. It consists of an NPDES permitted above ground tank waste water treatment system.

4. Unique land or site features

   The Elf Atochem plant is located at river mile 7.5. The plant site is generally flat with surface elevations between about 25 and 38 feet National Geodetic Vertical Datum (1929). Recent alluvium in the area consists of Quaternary deposits of sands, silts, and gravels deposited by the Willamette and Columbia rivers. Anthropogenic fill is common along many of the terraces adjacent to the Willamette River. The primary source of this fill is dredged material from the river's shipping channel.

5. Adjacent land use.

   Refer to #2 above.

6. Site security

   The developed portion of Elf Atochem's plant site is surrounded by steel security fencing, and security personnel are on site 24 hours a day.

7. Site location map

   See Attachment No. 2.

8. Site/Facility map

   See Attachment No. 1.

2.2 Ownership and Operations History

1. Ownership history

   The plant started operations in 1941 to meet wartime needs for chlorate production in the western United States. It was built by Pennsylvania Salt Manufacturing, which later became known as Pennwalt Corporation. 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.

2. Operating history

   1941 Sodium chlorate manufacturing started in its current location. Chlorate is produced by electrolysis of a sodium chloride solution. Sodium bichromate is added to the process as a corrosion inhibitor and it improves the electrical efficiency of the process.

   Potassium chlorate manufacturing also started within the sodium chlorate area in 1941. This operation terminated in approximately 1978. Production operations were very similar to sodium chlorate except potassium chloride was used as the source of salt rather than sodium chloride.

   Operation of the Steam Plant (or Boiler Room as shown on Attachment No. 1) also started in 1941. The location of the Steam Plan has remained unchanged over the years. Materials used in this area include natural gas, hydrogen, No. 6 fuel oil, and propane.

1946 Chlorine and sodium hydroxide manufacturing processes were added to plant operations. These initial operations were located in what is known today as the Maintenance Shop. The cell technology consisted of asbestos diaphragm cells.

1947 DDT manufacturing was initiated at the plant in late 1947. 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. Raw materials consisted of monochlorobenzene, oleum (104% fuming sulfuric acid), and chloral (trichloroacetaldehyde).

DDT was manufactured inside the former DDT process building (identified as Process on Attachment No. 1). Manufacturing process residues were discharged to a floor drain in the DDT manufacturing building during initial startup. From 1948-1950, process residues were discharged directly to a process residue pond located northeast of the building. From 1950 until DDT manufacturing ceased completely in 1954, the manufacturing process residue was piped to an MCB recovery system and then into the shallow manufacturing process residue pond. In about 1951 or 1952, a trench was constructed and extended north about 200 feet from the northeastern corner of the former residue pond.

The area known as the Acid Plant area was used for all materials-handling operations associated with the manufacturing and handling of DDT manufacturing process waste.

1950 Sodium orthosilicate operations started in 1950 and were terminated in 1980. Silica sand and soda ash were mixed with sodium hydroxide to produce granular cleaners. Other ingredients occasionally used in some of the orthosilicate products included trisodium phosphate, soap, paraffin oil, and bentonite clay. This operation occurred in what is known today as the No. 1 Warehouse.

Early 1950's In the early 1950's a process was installed to produce solid (100%) sodium hydroxide. Large pots were filled with sodium hydroxide solution and the caustic was boiled using fuel oil to fire the pots. This operation took place in what is known today as the south side of the No. 1 Warehouse. The operation was terminated in the early 1980's.

Early 1950's For only a few months in the early 1950's Pennwalt Corporation attempted to produce a grass defoliant material for use in the agricultural industry. The operation consisted of chlorinating acetone with chlorine gas. The operation took place inside the old DDT process building. It is not known if an acetone storage tank ever existed for this short lived operation.

concentrations were well below any of Oregon's simple soil cleanup levels. Since the trench was a clearly defined, discrete unit, complete removal of the soils containing the DDT was proposed.

By 1993, contracts were in place to remove the remaining trench, but extremely wet weather in the fall of the year delayed excavation until the summer of 1994, when the trench was completely excavated. Approximately 1700 tons of soil were removed. Post excavation confirmation sampling showed that soils containing DDT residues in the trench had been completely removed and that surrounding soils met Oregon residential soil cleanup standards. After verification sampling was performed, the excavation was backfilled with clean fill, including a low permeability silty clay, compacted in place to a depth of 3-4 feet, overlayed by a silty sand material. A summary report titled, "Remedial Action Report, North Plant Area, Elf Atochem North America, Inc. Facility, Portland, Oregon, Prepared for Elf Atochem North America, Inc. April 1995" (Remedial Action Report) was submitted to the Department.

Acid Plant Area

In 1994, Elf Atochem undertook further investigations to confirm and characterize the source of the material that was removed from the last trench. A preliminary soil and groundwater investigation was conducted in what was believed to be the former DDT manufacturing area, currently known as the "Acid Plant area". Prior operational history suggested that a DDT manufacturing process residue pond was located in the Acid Plant area and the investigation indicated the location and extent of the former residue pond.

Oregon DEQ Voluntary Cleanup Program

In June 1995, Elf Atochem requested a meeting with the Oregon DEQ to discuss the DDT investigations and to submit an "Intent to Participate Form" for the Oregon DEQ Voluntary Cleanup Program. This investigation and later investigations have been summarized in the following reports:

-Phase II Site Characterization Acid Plant Project, June 1997
-Phase 2 Site Characterization Groundwater Monitoring Report
June and September 1997 General Acid Plant Area April 2, 1998
-Phase 2 Site Characterization Report Addendum
Acid Plant Project, April 2, 1998
-Remedial Investigation and Feasibility Study Work Plan September 1998
-Remedial Investigation Interim Data Report, June 1999

The river bank area, generally between the plant's No. 1 and No. 2 Docks, received miscellaneous fill material for many years. Sources of this fill material included the City of Portland, private excavation contractors, and Elf Atochem. Fill material included clean soil, asphalt, concrete, metal piping, and miscellaneous materials from spent chlorine cells. Most of this area lies within the general Acid Plant area.

1952 In 1952, production of a sodium chlorate-based cotton defoliant material was initiated. Magnesium chloride was brought into the plant and hydrated to form magnesium chloride hexahydrate. This activity was conducted inside what is known today as the No. 1 Warehouse (near the orthosilicate operations). The magnesium chloride hexahydrate was brought to the north end of the sodium chlorate process area where it was ground and mixed with sodium chlorate. The blended material was bagged and sold. It is believed this operation was conducted for approximately 10 years.

mid 1950's Ammonia production operations commenced in the mid 1950's and lasted until approximately January of 1990. Nitrogen was stripped from air and combined with hydrogen that was produced in the chlor-alkali process. The combined gases were compressed and cooled to form anhydrous ammonia. A portion of the ammonia was mixed with water to produce aqua ammonia. These products were shipped by truck and railcar. Oils were used in the compressors and a small amount of sodium hydroxide solution was used to scrub carbon dioxide from air. The operation was located in what is currently the site of the new caustic tank farm.

1958 Ammonium perchlorate operations started in the old DDT process building in 1958. Sodium chlorate solution was used to produce sodium perchlorate, which was converted to ammonium perchlorate by using ammonium chloride. This material was sold as a solid propellant for guided missiles. The operations were shut down in approximately 1962. Some ammonium perchlorate handling took place in what is known today as the No. 3 Warehouse.

1962 The first bay of electrolytic chorine cells was installed in the new chorine cell room. This building is currently known today as the Chlorine Cell Room. The older chlorine cells in the Maintenance Shop area were gradually phased out with expansions in the new cell room. Eventually 200 asbestos diaphragm cells were installed in the new cell room. All of the cells in the Maintenance Shop were eliminated by 1971.

1966 Hydrochloric acid manufacturing started in the general Acid Plant area in 1966. Chlorine and hydrogen are burned together to form hydrogen chloride vapor. The vapor is absorbed in water to form hydrochloric acid. There are two fiberglass hydrochloric acid storage tanks associated with the Acid Plants.

1990 Thirty three additional chlorine cells were added to the existing chlorine cell room. These new cells utilized membrane technology (nonasbestos technology).

3. Discussion of known or potential problems.

Asbestos Trenches

The asbestos diaphragm chlorine cells are rebuilt annually. Current maintenance practices include the removal of used asbestos diaphragms in a controlled maintenance room and sending the drummed asbestos to a Department-approved landfill. Prior maintenance practices included removing the diaphragms with water and rinsing the residue to three on-site ponds. In the past, the ponds would be cleaned occasionally and the material would be placed in trenches located on the plant property. The Department was aware of and acknowledged the pond maintenance practice. Pennwalt Corporation kept maps to identify the location of the trenches. By the late 1980's, approximately 12 trenches were filled with asbestos-containing residue on the north end of the property.

Elf Atochem acquired the plant from Pennwalt Corporation in 1990. In 1991, Elf Atochem began reviewing its options for use of the north end of its property. In order to make the property useful for potential future development, and to meet conditions in its renewed air permit, the company 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 Department and under the agency's oversight. The project was completed in 1992.

DDT Trench

During the asbestos trench excavation, a trench identified on the asbestos trench map was found to contain what appeared to be pesticide residues. Tests conducted during the asbestos removal project confirmed this last trench did not include asbestos, but did hold soils which contained residue from a DDT manufacturing process.

In late 1992, after the asbestos trench work was completed, the company continued its investigation of the final trench to fully delineate, characterize, and remove the soils containing DDT residues. A review of prior operations at the plant indicated that Pennwalt Corporation had manufactured DDT for a brief period of time, and confirmed that the material in the last trench had come from the area at the plant where a former manufacturing process waste pond had been located.

Elf Atochem hired an engineering consulting firm to complete characterization of the material in the last trench, estimate the volume of soils remaining, and propose removal or remedial options. It was determined that the trench was approximately 30 feet wide by 80 feet long and approximately 10-11 feet deep. The salient features of the trench were that it had clearly delineated side walls and a tight, silt clay bottom. The chemical of concern identified in the soils was DDT residue in concentrations exceeding Oregon's simple soil cleanup rules. The only chemicals detected in the soils in the trench were DDT and monochlorobenzene. MCB

2.3. Regulatory History

1. Permits

Permit Type: NPDES
Issuing Agency: DEQ
Date Issued: 4-12-91
Expiration Date: 3-31-96 (Administratively extended)
Compliance/Noncompliance: Elf Atochem received a Notice of Permit Violation (No. WEQ/INGRR-98-215) on February 23, 1998. The Notice was in response to pH excursions of the permit during 1997 and 1998. The facility has upgraded the sewer alarm system, instrumentation, and piping systems.

Permit Type: Air Containment Discharge Permit
Issuing Agency: DEQ
Date Issued: 4-15-96
Expiration Date: 4-1-2000
Compliance/Noncompliance: Operating in compliance.

Permit Type: City of Portland Sanitary Sewer Permit
Issuing Agency: City of Portland
Date Issued: 10-14-97
Expiration Date: 10-15-02
Compliance/Noncompliance: Operating in compliance.

2. Past Inspections

DEQ Air Quality: Last inspection was 8-26-98. In compliance. No samples taken.
Water Quality: Last inspection was 6-10-97. In compliance. Elf Atochem split NPDES samples with DEQ. The data results are included in the DEQ Water Quality files.
Hazardous Waste: Last inspection was 6-10-98. In compliance. No samples taken.

EPA Multimedia Inspection: Last inspection was during the week of March 25, 1996. No samples taken. No enforcement actions.

City of Portland: Last inspection was on 10-19-98. In compliance. No samples taken.

3. Summary of PA Site Visit

NA

3.0 Waste Characteristics

3.1 Source Areas

I. 1. Source Name: Asbestos Ponds

See "Asbestos Trenches" in Section 2.2 Ownership and Operational History for additional information.

The asbestos diaphragm material was removed from the chlorine cells by washing with water. The slurry entered two earthen impoundments near the chlorine plant. A pipe had been installed between these ponds to keep the water level somewhat equal. A manually controlled pump was available in one of the ponds to transfer the slurry to the third surface impoundment. This practice continued until the ponds began to fill with asbestos. Occasionally the asbestos was excavated from the ponds and was disposed of in trenches on Pennwalt Corporation's northern property. This practice was terminated in the late 1980's when approximately 12 trenches had been filled.

Scrubber water from the Sodium Orthosilicate plant was also discharged into the asbestos pond nearest the river for an unknown period of time. The scrubber water was used to control particulate dusts and did not contain any hazardous substances. The particulates would have consisted of silica sands and bentonite clay particles.

2. Type of Source: Surface Impoundments

3. Location of Source: See Attachment No. 1 - Plant Plot Plan

4. Current Use: The material was excavated in accordance with a DEQ approved work plan and hauled to the Columbia Ridge Landfill. The land where the ponds were located is currently vacant. The former asbestos pond area nearest the Chlorine Plant has been partially asphalted.

5. Length of Use: Uncertain. It is not known when the use of these surface impoundments commenced. Use of the ponds was terminated in the late 1980's.

6. Permits Addressing Source: Not applicable.

7. Type and Condition of Containment: The containment facilities consisted of unlined earthen ponds. They no longer exist.

8. Name and Quantity of Hazardous Substances and Contaminated Media Found in the Source: Several thousand pounds per year of asbestos entered these ponds. All of the asbestos was excavated.

9. Release (documented) of Hazardous Substances: Although asbestos entered the three asbestos ponds, there was no release of asbestos from these three ponds to the environment.

10. Pathways of Hazardous Substances: Not applicable.

11. Disposal: All materials excavated from these ponds were disposed at the Columbia Ridge Landfill in Arlington, Oregon.

12. Site Accessibility: The areas where these surface impoundments were located is within the Portland plant's fenced property and is not accessible to the public.

II 1. Source Name: Brine Mud Materials

The salt (sodium chloride) which is brought into the plant as a raw material comes from either the Pacific Ocean or Utah. The salt contains crystals of calcium and magnesium which must be removed prior to use in our electrolytic cells. With the addition of sodium carbonate and sodium hydroxide, the calcium and magnesium are precipitated in the form of calcium carbonate and magnesium hydroxide (otherwise known as dolomite). This material was evaluated several years ago by Oregon State University for its lime equivalency for agricultural use and received a high rating. This material is dewatered in a filter press and is currently transported to a local landfill. Brine mud is not a hazardous substance.

Historically, brine mud was stored on soil in a diked area and in a pond located in the northern area of the property. These accumulations of brine mud were excavated in the early 1990's and the material was hauled to a permitted landfill.

2. Type of Source: Surface Impoundment

3. Location of Source: Northern portion of property (See Attachment No. 1)

4. Current Use: The material has been excavated and hauled to a local permitted landfill. The land where the ponds were located is used for the storage of unused equipment.

5. Length of Use: Uncertain. It is not known when the use of these surface impoundments commenced. Use terminated in the early 1990's.

6. Permits Addressing Source: Not applicable.

7. Type and Condition of Containment: The containment facilities consisted. of unlined earthen ponds. They no longer exist.

8. Name and Quantity of Hazardous Substances and Contaminated Media Found in the Source. There were no hazardous substances contained in this material.

9. Release (documented) of Hazardous Substances: Not applicable. Brine mud is not a hazardous substance.

10. Pathways of Hazardous Substances: Not applicable.

11. Disposal: All materials were disposed at the Hillsboro Landfill either by landfilling or by incorporating into the final cover material.

12. Site Accessibility: The area where these surface impoundments were located is within the Portland plants fenced property and is not accessible to the public.

III. 1. Source Name: Sand/Salt Residue

The plant historically has received salt by ship. The salt is transferred onto lined/asphalted pads where it is dissolved in water. As the salt dissolves, small quantities of sand which comes in with the salt is left on the pad. Over a period of years the sand accumulates and it must be removed. The sand is currently hauled to a local permitted landfill. For a period of years, ending in the mid 1980's, Pennwalt Corporation disposed of the sand on the plant's northern property. Some salt would have been mixed with the sand.

2. Type of Source: Pile.

3. Location of Source: On the Portland plant's northern property.

4. Current Use: The sand/salt residue was spread across the plant's northern property. This land is vacant land zoned for heavy industrial use.

5. Length of Use: Uncertain. It is not known when the sand/salt residue was first placed on the plant's northern property.

6. Permits Addressing Source: Not applicable.

7. Type and Condition of Containment: The area where the sand was spread is a flat sandy area.

8. Name and Quantity of Hazardous Substances and Contaminated Media

Found in the Source: There were no hazardous substances contained in this material.

9. Release (documented) of Hazardous Substances: Not applicable. The sand/salt residue is not a hazardous substance.

10. Pathways of Hazardous Substances: Not applicable.

11. Disposal: All materials were spread on the plant's northern property.

12. Site Accessibility: The plant's northern property lies outside of the fenced property. It is only accessible by vehicle through a locked gate, but pedestrians could trespass into the area..

IV 1. Source Name: Former Lined Waste Water Pond

In the early 1980's a wastewater treatment system was constructed on site by Pennwalt Corporation. The system utilized two above-ground tanks for pH neutralization and an associated lined surface impoundment. The surface impoundment was used as an overflow device so that if the two wastewater treatment tanks could not control the pH of the waste water within permitted limits (pH from 6.0 to 9.0), the treated water could flow into the lined surface impoundment where it could be held and returned to the tanks for additional treatment. The treatment system was replaced in early 1995.

2. Type of Source: Surface Impoundment.

3. Location of Source: Adjacent to the river bank in the fenced portion of the plant's northern property.

4. Current Use: The surface impoundment is no longer in use.

5. Length of Use: Approximately 15 years.

6. Permits Addressing Source: Pennwalt Corporation maintained an NPDES permit to operate this treatment system.

7. Type and Condition of Containment: The pond consists of an earthen structure with concrete sidewalls and an 80 mil high density polyethylene (HDPE) liner.

8. Name and Quantity of Hazardous Substances and Contaminated Media Found in the Source: The treatment system was designed for primary pH neutralization of waste waters from the production of hydrochloric acid and chlorine/sodium hydroxide. These waste waters could have contained

dilute forms of hydrochloric acid or sodium hydroxide.

9. Release (documented) of Hazardous Substances: None.

10. Pathways of Hazardous Substances: Not applicable.

11. Disposal: All waste waters entering the pond were pumped back to the treatment tanks where they were treated and discharged in accordance with the NPDES permit.

12. Site Accessibility: The lined pond lies within the fenced portion of the plant's property and is not accessible to the public.

V. 1. Source Name: Oil Tank Farm Soils

An oil tank farm was constructed in the 1940's by Pennwalt Corporation just east of the Boiler Room. The tank farm currently contains two 210,000 gallon above ground steel tanks which contain No. 6 fuel oil. A third tank with a capacity of 420,000 gallons was dismantled in the early 1990's. Based on a recent interview with a retired employee it is believed there may have been one or more storage tanks containing monochlorobenzene in the northern end of the oil tank farm. There is no knowledge or indication of a release from this area. The tank farm was constructed with concrete containment walls and an earthen floor. Soil testing conducted in the early 1990's confirmed the presence of petroleum hydrocarbons in the shallow soils beneath the floor of the tank farm. Testing also confirmed the soils were free of metals, PCB's, and volatile organic compounds. In 1995 approximately 2000 yards of soil were removed from the tank farm and the area was backfilled with clean gravel. The soil cleanup goal for the project was set at 100 ppm TPH-418.1 Modified. At the conclusion of the project, the floor of the tank farm was asphalted.

2. Type of Source: No. 6 Fuel Oil Storage Tanks

3. Location of Source: Near the Boiler Room within the fenced portion of the property.

4. Current Use: The tank farm is still in use for the storage of No. 6 fuel oil. Normally oil is only burned in the boilers a few days per year.

5. Length of Use: The oil tank farm was constructed during the 1940's. It is still in use today.

6. Permits Addressing Source: Not applicable.

7. Type and Condition on Containment: The tank farm is surrounded by concrete containment walls. The tanks are provided with concrete foundations and the floor of the tank farm is asphalted.

8. Name and Quantity of Hazardous Substances and Contaminated Media Found in the Source: The tank farm was designed for the storage of No. 6 fuel oil. Testing in the early 1990's confirmed the presence of petroleum materials in the shallow soils around the tank farm. No metals, PCB's, or VOC's were detected. The contaminated soils were removed in 1995.

9. Release (documented) of Hazardous Substances. In the early 1990's soil testing confirmed the presence of petroleum material in the soils beneath the floor of the tank farm.

10. Pathways of Hazardous Substances: A remediation project conducted in 1995 removed the contaminated soils from the floor of the tank farm.

11. Disposal: The soils removed from the tank farm were disposed of at the Waste Management, Inc's. Subtitle D facility in Arlington, Oregon.

12. Site Accessibility: The oil tank farm is within the fenced portion of the plant's property and is not accessible to the public.

V. MISCELLANEOUS MATTERS

1. On July 16, 1987 Pennwalt experienced a spill of 30% aqua ammonia. It was estimated that 400 gallons of solution spilled onto the ground which would have contained approximately 896 pounds of ammonia. At 12:20 p.m. on the day of the spill the temperature was 75°F. Most of the ammonia would have volatilized. The ammonia plant was located in the current location of the new caustic tank farm.

2. On October 17, 1987 Pennwalt experienced an overflow of the evaporator in the sodium chlorate department. Approximately 48 pounds of sodium bichromate was conveyed to the plant's No. 1 sewer via piping. All appropriate agencies were notified of the release.

3. On November 8, 1987 Pennwalt experienced a leak in a shallow underground pipe which allowed approximately 90 gallons of sodium chlorate (approximately 2.8 lbs of sodium bichromate) to enter the plant's No. 1 sewer. The underground pipe, which was approximately two feet deep, was immediately drained and abandoned. A later project removed the pipe and several feet of the surrounding soil. Soil samples were taken of the excavated material for proper characterization. Because the soils contained little, if any chromium, the soils were taken to the Hillsboro Landfill. Soil samples were also taken from the floor and sidewalls of the excavated area and confirmed that very little chromium was present in these soils.

4. On February 7, 1989 Pennwalt experienced a rupture of a sodium hydroxide fiberglass storage tank. The tank was located in the Bygas area which is immediately (plant) west of the old DDT Process Building (within the Acid Plant study area.). The caustic flowed into the plant's No. 1 and 2 sewers. Approximately 3,840 gallons of sodium hydroxide entered the Willamette River through these sewers. All appropriate agencies were notified of the release.

5. On February 22, 1990 the plant experienced a problem in the sodium chlorate process area which caused the discharge of approximately 37 pounds of chromium through piping to the plant's No. 1 sewer outfall. All appropriate agencies were notified of the release.

6. On January 14, 1991 the plant experienced a leak in a heat exchanger in the chlorate process area which caused the discharge of approximately 3 pounds of chromium through piping to the plant's No. 1 sewer outfall.

7. On June 8, 1993 an expansion joint ruptured inside the former caustic tank farm which allowed approximately 225 gallons of 50% sodium hydroxide to spill onto the floor of the tank farm. The floor of the old tank farm had collection sumps which conveyed the caustic to a central tank farm sump. The caustic was collected in the sump and pumped to the plant's waste water treatment system for neutralization. The entire floor area was cleaned with water and the wash water was conveyed to the treatment system.

8. On February 23, 1996 a tank of sodium hydroxide overflowed inside the former caustic tank farm spilling approximately 200 gallons of caustic. The floor of the old caustic tank farm had collection sumps which conveyed the caustic to a central collection sump. The caustic was collected in the sump and pumped to the plant's waste water treatment system for neutralization. The entire floor of the tank farm was washed with water and the wash water was conveyed to the treatment system. A new sodium hydroxide tank farm was completed and put into operation later in 1996.

3.2 Waste Characteristics Conclusions

Section 2.2 (3) of this Preliminary Assessment includes a discussion of known or potential problems on the Elf Atochem property. That discussion leads to studies which have occurred and are continuing to occur in the general Acid Plant Area. The nature and extent of COI's have been defined in various documents which have been submitted to the Department. These documents, and additional work which is to be conducted under the Voluntary RI/FS Agreement for the Acid Plant Area will address the potential for COI's to affect human health and/or environmental health.

8.0 Summary and Conclusions

During the first nine years of plant ownership Elf Atochem North America, Inc., completed the following remediation projects:

-Removal of two brine mud surface impoundments,
-Removal of all asbestos trenches in the plant's northern property,
-Removal of three asbestos ponds,
-Removal of a DDT residue trench in the plant's northern property, and
-Removal of petroleum stained soils in the Oil Tank Farm.

1. Pathway Affected or of Concern

See the discussion under Section 3.2 above.

2. Documented Incidents

See the discussion under Section 3.2 above. The work conducted under the Voluntary RI/FS Agreement has identified COI's in the groundwater and in the sediment associated with the general Acid Plant Area.

During the asbestos trench removal project, which is described in Section 2.2 (3) of this Preliminary Assessment, one of the trenches was discovered to contain a DDT residue material. Considerable soil testing was associated with the removal of the DDT trench. The trench was clean closed based on the residential maximum allowable soil concentrations contained in DEQ's Soil Cleanup Manual, April 1994. This work has been documented in a summary report titled, "Remedial Action Report, North Plant Area, Elf Atochem North America, Inc. Facility, Portland, Oregon, Prepared for Elf Atochem North America, Inc., April 1995". The Department was provided a copy of this report in 1995.

Section 3.1 of this Preliminary Assessment includes a discussion of Miscellaneous Matters which have been documented. Two of the spills involve the release of sodium bichromate to the Willamette River. Sodium bichromate is a very water soluble material and would quickly mix with river water. These discharges would not be expected to have any long term affect on water quality or sediments of the Willamette River.

3. Potential Problems

There are no known potential problems on the Elf Atochem property.

4 Unique Problems

There are no known unique problems in or around the Elf Atochem property.

5. Statement of Further Action Recommended

It is recommended that Elf Atochem North America, Inc. continue with its work in the general Acid Plant Area as agreed upon in the Voluntary RI/FS Agreement.

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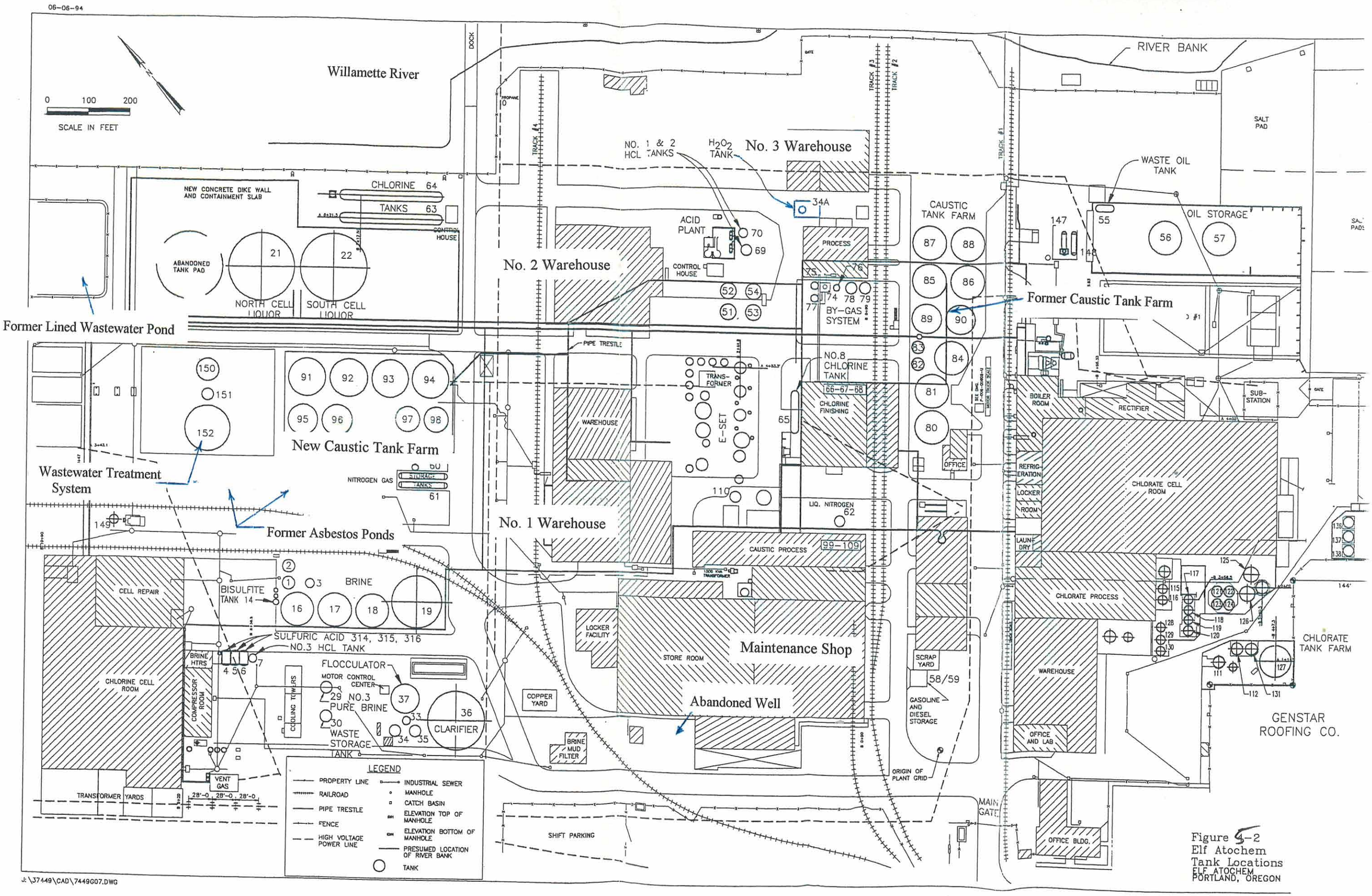


Figure 4-2
Elf Atochem
Tank Locations
ELF ATOCHEM
PORTLAND, OREGON

ATTACHMENT NO. 1 - PLANT PLOT PLAN

Former Asbestos Pond

Former Brine Mud Pile and Pond

Former Lined Wastewater Pond

Former Location of Asbestos Trenches

N 40°25' E 889.23'

BURLINGTON NORTHERN RAILROAD

S 40°23'43" W 467.17'

S 25°43'55" E 511.10'

164.48' AT S 37°40'15" W

S 54°59'43" E 129.09'

1760.08' R
09°32'00" ARC

150.0'

S 34°04'15" E

PUMPING STATION

317.95'

N 55°55'44" W 339.30'

127.55' AT S 07°59'27" W

N 41°42'48" W 207.60'

BPA SUBSTATION ANNEX

N 41°42'10" W 624.92'

187.32'

GATE

CONSTRUCTION

MATCH LINE SEE PLATE A-2

BAY 5 BRINE STORAGE TANK NO.1

BAY 5 BRINE STORAGE TANK NO.2

41

42

BAY 5 CAUSTIC RECIRCULATION TANK

BAY 5 CAUSTIC MAKEUP TANK

DEPLETED BRINE STORAGE TANK NO.2

43

44

45

46

24

23

25

27

26

CELL REPAIR

CHLORINE CELL ROOM

DEPLETED BRINE STORAGE TANK NO.1

TRANSFORMER YARDS

Figure 3-1
Elf Atochem
Tank Locations
ELF ATOCHEM
PORTLAND, OREGON

7449G09.DWG J:\37449\CAD\7449G09.DWG

Table 5-1
Above Ground Storage Tank Inventory

Number	Tank ID	Contents	Capacity (gals.)	Spill Control and Recommended Action
Spent Acid Tanks				
1 2 3	No. 318 No. 319 No. 4	Spent Sulfuric Acid Hydrochloric Acid	20,000 20,000 30,000	Acid will be contained in concrete secondary containment system. If possible, acid should be pumped to another tank or railcar. Otherwise, slowly pump to No. 4 treatment system and neutralize with cell liquor.
Sulfuric Acid Tanks				
4 5 6	No. 314 No. 315 No. 316	98% Sulfuric Acid	13,700 13,700 13,700	Acid will be contained in concrete secondary containment system. If possible, acid should be pumped to another tank or railcar. Otherwise, slowly pump to No. 4 treatment system and neutralize with cell liquor.
Hydrochloric Acid Tanks				
7	No. 3	Hydrochloric Acid	20,300	Same containment system as for Sulfuric Acid Tanks Nos. 314, 315, & 316, above. See comments above.
Chlorine Drying				
8 9 10 11 12	Spent Acid Surge No. 1 Tower Sump No. 2 Tower Sump No. 3 Tower Sump Waste-Portable	72% Sulfuric Acid 72% Sulfuric Acid 84-92% Sulfuric Acid 96% Sulfuric Acid Weak Sulfuric	254 365 365 365 300	Acid will be contained in lead-lined containment structure. Liquids pumped to portable poly tank and conveyed to No. 4 treatment system.

Table 5-1
Above Ground Storage Tank Inventory

Number	Tank ID	Contents	Capacity (gals.)	Spill Control and Recommended Action
Hydrochloric Acid Tanks				
13	Brine Heater Acid Tank	Sodium Bisulfite	1,050	Bisulfite will be conveyed to No. 4 treatment system and neutralize with cell liquor.
Bisulfite Tank				
14	Bisulfite Tank (10%)	Sodium Bisulfite	10,000	Bisulfite will be contained in concrete secondary containment system. If possible, bisulfite should be pumped to another tank. Otherwise, slowly pump to No. 4 treatment system and neutralize with cell liquor.
15	Mix Tank	Sodium Bisulfite	400	
Brine Tanks				
16	No. 1	Salt Brine	282,000	Brine will flow to No. 4 outfall treatment system. Any drainage towards south will enter No. 3 outfall treatment system.
17	No. 2	Salt Brine	282,000	
18	No. 3	Salt Brine	282,000	
19	No. 4	Salt Brine	634,000	
20	Cell Liquor/Brine Tank	Cell Liquor (11.5% NaOH)	400	
Cell Liquor Tanks				
21	North Tank	Cell Liquor (11.5% NaOH)	1,300,000	No drains inside containment area. For large spill, pump to the other cell liquor tank or to No. 4 treatment system.
22	South Tank		1,300,000	

Table 5-1
Above Ground Storage Tank Inventory

Number	Tank ID	Contents	Capacity (gals.)	Spill Control and Recommended Action
Seal Scrubber Tanks				
23	1st Stage Scrubber caustic supply	20% NaOH	13,000	Caustic will be contained in concrete containment system. Caustic can be pumped to cell liquor system or to No. 4 treatment system.
24	2nd Stage scrubber caustic supply	20% NaOH	12,000	
25	Emergency caustic supply	20% NaOH	5,000	
26	Cooling Water Tank	River Water	11,850	
27	Cooling Water Tank	River Water	13,000	
Brine Treatment				
28	Caustic Day Tank	30% NaOH	880	Spill contained in concrete containment system and pumped to No. 4 treatment system.
29	Brine Tank No. 3	Purified Brine	34,500	
30	Wastewater Eff. Tank	Regen. Water	34,500	
31	Waste Surge Tank	Regen. Water	1,268	
32	Brine Surge Tank	Sat. Brine	1,315	
33	Carbonate Tank	Sod. Carbonate	7,614	Spilled liquids would flow either to No. 4 treatment system or No. 3 outfall treatment system.
34	Brine Treatment Tank	Brine	15,862	
35	Brine Treatment Tank	Brine	15,862	
36	Clarifier	Sat. Brine	345,437	
37	Flocculator	Sat. Brine	86,368	
Cell Repair				
38	HCl Dip Tank	18% HCl	1,013	Spills contained inside cell repair. Pump spillage to poly and transfer to No. 4 treatment system.
39	NaOH Dip Tank	Cell Liquor	1,650	
40	Washrack Water	Recycle Water	4,669	Spillage contained by secondary structure.

Table 5-1
Above Ground Storage Tank Inventory

Number	Tank ID	Contents	Capacity (gals.)	Spill Control and Recommended Action
Bay 5				
41	Brine Storage No. 1	Membrane Brine	34,500	Spill contained in concrete containment system. Liquids pumped to No. 4 treatment system.
42	Brine Storage No. 2	Membrane Brine	34,500	
43	Caustic Makeup	Membrane NaOH	1,850	
44	Caustic Recirculation	Cell Liquor	9,253	
45	Depleted Brine	Brine/Low pH	15,000	
46	Depleted Brine	Brine/Low pH	15,000	
47	Bisulfite Tank	Bisulfite	300	
Deionization System				
48	Caustic Tank	30% Caustic	353	Spills contained in concrete containment system. Liquids pumped to No. 4 treatment system. No containment for DI water tank.
49	Acid Tank	HCl	189	
50	DI Water Storage	Deionized Water	34,000	
E-Set				
51	Boil Out Wash Tank	Weak Caustic	58,000	Spillage inside curbed area can be pumped back to E-Set or to cell liquor tanks. If the curbed containment structure overflows, the spillage will enter the acid treatment sump. This sump pumps to the No. 4 treatment system.
52	Boil Out Tank	20-40% Caustic	38,000	
53	Cold Condensate	Clean Condensate	45,000	Spillage could enter either No. 1 or 2 outfall treatment systems. Clean condensate would have no impact on either outfall.
54	Hot Condensate	Clean Condensate	45,000	

Table 5-1
Above Ground Storage Tank Inventory

Number	Tank ID	Contents	Capacity (gals.)	Spill Control and Recommended Action
Oil Tank Farm				
55 56/57	Used Oil 2 Oil Storage Tanks	Used Oil for Recycle No. 6 Oil	2,400 210,000 each	Spillage would be contained inside oil tank farm. Drainage pumps to boiler oil/water separator. (Refer to SPCC Plan.) Any quantity of oil which cannot be quickly returned to a tank will thicken on the surface of the tank farm.
Auto Fuel Tanks				
58 59	Diesel Tank Gas Tank	Diesel Fuel Gasoline	1,000 1,000	Fuel spill will be contained in concrete secondary containment system. Contact fuel/oil recycler to reclaim product.
Air Plant				
60 61 62	Nitrogen Tank Nitrogen Tank Nitrogen Tank	Nitrogen Gas Nitrogen Gas Liquid Nitrogen	21,550 21,550 13,600	Leakage would vaporize instantaneously.
Chlorine Tanks				
63	West Shore Tank (11)	Chlorine	650 tons (125,670 gals)	No drains inside containment area.
64	East Shore Tank (12)	Chlorine	650 Tons (125,670 gals)	
65	Tank (8)	Chlorine	53,000	Provided with concrete secondary containment.
66	Tank (7)	Chlorine	10,170	
67	Tank (6)	Chlorine	10,170	
68	Tank (5)	Chlorine	10,170	

Table 5-1
Above Ground Storage Tank Inventory

Number	Tank ID	Contents	Capacity (gals.)	Spill Control and Recommended Action
Acid Plant				
69	No. 1 HCl	HCl	20,300	Acid will be pumped to No. 9 sump treatment.
70	No. 1 HCl		20,300	
71	No. 1 Day Tank		2,300	Spillage flows to No. 9 sump. This sump pumps to the No. 4 treatment system
72	No. 2 Day Tank		2,300	
73	Trap Acid		800	
By-Gas System				
74	Absorber	Sodium Hypochlorite/ Weak Caustic	12,600	Spills contained in secondary structure and routed to acid treatment sump, and pumped to No. 4 treatment system. Thoroughly wash area with water. Spills outside of containment area may necessitate plugging area drains and pumping material to No. 9 sump.
75	Emergency Absorber	Weak Caustic	9,200	
76	Rundown Tank	Sodium Hypochlorite/ Weak Caustic	3,000	
77	Caustic Tank	50% Sodium Hydroxide	8,000	
78	N. Bygas Surge Tank	Bygas Liquor	16,490	
79	S. Bygas Surge Tank	Bygas Liquor	16,490	

Table 5-1
Above Ground Storage Tank Inventory

Number	Tank ID	Contents	Capacity (gals.)	Spill Control and Recommended Action
Caustic Tank Farm				
80	No. 150	Abandoned	281,000	Spillage can be pumped back to any tank within the tank farm with sufficient capacity. Spillage can also be pumped to the boil out wash tank, to the acid treatment sump, or to cone bottom tank Nos. 1 through 7.
81	No. 151	"	281,000	
82	No. 152	"	22,000	
83	No. 153	"	22,000	
84	No. 154	"	281,000	
85	No. 155	"	281,000	
86	No. 156	"	281,000	
87	No. 157	"	281,000	
88	No. 158	"	281,000	
89	No. 164	"	122,000	
90	No. 165	"	122,000	
New Caustic Tank				
91	No. 250	NaOH (50%) Diaphragm	400,000	Caustic will be contained in concrete containment system and will be conveyed back to process or to No. 4 treatment system.
92	No. 251	NaOH (50%) Diaphragm	400,000	
93	No. 252	NaOH (50%) Diaphragm	400,000	
94	No. 253	NaOH (50%) Diaphragm	400,000	
95	No. 255	NaOH (50%) Membrane	200,000	
96	No. 256	NaOH (50%) Membrane	200,000	
97	No. 257	NaOH (50%) Diaphragm	125,000	
98	No. 258	NaOH (50%) Diaphragm	125,000	

Table 5-1
Above Ground Storage Tank Inventory

Number	Tank ID	Contents	Capacity (gals.)	Spill Control and Recommended Action
Old Caustic Area				
99	Cone Bottom No. 1	6-7% Caustic	14,700	Spills contained in concrete containment structure. Pump conveys liquids to boil out wash tank, or to No. 9 sump.
100	Cone Bottom No. 2	6-7% Caustic	14,700	
101	Cone Bottom No. 3	6-7% Caustic	14,700	
102	Cone Bottom No. 4	6-7% Caustic	14,700	
103	Cone Bottom No. 5	1-20% Caustic	14,700	
104	Cone Bottom No. 6	1-20% Caustic	14,700	
105	Cone Bottom No. 7	1-2% Caustic	8,700	
106	Cone Bottom No. 8	1-2% Caustic	8,700	
107	C1 C-Set	30-33% Caustic	17,400	
108	C1 C-Set	30-33% Caustic	17,400	
109	C1 C-Set	30-33% Caustic	22,200	
Track No. 4 System				
110	Track 4 wash water storage	1-50% Caustic	19,600	Spills contained in concrete contained structure and drain back to B-Set.
Chlorate Tank Farms				
111	No. 27	45% Low bichromate chlorate	19,104	Spillage will collect inside curbed area. Liquids should be pumped to tank as soon as possible. Any spill which may get beyond the containment curbs will enter the chlorate containment system. High conductivity will close the automatic sewer valve and the liquid will be pumped to the spill containment tanks. The containment water can be returned to either Tank No. 031 (116) or Tank No. 35 (120).
112	69-201	Wastewater	30,000	
113	69-205	46% chlt. Low bichromate	32,000	
114	69-206	Misc. chlorate	5,000	
115	No. 30	Misc. chlorate	12,440	
116	No. 31	Misc. chlorate	12,440	
117	No. 32	Misc. chlorate	11,610	
118	No. 33	Misc. chlorate	11,610	
119	No. 34	Misc. chlorate	11,610	
120	No. 35	Tank Farm Rainwater	18,600	

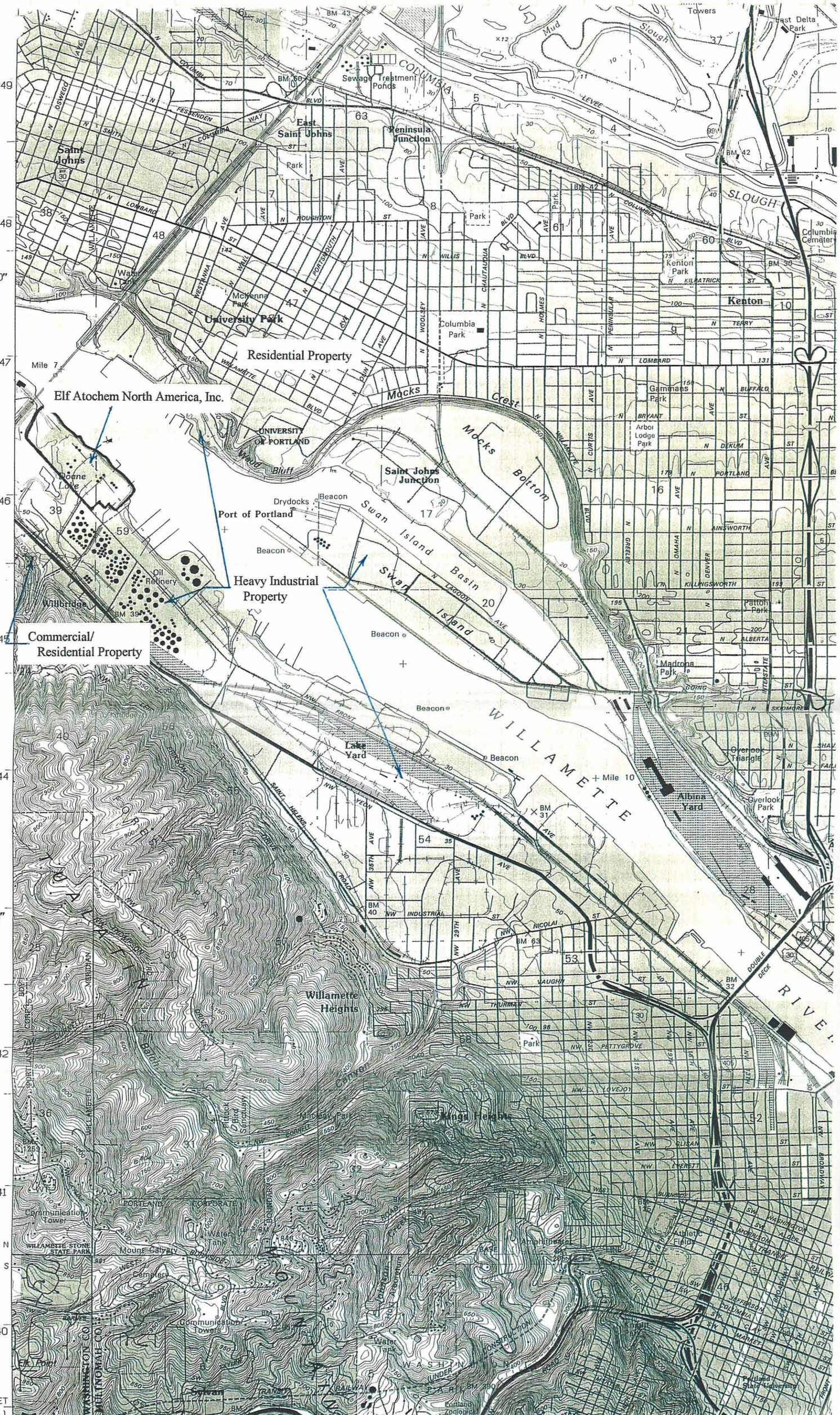
Table 5-1
Above Ground Storage Tank Inventory

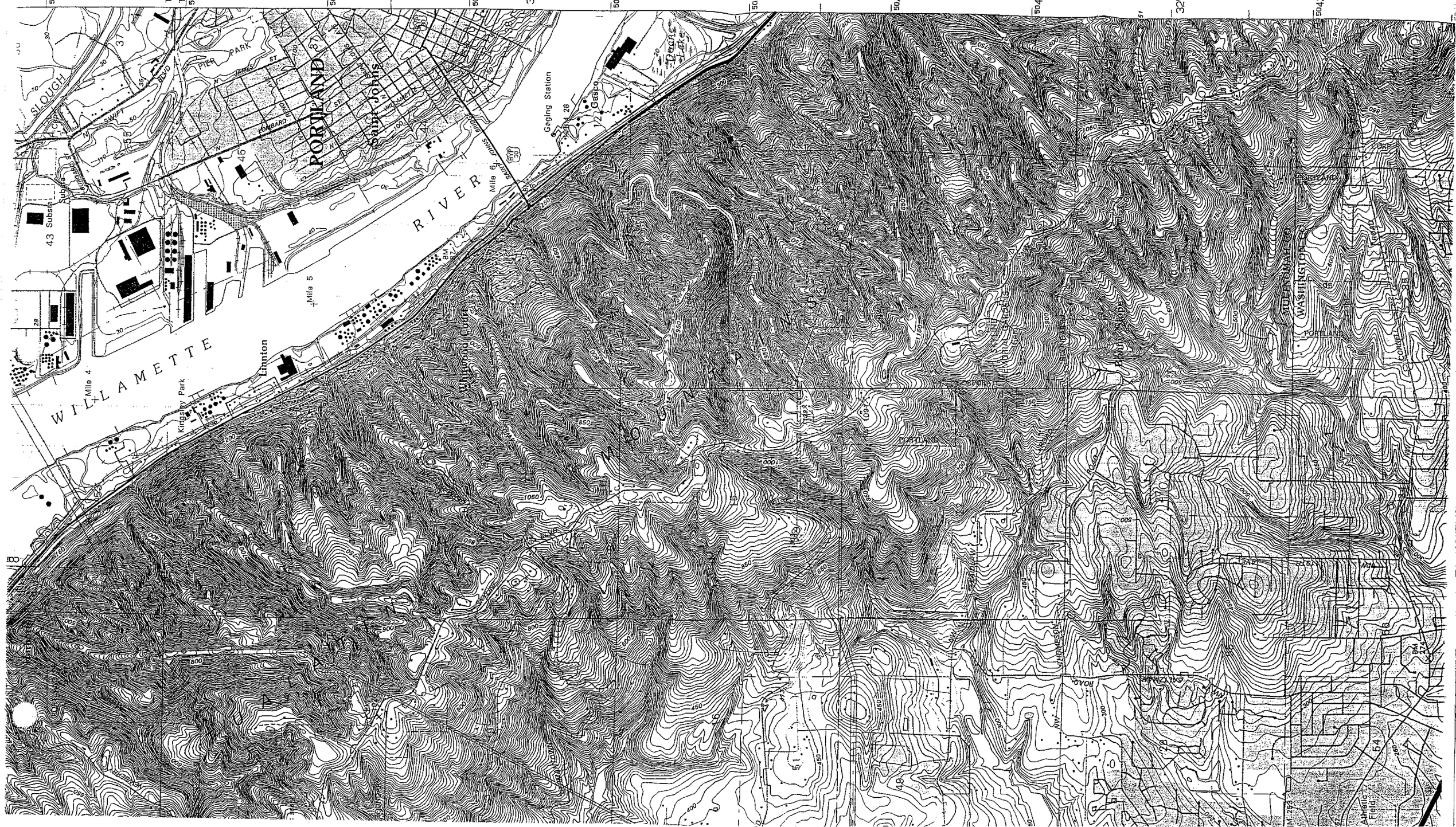
Number	Tank ID	Contents	Capacity (gals.)	Spill Control and Recommended Action
121	61	Misc. Chlorate	40,000	Spillage will collect inside curbed area. Liquids should be pumped to tank as soon as possible. Any spill which may get beyond the containment curbs will enter the chlorate containment system. High conductivity will close the automatic sewer valve and the liquid will be pumped to the spill containment tanks. The containment water can be returned to either Tank No. 031 (116) or Tank No. 35 (120).
122	62	46% Chlorate lo bichromate	40,000	
123	63	46% Chlorate lo bichromate	40,000	
124	64	46% Chlorate lo bichromate	40,000	
125	No. 41	38% Chlorate	45,040	
126	No. 42	15-25% chlorate (low)	45,040	
127	No. 43	45% chlorate (low)	299,760	
128	No. 50	25% chlorate	11,870	
129	No. 51	25% chlorate	11,870	
130	No. 51A	25% chlorate	11,610	
131	No. 52	25% chlorate	33,200	
132	Overflow #1	Misc. chlorate	5,383	
133	69-200	51% chlorate	35,000	
134	Mud Tank	Chlorate Mud	7,000	
135	Bygas Tank	Chlorate/Hypo	12,400	
136	Wastewater 008	Wastewater	33,000	
137	Wastewater 009	Wastewater	33,000	
138	Wastewater 010	Wastewater	33,000	
139	69-202	Misc. chlt	31,300	
140	Evap. Feed #15	Chlorate	9,500	
141	Dechlor. No. 11	Chlorate	15,000	
142	Dechlor. No. 12	Chlorate	15,000	
143	69-203	Misc. Chlorate	30,000	
144	69-204	Misc. Chlorate	30,000	
145	69-209	Misc. Chlorate	10,000	
146	69-209	Dissolving	10,000	

Table 5-1
Above Ground Storage Tank Inventory

Number	Tank ID	Contents	Capacity (gals.)	Spill Control and Recommended Action
Carbonate System				
147 148	North Tank South Tank	Sodium Carbonate Sodium Carbonate	5,850 5,770	Overflow of containment pad and carbonate sump flows to No. 1 outfall treatment system; pH and conductivity alarms will sound on No. 1 outfall. If the overflow is due to a pump failure, install a temporary emergency pump.
Waste Water Treatment				
149 150 151 152	Tank No. 12 Tank No. 21 Tank No. 22 Tank No. 23	Waste Water Waste Water Waste Water Waste Water	12,600 100,000 30,000 480,000	Overflows to Pit 16 Overflows to Tank 22 Overflows to Tank 23 Overflows to concrete containment area

ATTACHMENT NO. 2 - SITE LOCATION MAP

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Mile 6
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Whitwood Court
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Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

May 14, 1999

Larry Patterson
Elf Atochem North America, Inc.
6400 N.W. Front Ave.
Portland, OR 97210

Re: Preliminary Assessment of Elf Atochem Portland Plant

Dear Mr. Patterson:

As we have discussed, the Oregon Department of Environmental Quality has asked Elf Atochem to expand the scope of work defined in the Voluntary Agreement ECVC-WMCVC-NWR-97-14. This request was made because of the increased priority of identifying releases of hazardous substances that could impact the Portland Harbor reach of the Willamette River. Based on this request, Elf Atochem agreed to perform an assessment of current and past facility operations to identify areas where hazardous substances may have been released. This assessment will be the basis for expanding remedial investigation (RI) activities beyond those defined in the Agreement. Priority for any expanded RI activities will be given to assessing potential releases that may have a complete pathway to the Willamette River.

We earlier agreed that this assessment would be included in the draft uplands Acid Plant RI report (due summer 1999 per RI proposed schedule). Given the priority of performing this assessment, we need to review the RI status/schedule during our upcoming May 20th meeting and determine if we need to break out the assessment as a separate report.

The Agreement will need to be amended to include this expanded scope of work. For the purpose of updating the administrative record, please provide a letter affirming Elf Atochem's commitment to expanding the above RI site activities. Because of the potential that the Agreement may also need to be amended to incorporate elements of the Portland Harbor Sediment Management Plan, the amendment process should include both amendments. The need for this later amendment should become clear within the next month.

RECEIVED 5-18-99

DEQ-1

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

June 28, 1999

Larry Patterson
Elf Atochem North America, Inc.
6400 N.W. Front Ave.
Portland, OR 97210

Re: Preliminary Assessment of Elf Atochem Portland Plant

Dear Mr. Patterson:

Thank you for the response to the May 14, 1999 letter which requested Elf Atochem, Inc. to conduct a Preliminary Assessment (PA) of the Elf Atochem, Inc. Portland Plant. Based on your June 15, 1999 response, I felt the need to clarify that the PA needs to document the current and past use of non DDT related hazardous substances in the Acid Plant area.

Please call me at 229-5538 if you have any questions.

Sincerely,

Matt McClincy,
Project Manager
Voluntary Cleanup & Site Assessment Section

Enclosed is a copy of DEQ guidance for a preliminary assessment which should be followed for the above assessment. The assessment should include Sections 1 through 3 and 8. Sections 4 through 7, which describe exposure pathways, are anticipated to be redundant to the pathway discussion in the uplands Acid Plant RI report

Please call me at 229-5538 if you have any questions.

Sincerely,

Matt McClincy,
Project Manager
Voluntary Cleanup & Site Assessment Section

cc: Michael E. Rosen, DEQ/NWR
Claudia Powers, Ater Wynne
David Livermore, Exponent

elf atochem

ELF ATOCHEM NORTH AMERICA, INC.
6400 N.W. Front Avenue
Portland, Oregon 97210

(503) 228-7655

June 15, 1999

Mr. Matt McClincy
Department of Environmental Quality
Northwest Region
2020 S.W. Fourth Avenue, Suite 400
Portland, OR 97201-4987

Re: Preliminary Assessment

Dear Mr. McClincy:

In your letter dated May 14, 1999, you requested that Elf Atochem North America, Inc. ("Elf Atochem") conduct a Preliminary Assessment ("PA") for the Northwest Front Avenue plant on parts of the property lying outside of the Acid Plant area where our work with the Department of Environmental Quality ("DEQ") is currently in progress. Based on your letter and the DEQ's Preliminary Assessment Guidance ("Guidance"), we understand that you are requesting an evaluation of current and past plant operations to determine areas, if any, where hazardous substances may have been released. Specifically, you requested that we address Sections 1 through 3, and Section 8.

Please be informed that Elf Atochem has agreed to perform this assessment. Based on the uncertain time schedule for completing the uplands Acid Plant RI report, we feel it is best to keep the PA effort separate from the RI. Much of the information necessary to complete the PA will come from the review of historic files to the extent such files exist and can be located. As you know, much of this work already has been completed during the course of our past and present work with DEQ and you in the voluntary cleanup program. However, we plan to take another look at our files and review the information available to see if there is anything to add to the information we have already provided concerning historic operations of the plant.

As discussed with you on June 9, 1999 we will make every effort to complete this review and have the information assembled for your review by September 1, 1999.

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

Sincerely,
Elf Atochem North America

Larry D. Patterson

Larry D. Patterson
Environmental Manager

Oregon Department of Environmental Quality
Preliminary Assessment (PA) Guidance

Sites contaminated with hazardous substances pose measurable risks to human and environmental health. Under state law (Oregon Revised Statutes (ORS) 465.245), the Oregon State Department of Environmental Quality (DEQ) is required to conduct a Preliminary Assessment (PA) at facilities where a significant threat to human health or the environment is suspected from a release of hazardous substances. The PA is the first phase in the site investigation process to determine whether a site is releasing, has released, or has the potential to release hazardous substances into the environment and whether a response action is required. During a PA, the investigator compiles and evaluates available information about a site and its surrounding environment, including information on potential sources of contamination, pathways for migration of contaminants and receptors potentially affected by them. The PA culminates in a brief report with recommendations on further action at the site. While the PA does attempt to establish whether the site has the potential to adversely affect human health or the environment, it is not intended to determine the exact magnitude of the release or threat.

Some sites will require sampling to determine whether further action is needed. In most instances sampling will be completed as a separate Expanded PA. In some cases however, a limited number of samples (e.g., no more than 5) may be collected and the results included in the PA report. Refer to the Expanded PA Guidance for information required regarding sample collection. If more than 5 samples are needed, then sampling would be better addressed by an Expanded PA.

DEQ will provide copies of completed PAs to the current owners and operators, if known. If DEQ determines that the facility requires further action, DEQ will notify the current owners and operators of its intent to list the facility on the Inventory of Hazardous Substances Sites. For these sites, DEQ will prepare a scoring package using the Site Scoring Procedure. The Site Scoring Procedure examines risks from an actual or potential hazardous substance release into four pathways: surface water, air, ground water and direct contact. The overall score generated for each site by the Site Scoring Procedure is used to rank sites on the Inventory.

DEQ will not list sites on the Inventory that do not require further action after the PA. The determination that no further action is required implies contaminants have either not been released to the environment or if released, are not significantly affecting human health or the environment at the time of the determination. A No Further Action decision can be reversed if additional information is obtained which warrants reevaluation of the site.

The following is an outline of information required for a Preliminary Assessment.

Preliminary Assessment (PA) Outline

For some sites a PA writer can **clearly** determine no problem exists. For example, the source of contamination may have been removed or contained, or there may never have been a potential threat to human health or the environment. For these sites, rather than completing the PA, a memo stating site history, current site conditions and explaining the reasoning for not completing a PA would be sufficient. All facts should be documented. For example, if the contamination has been removed, documentation should confirm this. The main objective is to ensure that all statements are defensible and that human health and the environment are **clearly** not being adversely effected by the site. If there is any doubt then the site should be fully evaluated.

With the exception of the General Site Information, each section should be presented in a narrative form and each point in that section addressed. General Site Information can be in bullet form. Each section (eg. 1.0, 2.0, etc.) should begin on a new page. An example of a completed PA report is available upon request.

TITLE PAGE

This should include the site name, address, ESCI ID#, date of report, preparer and preparer's address. In addition, if applicable, include contract, task order and task number.

GENERAL SITE INFORMATION

To avoid repetition, duplicate information should be combined. For example, if current owner and current operator are the same, then combine them on the same line (e.g., Current Owner/Operator -ABC Chemical).

1) Site Name and Address

2) Current Owner - name, address and phone

3) Current Operator - name, address and phone

4) Site Contacts - name, affiliation and phone

5) Latitude / Longitude [information can be obtained from a 7.5 minute topographic map]

6) Legal Description - township, range, section and tax lot identification (if available) [information can be obtained from a 7.5 minute topographic map]

7) Directions to the Site (narrative)

1.0 INTRODUCTION

Background information on why a PA is conducted.

2.0 BACKGROUND

2.1 Site Description

1) **Brief description** of current site operations

2) **Size** of site in acres

3) **Number, type and location** of buildings, hazardous substance / waste storage, disposal and treatment areas

4) **Unique land or site features** - sink holes, site situated in a gravel pit, etc. [information can be obtained during site visit]

5) **Adjacent land use** - Describe structures and activities on adjacent property within 1000 feet of contaminated or potentially contaminated area (agricultural, residential, industrial, etc.) [information can be obtained during site visit]

6) **Site security** - fenced, 24-hour guard, locked/open gate, etc.

7) **Site location map** (Figure 1) - The site location map should be a copy of a topographic map and should indicate the location of the site in relation to the rest of the state. Specifically the map should include the following: outline of the **site boundaries; site name; overland route to nearest surface water; nearest surface water;** surface water **intakes** (if applicable); **nearest well; nearest residence; 2-mile surface water target distance limit** (if possible); **unique points of interest** (e.g., sensitive environments, etc.); adjacent **land use;** and incorporate a **2-mile radius** of the site

8) **Site/Facility Map** (Figure 2) - The site map can either be a drawing made at the time of the site visit or a facility layout map supplied by the facility in question and should include the following: **site boundaries,** include fencing, gate location or any structure which prohibits entrance; **building locations, names and functions** - include all structures found on the property including interior/exterior process areas, chemical/waste storage/disposal areas, spill location, homes, well houses, etc.; **sources of hazardous substances** - include both active, inactive and former locations; path that **on-site drainage** would follow; **unique features; photograph** location and direction; location of **production, injection, abandoned or monitoring wells** on-site; and **storage tanks** (above and below ground) - past and present locations.

2.2 Ownership and Operational History

1) **Ownership history** - dates of ownership/operators, names, type (federal, private, state, etc.), leased, owned, etc. Historical information should go back as far as possible.

2) **Operating history** - past and current practices, dates of operations, hazardous substances used, production processes. Historical information should go back as far as possible. If applicable, include manufacturing, waste disposal and storage process flow diagrams in the report.

3) **Discussion of known or potential problem(s) - known or potential contaminants of concern;** summary of **existing analytical data; emergency or remedial actions; pathway affected or of concern** - brief statement regarding which pathways (groundwater, surface water, air, or direct contact) are affected or may be affected; **documented problems** - drinking water contamination, groundwater or surface water contamination, documented release, etc.; **potential problems** - contamination has not been documented through sampling but there is the potential for contamination to occur, e.g., waste deposited in water table indicating the potential for groundwater contamination but no analytical results documenting contamination; **unique problems** - unusual problems potentially associated with contamination, for example, an abnormally high death rate of cattle which drink from creek downstream of site, high incidence of cancer among area residents, odor or strange color of well water, etc.

4) **Sample Location Map(s)** (Figure 3 +) - if applicable - the sample location map should be a compilation of all samples collected (even if different events). Use codes to distinguish between different medium and events. The codes used should correspond to the table of analytical results found in the PA. More than one map may be needed to indicate locations, for example an on-site sample location map and an off-site sample location map. These maps can be copies of the site map and/or site location map with the sample locations added.

2.3 Regulatory History

1) **Permits** - type, issuing agency, dates of issue and expiration, compliance / noncompliance, etc. If noncompliance, type, nature, date, corrective action taken. [information can be obtained from DEQ, EPA and/or owner/operator]

2) **Past Inspections** - inspecting party (DEQ, EPA, OSHA, owner/operator, etc.), inspection results, sample collection, analytical results, etc. Include in report, a table(s) of analytical results. Values should be reported at the microgram level and correspond to the media samples, such as µg/kg and µg /L. Inspection results are not limited to official government inspections and should include any inspection performed at the facility. Other inspections might include, for example, reports prepared by consultants for owner/operators or lending institutions. [information can be obtained from DEQ, EPA, OSHA, owner/operator]

3) **Summary of PA site visit** - a brief summary of discussions and/or key observations made during the site visit. This should not include the detail which would be present in the Site Visit Summary which is to be included as a reference in the PA Report.

3.0 WASTE CHARACTERISTICS

3.1 Source Areas

Describe past, present, known and potential sources of hazardous substances found at the site. These areas are those locations on a site where a hazardous substance release to the environment has been documented, a threat of release exists or where hazardous substances have been stored or disposed of. A source is also known as a Hazardous Substance Release Area in the Site Scoring Procedure.

Specifically, a source is any building, structure, installation, equipment, pipe or pipeline including any pipe into a sewer or publicly owned treatment works, well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, above-ground tank, underground storage tank, motor vehicle, rolling stock, aircraft, or any site or area where a hazardous substance has been deposited, stored, disposed of, placed, or otherwise come to be located and where a release has occurred or where there is a threat of a release. It does not include any consumer product in consumer use or any vessel (watercraft).

Include those areas where hazardous substances may be present but do not currently pose a threat of release to the environment at this time. All areas where hazardous substances are handled should be listed. A list of names and location is sufficient for these areas if no problems are associated with them.

Permitted and authorized releases should be identified in the History section of the PA. A permitted and authorized release is a hazardous substance release that is from an active facility and that is subject to and in substantial compliance with a current and legally enforceable permit issued by the Oregon Department of Environmental Quality (DEQ), the U.S. Environmental Protection Agency (EPA), or the Lane Regional Air Pollution Authority; is in conformance with DEQ rules or a control regulation in a State Implementation Plan; or is otherwise in conformance with the provisions of a State Implementation Plan [OAR 340-122-420(9)]. However, the deposition, accumulation, or migration of substances resulting from an otherwise-permitted or authorized release is not a permitted or authorized release [OAR 340-122-427(2)]. These areas should be identified as a source as applicable.

Detailed information may not be available at some sites. It is important to make note of these deficiencies and to provide estimates of source containment, source size, and quantity and type of contaminants present. In addition, explain the thought process involved in obtaining these estimates. In addition, identify hazardous substances that are used or have been used at the facility and are not listed above. This would apply to those substances that have not been handled in the hazardous substance release areas listed above. Describe use, and how treated, disposed of, or recycled.

For each source, where a release or a threat of a release exists, provide a description which includes the following [information can be obtained from owner/operator and/or past reports]:

1) **Source name** - use facility name

2) **Type of source** - landfill, surface impoundment, containers, storage tanks, etc. Sources are described as follows: A **landfill** is an engineered hole in the ground into which hazardous substances have been disposed by backfilling or by contemporaneous soil disposition with waste disposal, covering wastes from view. A **surface impoundment** is a topographic depression, excavation, or diked area, primarily formed from earthen materials (lined or unlined) and designed to hold accumulated liquid wastes, wastes containing free liquids, or sludges that were not backfilled or otherwise covered during periods of

deposition. **Drums** are considered portable containers designed to hold a standard 55-gallon volume of hazardous substances. **Tanks and Non-Drum Containers** are any stationary device, designed to contain accumulated wastes, constructed primarily of fabricated materials (such as wood, concrete, steel, or plastic) that provide structural support; any portable or mobile device in which waste is stored or otherwise handled. **Contaminated Soil** - soil onto which available evidence indicates that hazardous substances were spilled, spread, disposed, or deposited. A **pile** is any non-containerized accumulation above the ground surface of solid, non-flowing wastes; includes open dumps.

3) **Location of source**

4) **Current use** - active, inactive, documented clean-closed, undocumented clean-closed, frequency of use, etc.

5) **Length of use** - beginning and end dates

6) **Permits addressing source** (if applicable)

7) **Type and condition of containment** - containment descriptions should include whether the source is lined or unlined, whether berms are breached or unbreached, the presence of a cap or cover, type of cover, such as 3 feet of daily cover, etc. Also, discuss whether or not containment structures are maintained, at what interval this maintenance occurs (biannually, annually) and if this maintenance is manual or automatic.

8) **Name and quantity of hazardous substances and contaminated media** found in each source. Include past and current disposals. If actual quantities are unknown (e.g., 2000 cu yds), then provide an estimate based on areal extent or volume using dimensions of the release area. If available, provide documentation in the form of analytical results and manifests.

9) **Release (documented) of hazardous substances.** A release is defined as any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment. Releases include the abandonment or discarding of barrels, containers and other closed receptacles containing a hazardous substance or threat thereof. Releases exclude the following: a) Any releases which result in exposure to a person solely within a workplace with respect to a claim that the person may assert against the person's employer under ORS chapter 656; b) Emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel (watercraft), or pipeline pumping station engine; c) Any release of source, by product or special nuclear material from a nuclear incident, as those terms are defined in the Atomic Energy Act of 1954, as amended, if such release is subject to requirements with respect to final protection established by the Nuclear Regulatory Commission under section 170 of the Atomic Energy Act of 1954, as amended, or, for the purposes of ORS 465.260 or any other removal or remedial action, any release of source, by-product or special nuclear material from any processing site designated under section 102(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978; and d) The normal application of fertilizer. A release can be documented through visual or analytical evidence and through facility documentation or admission that a release occurred. Specifically: a) an observation made and documented by a qualified government inspector or agent (photographs will help substantiate the observation); b) a written statement or report from an owner, operator or representative authorized by an owner or operator stating that a release has occurred; or c) laboratory

data indicating the hazardous substance has been detected at levels greater than background concentrations. A general rule is, a release may be verified when the substance is present at three times that of expected or measured background concentrations.

10) **Pathways affected or potentially affected.** Is the source contributing to contaminant migration? A **pathway** is considered as the medium in which a hazardous substance can migrate to a target or receptor. Four pathways are used to evaluate a site: surface water, air, ground water, and direct contact.

11) **Disposal** (both on and off-site) of each waste type, including names of companies contracted for disposal and site of disposal

12) **Accessibility** to source by public and on-site workers. Discuss whether the source is fenced, extent of fencing, and type of security present.

3.2 Waste Characteristics Conclusions

1) Briefly discuss those sources which are or have the potential to affect human and/or environmental health. Include in discussion a statement regarding pathways affected.

8.0 SUMMARY AND CONCLUSIONS

1) **Pathway affected or of concern** - brief statement regarding which pathways (groundwater, surface water, air, or direct contact) are affected or may be affected

2) **Documented problems** - drinking water contamination, groundwater or surface water contamination, documented release, etc. See documentation checklist.

3) **Potential problems** - contamination has not been documented through sampling but there is the potential for contamination to occur, e.g., waste deposited in water table implies potential for groundwater contamination but there are no analytical results documenting contamination

4) **Unique problems** - problems potentially associated with contamination but not regularly encountered at most sites. For example, an abnormally high death rate of cattle which drink from creek downstream of site, high incidence of cancer among area residents, odor or strange color of well water, etc.

5) Brief **statement of further action recommended** (e.g., sampling of groundwater to determine if neighboring well has been affected; fencing or other measures to control public access; no further action, etc.)

REFERENCES

All factual information presented in the report should be well documented with reliable sources. Reliable sources generally include, but are not limited to, letters from owners/operators and government agencies, reports regarding past waste management practices, records of communications with site owners and state and local government, and first hand observations by qualified government personnel. Information from other sources, such as past employees or nearby residents, can be presented in the report but should identify the source and identify whether the information has been confirmed either through analytical results or other means. In gathering information, an attempt should be made to obtain the best information available. For example, a document from the facility stating actual quantity of waste disposal is far better than a record of communication stating the same information. In the absence of the first, the latter would be sufficient.

A complete list of references used to prepare the report should be attached. List only those references that document information in the report. All other information gathered during the PA process should be included in the site file. Each reference on the list should include (as applicable), the author, or conversation or letter participants, title or subject, date, pages, publisher, and journal name. Include with the report a copy of those references that are site specific, such as record of communication, letters, or journal articles which are needed to understand the report. For books that are not common references, include title pages and copy of pages used. Copies of references should be attached to the report after the list of references.

In addition, references should include **photographs** of the site. Photographs are a good way of documenting a release and current conditions as well as providing the reader with an idea of what the facility looks like. When making copies of reports, color photocopies should be made of all photographs. Black and white photocopies of photographs lose their resolution and are not useful.

Furthermore, a **Site Visit Summary** should be included in the references. This should be a summary of information obtained during the site visit and should include, but is not limited to, area measurements of sources (ponds, landfills, etc.), monitoring information, information obtained during the interview, and observations made during the site tour. This is to be much more detailed than the summary of site visit that is included in the history section of the PA Report.

Appendix D
Expanded Preliminary Assessment

elf atochem
ATO

ELF ATOCHEM NORTH AMERICA, INC.
6400 N.W. Front Avenue
Portland, Oregon 97210

(503) 228-7655

April 17, 2000

Mr. Matt McClincy
Department of Environmental Quality
Northwest Region
2020 S.W. Fourth Avenue
Portland, Oregon 97201-4987

Dear Mr. McClincy:

Your letter of December 6, 1999 contained several questions pertaining to the Preliminary Assessment which was recently submitted to you by Elf Atochem North America Inc.'s Portland plant. Your letter requested the following:

1. A list of hazardous substances which are currently and were previously used on-site. The list of substances should be based on OAR 340-122-155 (30) which includes CERCLA hazardous substances, hazardous waste, oil, or any substance designated by the EQC;

2. A description of current and historical site operations for each hazardous substance;

3. Color-coded facility diagrams to locate the storage, process, transfer and disposal areas of each hazardous substance;

4. A description of specific active potential source areas using Section 3 of the Preliminary Assessment Guidance;

5. Documentation of sampling results and soil removal activities associated with the Oil Tank Farm soils;

6. Location of the July 1987 spill of aqua ammonia;

7. Documentation of sampling results and soil removal activities associated with the response to the November 1987 spill of sodium chlorate; and

8. Location and flow paths of the February 1989 spill of sodium hydroxide.

We have included DDT and monochlorobenzene on the Table of Hazardous Substances Currently or Previously Used on Site. However, no additional information was provided for these substances in the section for Current and Historical Site Operations or in the color-coded

plant diagrams because all known information has already been provided to the Department in previous RI reports.

Several color-coded diagrams have been provided for different hazardous substances. The narrative provided in the Current and Historical Site Operations section should explain the location information for most of the substances. Straight colored lines noted on many of the drawings represent overhead pipes. Some of these overhead pipes are historic and no longer exist. Some of the tanks, such as the two chlorine storage tanks north of Warehouse No. 2, are no longer used for chlorine storage. The No. 6 fuel oil storage tank located north of the new Caustic Tank Farm is now in service as a waste water treatment tank.

These questions have been addressed to the best of our ability based on the information available. We have not tried to guess or speculate where information was not available. If you have any questions, please feel free to contact me at 225-7210.

Sincerely,
Elf Atochem North America

Larry D. Patterson

Larry D. Patterson
Environmental Manager

a:coverletter

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

December 6, 1999

Larry Patterson
Elf Atochem North America, Inc.
6400 N.W. Front Ave.
Portland, OR 97210

Re: Elf Atochem Preliminary Assessment

Dear Mr. Patterson:

Thank you for providing the August 31, 1999 Preliminary Assessment (PA) for the Elf Atochem North America Inc. Portland Plant which was prepared at the request of the Oregon Department of Environmental Quality (DEQ). DEQ review of the PA generated the following requests for additional information.

1. Please provide a list or a table of the hazardous substances, as defined in OAR 340-122-115(30), which are currently and were previously used on-site. This list should include substances used to produce products, process intermediaries, products, waste generated from manufacturing operations and any substances used for facility operation and maintenance. The list should distinguish between those substances previously used and those in current use at the facility.

2. The PA does not explain the current and historical site operations in much detail. It is requested that the following information be provided for each hazardous substance or group of process related hazardous substances (e.g., solvents associated with painting and paint wastes).

   a. How are/were the hazardous substances received, stored and transferred for use?
   b. How are/were final products or product intermediaries stored, packaged and shipped off-site?
   c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

3. Given the complexity of past and current operations at the facility, it is requested that separate or color-coded facility diagrams be prepared that locate the storage, process, transfer and disposal (if applicable) areas for each hazardous substance.

4. Several active potential source areas were not described in the PA. It is requested that the following potential source areas be described in accordance with Section 3 of the PA Guidance.

   - Acid Plant
   - Caustic Tank Farms
   - Wastewater Treatment System
   - Gasoline, Diesel and Fuel Oil Tanks
   - Used/Waste Oil Tank
   - Maintenance Areas
   - Transformers
   - Transformer Yards
   - Caustic Recirculation Tank
   - Caustic Makeup Tank
   - Chlorate Tank Farm
   - Laboratory
   - Sand Blasting Area
   - Painting Area
   - Copper Yard

5. Please provide documentation of sampling results and soil removal activities associated with the Oil Tank Farm soils.

6. Please identify the location of the July 1987 spill of 30% aqua ammonia on a site plan.

7. Please provide documentation of sampling results and soil removal activities associated with the response to the November 1987 response to the sodium chlorate spill.

8. Please identify the location and flow paths of the February 1989 spill of sodium hydroxide on a site plan.

Please call me at 229-5538 to discuss a schedule for providing the additional information requested. Once this additional information is provided, DEQ will schedule a PA site visit to observe the various current and former hazardous substance handling areas prior to making any recommendations regarding the need for additional information or investigation.

Sincerely,

Matt McClincy
Project Manager
Voluntary Cleanup Program

cc: Claudia Powers, Ater Wynne Hewitt Dodson & Skerritt

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Section VIII	Flow Path of February 1989 Sodium Hydroxide Spill

a:table

a:sitepa1

TABLE OF HAZARDOUS SUBSTANCES
CURRENTLY OR PREVIOUSLY ON SITE

	CERCLA Substances	Currently Used	Previously Used
1.	Hydrochloric Acid	X	
2.	Sodium Hydroxide	X	
3.	Asbestos	X	
4.	Chlorine	X	
5.	Sodium Bichromate	X	
6.	Sulfuric Acid	X	
7.	No. 6 Fuel Oil	X	
8.	Diesel	X	
9.	Gasoline	X	
10.	Used Oil	X	
11.	Ethylene Glycol	X	
12.	CFC-11 (Trichlorofluoromethane)	X	
13.	CFC-12 (Dichlorofluoromethane)	X	
14.	Sodium Bisulfite	X	
15.	Ammonia		X
16.	Sodium Hypochlorite		X
17.	DDT		X
18.	Monochlorobenzene		X
19.	Chloral		X
20.	Acetone		X
21.	Ammonium Chloride		X

	RCRA Substances	Currently Generated	Previously Generated
1.	Waste Paint	X	
2.	Corrosive Wastewater	X	
3.	Refrigeration Brine		X
4.	Chlorate Filter Cake		X
5.	Chlorate Residue		X
6.	Navigation Batteries		X
7.	Steam Cleaning Residue		X
8.	Nonhalogenated Solvent		X
9.	Spent Halogenated Solvent (Methylene Chloride)		X
10.	Spent Halogenated Solution (1,1,1-Trichloroethane)		X

CURRENT AND HISTORICAL SITE OPERATIONS

(CERCLA Substances)

1. Hydrochloric Acid

a. How are/were hazardous substances received, stored and transferred for use?

As discussed in the Preliminary Assessment, the hydrochloric acid (HCL) plants were constructed in 1966 at their current location. HCL is produced by burning hydrogen gas in the presence of chlorine gas and absorbing the vapor in water. The chlorine and hydrogen gases have always been produced in our chlorine cell room. No other hazardous substances have been used in this process.

b. How are/were final products or product intermediates stored, packaged and shipped offsite?

There are two acid storage tanks located in the acid plant area. These tanks are used to load trucks on a concrete loading pad adjacent to the acid plants. A portion of the acid is pumped through an overhead pipeline to 1) a storage tank near the chlorine cell room, or 2) a storage tank near railroad track No. 6. The acid in the tank near the cell room is used to lower the pH of the brine fed into the chlorine cells. The acid in the tank near track No. 6 is pumped through overhead piping into railcars. Railcar loading occurs on a lined concrete containment pad.

c. What wastes are or were generated during the manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

Non contact cooling water is used at the acid plants. This water is conveyed to Outfall 002 where is is discharged in accordance with our NPDES permit.

Combustion chamber cooling water used at the acid plants has the potential of having a low pH. This water is collected in a fiberglass sump and is pumped through overhead piping to our waste water treatment system which provides pH neutralization in above ground tanks. This water is discharge through Outfall 004 in accordance with our NPDES permit. Throughout the 1970's, this water

was treated in the fiberglass sump and was discharged directly to Outfall 001 in accordance with our NPDES permit.

Maintenance activities at the acid plants can consist of replacing valves or plastic piping. Spent materials generated during maintenance in the acid plants are washed with water and placed into commercial drop boxes. These drop boxes are currently transferred across Front Avenue to the Metro Solid Waste Transfer Station where the material is loaded onto trucks and transported to the Columbia Ridge Landfill in Arlington, Oregon. Historically the drop boxes were taken to the St. Johns Landfill in north Portland.

2. Sodium Hydroxide

a. How are/were the hazardous substances received, stored and transferred for use?

Sodium hydroxide is produced in our chlorine electrolytic cells inside the chlorine cell room. Salt, water and electricity are the raw materials used in this process. Two different types of cells are used at the Portland plant; membrane cells and diaphragm cells. Asbestos is added to the diaphragm cells during the cell building process. For further discussion on asbestos, see the Asbestos section below.

b. How are/were final products or product intermediates stored, packaged and shipped offsite?

The sodium hydroxide produced in the chlorine cells is referred to as cell liquor.

Membrane cell liquor is approximately 32% sodium hydroxide and is pumped through overhead piping to storage tanks located near the B-Set of caustic evaporators near the Maintenance Shop. Steam is used in the evaporators to concentrate the caustic to 50%.

The cell liquor produced in the diaphragm cells is only about 12% caustic and is pumped through overhead piping to storage tanks located east of the new Caustic Tank Farm. The diaphragm cell liquor is pumped from these storage tanks through overhead piping to the E-Set of caustic evaporators located between the Maintenance Shop and the Acid Plants.

50% membrane and diaphragm caustic is pumped through overhead piping to the new caustic tank farm. Caustic is loaded onto trucks and railcars on the south side of the new caustic tank farm. Caustic is also pumped through overhead piping onto the No. 2 Dock where is is loaded into barges.

Prior to construction of the new caustic tank farm in the mid 1990's, all 50% caustic was stored in the old caustic tank farm. This tank farm, now abandoned,

is located south of the Acid Plant area.

c. What wastes are or were generated during the manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

Cooling water is used in both sets of caustic evaporators. This water is conveyed to Outfall 002 where it is discharged in accordance with the NPDES permit.

Water is generated from cleaning operations during shutdowns and maintenance. All water from these operations is collected and reused in the caustic evaporation systems.

3. Asbestos

a. How are/were the hazardous substances received, stored and transferred for use?

Asbestos is shipped to our plant in tightly sealed plastic bags which are sealed in plastic on pallets. These pallets are stored in a locked area of our No. 2 Warehouse. When asbestos is needed in the chlorine cell repair area, an entire pallet is moved into the weigh room which is under negative pressure. The room is provided with a fan which is coupled to a HEPA filtering system. The outer plastic is removed from the pallet and individual bags of asbestos are placed inside a sealed glove-box where the plastic bag is opened and the asbestos is slurried in water for use. All materials which leave the cell repair area are handled as asbestos containing materials. Plastic materials and PPE are double bagged, labeled, and placed into an asbestos drop box for disposal at the Hillsboro Landfill.

Construction of the current chlorine cell room started in 1962. Prior to that date, all chlorine production was in the older chlorine cell room which was located in the current Maintenance Shop area. These older chlorine cells used an asbestos paper which was shipped to the plant in rolls, similar to roofing paper.

b. How are/were final products or product intermediaries stored, packaged and shipped offsite?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

The diaphragm chlorine cells are rebuilt every 12-18 months. Current maintenance practices include the removal of used asbestos diaphragms in a controlled maintenance room and sending the drummed asbestos to a Department approved landfill. Prior maintenance practices included removing the asbestos

diaphragms with water and rinsing the residue to three on-site ponds. In the past, the ponds were occasionally cleaned and the material was placed in trenches located on the property. The Department was aware of and acknowledged the pond maintenance practice. Pennwalt Corporation kept maps to identify the location of the trenches. By the late 1980's, approximately 12 trenches were filled with asbestos-containing residue on the north end of the property.

Elf Atochem acquired the plant from Pennwalt Corporation in 1990. In 1991, Elf Atochem began reviewing its options for use of the north end of its property. In order to make the property useful for potential future development, and to meet conditions in its renewed air permit, the company 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 Department and under the agency's oversight. The asbestos residue was disposed of at a DEQ approved landfill in Arlington, Oregon. The project was completed in 1992.

4. Chlorine

a. How are/were the hazardous substances received, stored and transferred for use?

Chlorine is produced on site. The raw materials used in the process include salt, water, and electricity.

b. How are/were final products or product intermediaries stored, packaged and shipped offsite?

Chlorine is produced as a gas in the chlorine cell room. The gas is conveyed in an overhead pipe to the Chlorine Finishing area where it is chilled and converted to a liquid. The liquefied chlorine is stored in above ground tanks in the Chlorine Finishing area. This is the same procedure that was used when the older chlorine cell room was in operation in the Maintenance Shop area.

Liquefied chlorine is currently only shipped by railcar. Railcar loading is conducted on Tracks 2 and 3 on the south side of Chlorine Finishing. Historically, liquefied chlorine was also shipped by barge from the No. 2 Dock, and there was an occasional shipment by truck. Truck loading occurred in the railcar loading area.

The plant also used to package liquefied chlorine into 1 -ton containers and small 150-200 pound cylinders. The packaging occurred inside the Chlorine Finishing area.

c. What wastes are or were generated during manufacturing of facility operations and

maintenance? How and where are/were these wastes stored and disposed of?

Cooling water has always been associated with the production of chlorine. Cooling water is used in the existing chlorine cell room and is conveyed to Outfalls 003 and 004 where it is discharged in accordance with an NPDES permit. Cooling water is also used in Chlorine Finishing and is conveyed to Outfall 001 where it is discharged in accordance with an NPDES permit.

As stated above, waste asbestos is generated during the rebuilding of diaphragm cells. See Asbestos above for a detailed discussion of asbestos handling.

During the operation of the old chlorine cell room, various cell components including cell heads and bodies, anodes, cathodes and other miscellaneous cell parts were used as fill in the area between Dock Nos. 1 and 2.

5. Sodium Bichromate (or Sodium Dichromate)

a. How are/were the hazardous substances received, stored and transferred for use?

Sodium bichromate is used in the sodium chlorate process. The bichromate is received in a dry form. Historically the material came to the plant in sealed bags and was stored inside the chlorate department. The bags were opened inside the chlorate cell room and the contents were dissolved in tanks with water. The solution was fed into the circulating liquor in the chlorate cell room.

Since the early 1990's sodium bichromate has been received in 30 gallon metal drums. The drums are also stored inside the chlorate department. The bichromate material is dissolved in the 30 gallon drums and is syphoned into tanks for incorporation into the circulating liquor.

b. How are/were final products or product intermediaries stored, packaged and shipped offsite?

Historically the sodium chlorate solution product contained sodium bichromate. Chlorate solutions were shipped either by truck or barge. Truck loading has always occurred on the south side of the chlorate department. Barge loading of chlorate solutions used to occur at the No. 2 Dock.

Since completion of a chlorate plant modernization project in 1990, very little sodium bichromate is contained in chlorate products. The sodium bichromate is separated from the chlorate solution and is returned to the circulating liquor. Very little sodium bichromate is purchased today.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

See the section below which describes Chlorate Residues and Chlorate Filter Cake.

6. Sulfuric Acid

a. How are/were the hazardous substances received, stored and transferred?

Sulfuric acid is received in railcars as a 98% solution. It is off-loaded by air pressure over a containment pad on Track 6 near the chlorine cell room. It is conveyed into three above ground tanks. The acid is pumped from these tanks to the adjacent chlorine drying towers where it is used to absorb moisture from the chlorine gas. When chlorine was produced in the old cell room in the Maintenance Shop area, sulfuric acid was stored in an above-ground tank located on the north side of Chlorine Finishing. This area is currently occupied by a chlorine storage tank. Sulfuric acid was received by railcar on Track 3.

b. How are/were final products or product intermediaries stored, packaged and shipped offsite?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

Sulfuric acid is used in the chlorine drying towers until it reaches a strength of approximately 72%. The spent acid is conveyed through overhead piping to spent acid storage tanks near Track 6. The spent acid is pumped from these tanks through overhead piping to railcars and is sold for use in the production of other products. Spent acid has always been sold to off-site customers for use in making other products.

7. No. 6 Fuel Oil

a. How are/were the hazardous substances received, stored and transferred for use?

No. 6 fuel oil used to be a primary fuel for the steam generating boilers. The oil is currently brought into the plant by truck and is pumped through above ground piping into two 2 10,000 gallon above-ground storage tanks located in the Oil Tank Farm. There used to be a third storage tank (approx. 420,000 gal.) in the tank farm, but it was removed in the early 1990's because oil is now only a backup fuel.

Oil is pumped from the storage tanks through above ground piping to the boilers. Oil is normally only burned one or two days per year when natural gas is curtailed.

There used to be an underground oil pipeline from Shell Oil (located across Front

Avenue) to our oil tank farm. It is believed the pipe was buried south of the neighboring roofing company and came into our property near the salt pads. The pipeline was removed from our property many years ago.

From the early 1950's until termination in the early 1980's, fuel oil was transferred to the Caustic Pot Room area. Large pots were filled with sodium hydroxide solution and the caustic was boiled using fuel oil to fire the pots. The final product was sold as solid (100%) sodium hydroxide. This operation took place in what is known today as the south side of the No. 1 Warehouse.

For many years the plant maintained a large aqua ammonia storage tank near the ammonia plant. Towards the beginning of the oil shortages in the early 1970's, the plant apparently wanted to increase their fuel oil inventory. The aqua ammonia tank was moved slightly north and was converted into a fuel oil storage tank. The tank was filled by truck and an above-ground pipeline was installed along the river bank to transfer oil to the older Oil Tank Farm. The pipeline was never used except to empty the tank. After the "oil crisis" was over, the tank was emptied and the pipeline was removed. This coincided with the plant's initiation of hydrogen as a source of fuel. The tank remained empty until it was utilized in 1995 in the plant's new waste water treatment system.

b. How are/were final products or product intermediaries stored, packaged and shipped offsite?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

Generally there is very little waste generated from the use of fuel oil. The boiler room is provided with a concrete floor and trench which leads to an oil/water skimmer. Any oil removed by the skimmer is placed into the Used Oil Tank located in the Oil Tank Farm. For at least 25 to 30 years the used oil has been hauled off site by commercial oil recyclers. Prior to that time the oil was either placed back into the fuel tanks or was hauled to the St. Johns Landfill. It is believed the oil was used at the landfill for dust control on roads.

When the 420,000 gallon fuel oil tank was taken out of service in the early 1990's, Foss Environmental cleaned the tank and hauled the residue to a commercial oil recycler.

Testing of the Oil Tank Farm soils in the early 1990's showed they contained No. 6 fuel oil. A remediation project was undertaken in the mid-1990's. See the section below that pertains to the Oil Tank Farm Soils.

8. Diesel and, 9. Gasoline

a. How are/were the hazardous substances received, stored and transferred for use?

Diesel fuel and gasoline come into the plant by truck and are off-loaded by hose to 1,000 gallon above-ground storage tanks. These tanks are used for filling portable plant equipment such as manlifts, and plant vehicles. The tanks are located within a concrete containment system near the Front Gate.

There used to be an under-ground gasoline tank located immediately north of the Supervisor's Office. It is believed the tank had a capacity of approximately 1000 gallons. This tank was removed approximately 20 years ago.

There was also an above-ground 500 gallon steel diesel storage tank on the north side of the Supervisor's Office. This tank was only in service a few years until it was replaced with the current tank.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

There are no wastes generated from the use of diesel fuel and gasoline.

10. Used Oil

a. How are/were the hazardous substances received, stored and transferred for use?

Used oil is generated within the plant and is transferred to the Used Oil Tank located in the Oil Tank Farm. No used oils are received by the plant from outside sources.

b. How are/were final products or product intermediates stored, packaged and shipped offsite?

See next paragraph.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are these wastes stored and disposed of?

For the past 25 to 30 years the used oil has been hauled off site by commercial oil recyclers. Prior to that time the oil was either placed back into the fuel tanks or was

hauled to the St. Johns Landfill. It is believed the oil was used at the landfill for dust control on roads.

11. Ethylene Glycol (Antifreeze)

a. How are/were the hazardous substances received, stored and transferred for use?

Ethylene glycol antifreeze is used in two locations in the plant. A very small quantity is used in our Auto Shop for vehicle radiators. We maintain 3 to 4 small trucks for plant use and radiator fluid exchanges occur only every 5 or 6 years.

A 25% antifreeze/water mixture is also used in the second stage chlorine cooling system at our chlorine cell room. Total antifreeze use is less than one drum per year. Ethylene glycol is stored in the plant in metal 55-gallon drums in the Storeroom.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of.?

Used radiator fluid is stored in a drum in the Auto Shop and is recycled off-site. The antifreeze/water mixture in the second stage cooling system is only removed during maintenance. Generally the solution is stored in drums and is returned to the cooling system. Occasionally some of the solution must be disposed of and an antifreeze recycler handles the material at an off-site location.

12. CFC-11 (Trichlorofluoromethane)

a. How are/were the hazardous substances received, stored and transferred for use?

CFC- 11 is received in small metal drums. The containers are stored in the Chlorine Finishing area where it is used as a refrigerant. The containers are transported to the chillers where the refrigerant is transferred into the machines.

CFC- 11 used to be used as a refrigerant in chillers for the Calcium Chloride Brine system near the sodium chlorate plant.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

There are no wastes generated from the use of CFC-11.

13. CFC-12 (Dichlorofluoromethane)

a. How are/were the hazardous substances received, stored and transferred for use?

CFC-12 is received in small cylinders of pressurized liquid. The cylinders are stored in the Chlorine Finishing area where they are used as a refrigerant. The cylinders are transported to the chillers where the liquid is transferred into the machines. CFC- 12 used to be used in the chlorine cell room area.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

CFC-12 is a pressurized liquid and is quite volatile if released to air. There are no wastes generated from the use of CFC- 12.

14. Sodium Bisulfite

a. How are/were the hazardous substances received, stored and transferred for use?

Sodium bisulfite is used in the plant to neutralize free chlorine in waste water and in the process. It is received by tanker truck in liquid form and is off-loaded into an above-ground storage tank near the Chlorine Cell Room. The sodium bisulfite is conveyed through overhead piping to the plant's waste water treatment system and to the Chlorine Cell Room.

The plant used to receive sodium bisulfite as a dry powder in sealed bags. The bags were stored in the No. 2 Warehouse. The bags were occasionally brought to the bisulfite tank area where they were opened and mixed with water into an above-ground tank.

b. How are/were final products or product intermediates stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

There are currently no wastes generated from the use of sodium bisulfite. When the plant received bisulfite in sealed bags, the empty bags were washed with water and the bags were placed into a drop box.

15. Ammonia

a. How are/were the hazardous substances received, stored and transferred for use?

Ammonia production operations commenced in the mid 1950's and lasted until approximately January of 1990. Nitrogen was stripped from air and combined with hydrogen that was produced in the chlor-alkali process. The combined gases were compressed and cooled to form anhydrous ammonia. A portion of the ammonia was mixed with water to produce aqua ammonia.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

The plant maintained two above -ground anhydrous ammonia storage tanks which were located in the area of the existing new caustic tank farm. The tanks are still present, but they are used as nitrogen gas holders. Trucks were loaded with anhydrous ammonia immediately adjacent to the storage tanks. Anhydrous ammonia railcar filling occurred immediately west of the storage tanks.

The plant also maintained an aqua ammonia storage tank in the same location. Aqua ammonia was loaded onto trucks adjacent to the storage tanks.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

A small amount of sodium hydroxide solution was used to scrub carbon dioxide from air. The waste scrubber solution was pumped to the plant's waste water treatment system for treatment.

Oils were used in the air compressors as lubricants. Oils were collected from the compressor blowdown water and were transported to the plant's Used Oil Tank.

Solvents were occasionally used in the ammonia plant for degreasing. See Spent Halogenated Solvents below.

16. Sodium Hypochlorite (Bleach)

a. How are/were the hazardous substances received, stored and transferred for use?

Sodium hypochlorite was manufactured for a short time inside the sodium chlorate cell room. Chlorine was bubbled through sodium hydroxide and the reaction was cooled to form sodium hypochlorite.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

The solution was stored in a small tank inside the cell room. Sodium hypochlorite was not used inside the plant. Final product was loaded into small flexible plastic containers in cardboard boxes and was shipped from the plant by truck.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

Little, if any, wastes were generated from the sodium hypochlorite operations.

17. Dichloro-diphenyl-trichloroethane (DDT)

Refer to previous reports submitted to the DEQ for this information.

18. Monochlorobenzene (MCB)

Refer to previous reports submitted to the DEQ for this information.

19. Chloral

a. How are/were the hazardous substances received, stored and transferred for use?

Chloral was produced on site by chlorinating denatured alcohol (ethyl alcohol). The operation was located immediately east of the old DDT process building. The chlorine was produced on site. The denatured alcohol was brought into the plant by truck and was stored in above ground storage tanks at the north end of the Oil Tank Farm. The alcohol was conveyed to the chloral production unit via an overhead pipeline.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Chloral was stored in a tank inside the DDT process building. The substance was used internally and consumed in the DDT manufacturing process. No chloral was shipped off-site.

c. What wastes are or were generated during manufacturing or facility operations and

maintenance? How and where are/were these wastes stored and disposed of?

Hydrochloric acid (HCL) was generated during the production of chloral. HCL was removed in an absorber and sold as a commercial product.

20. Acetone

a. How are/were the hazardous substances received, stored and transferred for use?

For only a few months in the early 1950's the plant attempted to produce a grass defoliant material for use in the agricultural industry. The operation consisted of chlorinating acetone with chlorine gas. The operation took place inside the old DDT process building. It is not known if an acetone storage tank ever existed for this short lived operation. It is not known how acetone was brought into the plant.

Denatured alcohol was used in the production of chloral. Denatured alcohol is ethyl alcohol to which a substance has been added to render it entirely unfit for consumption as a beverage. One method of producing denatured alcohol used acetone as an additive. It is not known if the denatured alcohol used in the production of chloral contained acetone.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

It is not known how the grass defoliant material was shipped from the plant.

c. What wastes are or were generated during the manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

If is not known what, if any, wastes were generated during this short lived process.

21. Ammonium chloride

a. How are/were the hazardous substances received, stored and transferred for use?

Ammonium chloride was used from 1958 to 1962 to produced ammonium perchlorate, a solid rocket fuel. Aqua ammonia was pumped through an overhead pipe from the ammonia plant to an above-ground storage tank located in the area of the old MCB recovery system. The aqua ammonia was mixed with hydrochloric acid to form ammonium chloride. An above-ground ammonium chloride storage tank was located in the same area. The ammonium chloride solution was pumped through overhead piping into the old DDT process building where is was mixed with sodium perchlorate. Sodium perchlorate was produced for some time in the sodium chlorate cell room. The mixture of sodium perchlorate and ammonium chloride formed ammonium perchlorate. Ammonium perchlorate was shipped via

railcar in stainless steel metal tote containers.

b. How are/were final products or product intermediaries stored, packaged, and shipped off-site?

All ammonium chloride produced on site was consumed in the ammonium perchlorate manufacturing process.

c. What wastes are or were generated during the manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

No wastes were generated from the production of ammonium chloride.

(RCRA Substances)

1. Waste Paint

a. How are/were the hazardous substances received, stored and transferred for use?

New paint and paint thinners are brought into the plant by truck. These materials are stored in small containers in the Storeroom while they await use by the plant's painting contractor. The paints are used throughout the plant for general maintenance purposes. Paints which have been opened and are awaiting future use are stored in the contractor's paint shed located along the river bank east of the Acid Plant area. The painting equipment cleaning activities also take place in the contractor's paint shed.

In the early days of the plant paints and thinners were stored in the back room of the Supervisor's Office.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

The paint thinner contains toluene, MEK, mixed xylenes, and ethyl benzene. All paint wastes are blended into a RCRA satellite accumulation drum located within the paint shed. Whenever the accumulation drum is full, the drum is shipped offsite for fuel blending at a RCRA Subtitle C facility.

Years ago the paint wastes were blended into the spent sandblast sand pile which is

located in the paint shed area. The sandblast sand was periodically hauled to the St. Johns Landfill. Apparently some sand was used for fill along the riverbank south of the No. 2 Dock.

2. Corrosive Wastewater

a. How are/were the hazardous substances received, stored and transferred for use?

The plant produces sodium hydroxide and hydrochloric acid. Corrosive wastewater can be generated from the production and handling of these hazardous substances.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

Corrosive wastewaters which cannot be reused in the plant have generally been conveyed to the NPDES permitted treatment and discharge systems. The current waste water treatment system is located east of the chlorine cell room and is an above-ground tank based system. The former treatment system is immediately north of the current system. Waste waters are conveyed to the treatment system through piping on an overhead piperack.

3. Refrigeration Brine (Calcium chloride brine containing Sodium Bichromate)

a. How are/were the hazardous substances received, stored and transferred for use?

A calcium chloride solution was used in the sodium chlorate department as a heat transfer fluid. The system was coupled with a CFC based chiller and was used to help crystalize sodium chlorate. The brine was circulated in a closed pipe system and returned to a storage tank. The brine contained sodium bichromate as a corrosion inhibitor. The system has been dismantled.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of.?

The operation of the calcium chloride brine system did not generate any wastes. It is unknown during historic maintenance activities if any wastes were generated.

The calcium chloride brine heat transfer system was dismantled in the early 1990's. All of the chromium containing calcium chloride brine was sent off-site to a RCRA Subtitle C facility.

4. Chlorate Filter Cake and, 5. Chlorate Residue

a. How are/were the hazardous substances received, stored and transferred for use?

Refer to the sodium bichromate section above for more information about sodium bichromate use in the chlorate department.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of.?

The entire sodium chlorate operation is a contained operation where all concrete floor trenches are designed to return liquids to process tanks. Because dirt and foreign particles can be tracked into the chlorate department, it is necessary to filter some of the process streams. The spent filter bags are laundered in a dedicated washing machine where all the wash water flows into a cone bottom tank. After laundering the filter bags are returned to the process. Solids which accumulate in the cone bottom tank are pumped to a filter press where the liquids are extracted and returned to the process. The filter cake (referred to as Chlorate Filter Cake), although non-RCRA regulated, is sent off-site to a RCRA Subtitle C facility.

Sand, rocks, bolts, and dirt will accumulate over time in the concrete trenches in the chlorate department. Occasionally these materials are removed and placed into metal drums. This material is referred to as Chlorate Residue. This residue is sent off-site to a RCRA Subtitle C facility.

6. Navigation Batteries

a. How are/were the hazardous substances received, stored and transferred for use?

The plant maintains an ocean-going barge for shipment of chemicals. U.S. Coast Guard rules require the use of navigation lights on the unmanned barge. Since there is no engine or generator on the barge, batteries are necessary to power the navigation lights. The original batteries were a carbon zinc anode type which

contained a small quantity of mercury. These batteries have been replaced with a carbonaire type which do not contain mercury.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

New navigation batteries are stored in the plant's Storeroom.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of.

The original spent navigation batteries were handled as hazardous waste and were sent off-site to a RCRA Subtitle C facility. Although the replacement batteries are not a regulated waste, they are also sent off-site to a RCRA Subtitle C facility.

7. Steam Cleaning Residue

a. How are/were the hazardous substances received, stored and transferred for use?

The plant maintains a small steam cleaner adjacent to the north edge of the Auto Shop. The cleaner is used for removal of dirt and grease from vehicles and portable equipment. The steam cleaner used to use a caustic based additive to aid in cleaning. The plant has switched to a sodium carbonate based additive.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

The steam cleaner area consists of a concrete pad which drains to a concrete oil/water separator. Solids accumulate on the bottom of the concrete separator basin and must be periodically removed. The basin is provided with an oil skimmer which removes oil from the basin and allows it to accumulate in a container which is periodically emptied into the plant's Used Oil Tank. Effluent from the separator basin is pumped to the plant's waste water treatment system.

The solids originally removed from the separator basin were considered to be RCRA corrosive because of the caustic additive. This residue was sent off-site to a RCRA Subtitle C facility. Since switching to the sodium carbonate cleaner the residue is no longer considered corrosive. However, the plant still sends it offsite to a RCRA Subtitle C facility.

8. Nonhalogenated Solvent

a. How are/were the hazardous substances received, store and transferred for use?

The plant used a mineral spirit solvent cleaner for many years in the Auto Shop. The mineral spirit cleaner was brought into the plant in a 55 gallon drum and was stored in the Storeroom. Spent materials were blended with the plant's used oil. In the late 1980's the plant contracted with Safety Kleen to provide a 10 gallon parts washer which used mineral spirits. Every 60 days Safety Kleen changed out the fluid and recycled the spent solvent. In the mid 1990's the plant purchased its own parts cleaner and terminated the services with Safety Kleen. The new parts cleaner was filled with a citrus cleaner.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

The spent mineral spirits manifested through Safety Kleen were recycled at their RCRA Subtitle C facility in Clackamas, Oregon. To date we have not changed out the citrus cleaner in our current parts washer.

9. Spent Halogenated Solvent (Methylene Chloride)

a. How are/were the hazardous substances received, stored and transferred for use?

The plant used to maintain a small covered stainless steel dip tank in the Auto Shop for parts cleaning. Because the tank had high sidewalls and a heavy cover, it apparently was seldom used. It is believed that no waste was generated from this tank until it was taken out of service in the early 1990's.

Methylene chloride was also used in the ammonia plant as a degreaser for the air columns. The solvent was acquired through a local chemical supplier in 55 gallon drums. Apparently it was only used during maintenance in the ammonia plant once every 5 to 10 years. Approximately one to two drums were required during each maintenance activity.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

In the early 1990's the contents of the dip tank in the Auto Shop were sent off-site to a RCRA Subtitle C facility for fuel blending.

In the early 1980's 4 drums of spent solvent (generated in the ammonia plant) were returned to the chemical supplier.

10. Spent Halogenated Solution (1,1,1-Trichloroethane)

a. How are/were the hazardous substances received, stored and transferred for use?

1,1,1 -Trichloroethane (Chlorothene) was also used in the ammonia plant as a degreaser. It was occasionally used as a substitute for methylene chloride.

Plant electricians also used small quantities of 1,1,1 -Trichloroethane to clean electrical contacts. Trichloroethane was transferred from a drum in the Storeroom into open buckets. Rags were apparently dipped into the buckets for use in cleaning electrical equipment. The rags and buckets were apparently reused until they were very dirty. The buckets were left uncovered where the solvent could evaporate. Spent rags and buckets were discarded into plant drop boxes.

b. How are/were final products or product intermediaries stored, packaged and shipped off-site?

Not applicable.

c. What wastes are or were generated during manufacturing or facility operations and maintenance? How and where are/were these wastes stored and disposed of?

In the mid 1980's several drums of spent solution generated in the ammonia plant were sent off-site to a RCRA Subtitle C facility.

(Other)

1. Dredged Materials

a. Northern Plant Property

In 1953 Pennsylvania Salt Manufacturing Company of Washington, owner of the property at that time, allowed the Port of Portland in cooperation with the U.S. Army Corps. of Engineers to dispose of dredged materials from the Willamette River onto what is currently the plant's vacant northern property.

b. Salt Pad Area

In 1956 Pennsylvania Salt Manufacturing Company of Washington dredged a portion of the near shore area at the upstream end of the property. The dredged material was placed behind a dike which extended from the No. 1 Dock, south to the upstream end of the property. Some dredged materials from the navigation channel may have also been placed on the property by others.

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