

Revised Draft

WORK PLAN

ENGINEERING EVALUATION/COST ANALYSIS ARKEMA REMOVAL ACTION

PORTLAND, OREGON

APPENDIX F

PORTLAND HARBOR RI/FS CONCEPTUAL SITE MODEL, VOLUME II, APPENDIX A-2, ARKEMA, INC.

Prepared for

Legacy Site Services, LLC

468 Thomas Jones Way
Exton, PA 19341

DO NOT QUOTE OR CITE

This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Prepared by



319 SW Washington Street, Suite 1150
Portland, OR 97204

July 14, 2006

ARKEMA INC.
CSM Site Summary – Appendix A-2

ARKEMA INC.

(formerly ATOFINA Chemicals, Inc. or Elf Atochem North America, Inc.)

Oregon DEQ ECSI #398

6400 NW Front Avenue

DEQ Site Mgr: Matt McClincy

Latitude: 45.5708°

Longitude: -122.74°

Township/Range/Section: 1N/1W/13

River Mile: 7.3 West bank

LWG Member Yes No

Upland Analytical Data Status: Electronic Data Available Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Arkema site to the river is summarized in this section and Table 1, and supported in the following sections.

According to the Upland RI Report (ERM 2004a), the following potential contaminant transport pathways have been identified:

- Surface water discharge (overland flow from the riverbank soils)
- Groundwater migration via advection and hydrodynamic dispersion
- Stormwater discharge via outfalls.

1.1. *Overland Transport*

With the exception of bank soils, there is expected to be little overland transport of contaminants via soil erosion. The northern third of the property consists of open fields of brush and healthy vegetation. The southern two-thirds of the property, where chemical manufacturing activities took place, is almost entirely paved, covered with gravel, or covered with a temporary cover systems. Stormwater that does not infiltrate the ground enters the facility's four permitted outfall systems. Overland sheet runoff to the river is not an applicable issue for this facility.

1.2. *Riverbank Erosion*

As shown in Figure 2-3 of Appendix B (Ecological Risk Assessment Approach) of the Portland Harbor Work Plan (Integral et al. 2004), the bank in the vicinity of Arkema is partial river beach and steep slopes covered with bank stabilization material that includes large chunks of concrete, asphalt, and other impervious material. There is no evidence of large-scale bank erosion, although there was minor sloughing of the bank between Docks 1 and 2 during the 1996 flood. Periodic monitoring of sediment stakes placed at low-, mid-, and high-bank elevations just north of Arkema's northern dock shows only relatively small-scale erosion and accretion (i.e., typically less than 5 cm in extent) in riverbank elevations between July 2002 and January 2004 (Anchor 2004).

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1.3. Groundwater

Groundwater occurs within four distinct zones at the facility (shallow, intermediate, deep, and basalt zones). The depth of shallow groundwater at the facility varies from approximately 6 to 12 feet along the western property boundary to approximately 14 to 32 feet along the eastern property boundary, along the riverbank. The general direction of groundwater flow for all zones is towards the river. The point at which each zone discharges to the river is not fully known. However, it is likely that shallow groundwater may discharge to the river near the riverbank. Upward vertical hydraulic gradients were observed in the sediment and groundwater investigations conducted in the river, in the vicinity of Docks 1 and 2.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Stormwater from Arkema is discharged through four outfalls (Figure 1). These are described in Section 9.3.

1.5. Relationship of Upland Sources to River Sediments

Investigations conducted in the upland areas and in the river indicate that upland groundwater has contributed to contamination to river groundwater. DDT in river sediments adjacent to the property is primarily present due to historic discharges from a process discharge pipe located just north of Dock 1.

The primary transport mechanism to the river is dissolved-phase constituents in groundwater.

1.6. Sediment Transport

As shown in Figure 2-3 of Appendix B (Ecological Risk Assessment Approach) of the Portland Harbor Work Plan (Integral et al. 2004), the bank in the vicinity of Arkema is described as river beach. Evidence of large-scale bank erosion is unknown. Periodic monitoring of sediment stakes placed at low, mid, and high bank elevations at the downstream end of the Arkema property near RM 7 shows only relatively small-scale erosion and accretion (i.e., typically less than 5 cm in extent) in riverbank elevations between July 2002 and January 2004 (Anchor 2004).

As described in Section 2 of the Portland Harbor Work Plan (Integral et al. 2004), the Arkema property is located at the downstream end of a main channel depositional zone that extends from RM 7 to 10 based on Sediment Trend Analysis® and sediment-profile image survey data. This depositional zone appears to be a function of the relatively wide cross-sectional area in this reach. The river narrows as it approaches RM 7 and the channel transitions into a more dynamic sediment transport regime. There is no site-specific sediment transport information available for the nearshore portions of the site. However, time-series bathymetry change (January 2002 to February 2004) measurements of riverbed elevation between the channel boundary and the Arkema shoreline show net sediment accretion on the order of 1 foot along the upstream portion of the site (around and just downstream of the farthest upstream pier) and net erosion of about 1 foot along the site downstream of the middle pier (Integral and DEA in prep).

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: October 10, 2005

3. PROJECT STATUS

[Primary Source: ECSI file and DEQ Staff Report]

Activity		Date(s)/Comments
PA/XPA	<input checked="" type="checkbox"/>	Preliminary Assessment (Elf Atochem 1999); Phase II Preliminary Assessment (Elf Atochem 2000)
RI	<input checked="" type="checkbox"/>	Environmental Summary Report, Lots 1 and 2 (ERM 2003); Phase II Stage 1 & 2 In-River Groundwater and Sediment Investigation Report (Integral 2003); Upland Remedial Investigation Report, Lots 3 and 4 and Tract A (ERM 2004a)
FS	<input type="checkbox"/>	
Interim Action/Source Control	<input checked="" type="checkbox"/>	Remedial Action Report, North Plant Area (CH2M Hill 1995); Interim Remedial Measures Implementation Report (ERM 2001 – Phase I Soil Removal IRM); Phase II Soil Interim Remedial Measure (ERM 2002); Dense Non-Aqueous Phase Liquid Remediation Pilot Study Completion Report (ERM 2004b); Hexavalent Chromium Reduction Pilot Study Completion Report (ERM 2004c). Air Sparging/Soil Vapor Extraction Interim Remedial Measure Work Plan (ERM 2004d); Hexavalent Chromium Reduction Interim Remedial Measure Work Plan (ERM 2005a); In-Situ Persulfate Oxidation Interim Remedial Measure Work Plan (ERM 2005b).
ROD	<input type="checkbox"/>	
RD/RA	<input type="checkbox"/>	
NFA	<input type="checkbox"/>	

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 1

4. SITE OWNER HISTORY

Owner/Occupant	Type of Operation	Years
Arkema, Inc.	Inactive, site decommissioned	2004 – Present
ATOFINA Chemicals, Inc.	Chemical Manufacturing, site decommissioned	2000-2004
Elf Atochem North America, Inc.	Chemical manufacturing	1990 – 2000
Pennsylvania Salt Manufacturing/Pennwalt Corp.	Chemical manufacturing	1941 – 1989

5. PROPERTY DESCRIPTION

The site is located at 6400 N.W. Front Avenue in Portland, Oregon, along the west bank of the Willamette River, at approximately RM 7.5 in the Guild’s Lake Industrial Sanctuary (formerly the Northwest Portland Industrial Sanctuary). The site is zoned and designated “IH” for heavy industrial use and is bordered on the east by the Willamette River, on the south by a roofing products company, and on the north and west by Front Avenue. Excluding the river bank, the site occupies approximately 55 acres and is generally flat with surface elevations of approximately 25 to 38 feet National Geodetic Vertical Datum (NGVD) 1929 (Figure 1).

The Arkema property is divided into four lots and one tract (Tract A) along the Willamette River bank [see Supplemental Figure 4 from ERM (2004a)]. Manufacturing processes took place on the southern

two lots at the site (Lots 3 and 4), with the northern portion of the site (Lots 1 and 2) left relatively undeveloped [Figure 1 and Supplemental Figure 4 from ERM (2004a)]. Lots 3 and 4 were developed with buildings, paved roads, rail spur access and associated tanks and piping in support of manufacturing processes. The plant has been decommissioned, and most of the facility infrastructure has been demolished and removed, concurrent with RI activities. Arkema maintains leases from the Department of State Lands (DSL) for the docks in the Willamette River.

6. CURRENT SITE USE

Arkema manufacturing operations ceased in 2001. Nearly all of the infrastructure associated with the manufacturing processes has been decommissioned and removed. Demolition was carried out in three phases. During Phase I, steel structures and tanks were removed. During Phase II buildings on Lot 3 and the northern portion of Lot 4 were demolished. Phase III demolition activities were completed during 2004 and included the removal of the remainder of building structures.

According to DEQ's ESCI database, Arkema still retains their RCRA large-quantity generator status. Remedial activities to address environmental contamination are ongoing.

7. SITE USE HISTORY

The facility was an inorganic chemical manufacturing facility from 1941 to 2001. It was constructed and operated by Pennsylvania Salt Manufacturing, which later became Pennwalt Corporation. Pennwalt was purchased by Societe Nationale Elf Aquitaine (ELF) in 1989, and in 1990 was combined with two other companies to form Elf Atochem North America, Inc. In 2000, Elf Atochem became ATOFINA Chemicals, Inc. ATOFINA changed its name to Arkema Inc. in October of 2004.

The plant began producing sodium chlorate and potassium chlorate in 1941 in the Sodium Chlorate Area [Figure 1 and Supplemental Figure 4 from ERM (2004a)]. Chlorate was produced by the electrolysis of sodium chloride solution, with sodium bichromate added as a corrosion inhibitor and to improve electrical efficiencies. Chlorate solutions were shipped from the facility by truck or barge (Dock 2). Potassium chlorate manufacturing, a process similar to the sodium chlorate operation, ended in 1978.

Sodium chloride was the primary raw material used at the site throughout its operation. It was historically delivered to the facility by ship. The salt was transferred and stored on asphalt-lined salt pads located in the southeastern corner of the site adjacent to the river [Figure 1 and Supplemental Figure 4 from ERM (2004a)].

Chlor-alkali operations started at the plant in 1946. Products included chlorine, sodium hydroxide, and hydrogen gas. Asbestos (used as a diaphragm in electrolytic cells) was historically buried in trenches on Lot 1. The trenches were excavated and the buried asbestos removed with DEQ oversight in 1992. Later, process waste asbestos was conveyed to a filter press, and the filter cake was placed in drums for offsite disposal. The plant never operated mercury chlorine cells.

Hydrochloric acid production began in 1966 in the general area where DDT was formerly manufactured. This area became known as the Acid Plant [Figure 1 and Supplemental Figure 4 from ERM (2004a)]. Chlorine and hydrogen were burned together in aboveground towers to form hydrogen chloride vapor. The vapor was absorbed in water to form hydrochloric acid. This production ceased in 2001.

The pesticide, dichlorodiphenyltrichloroethane (DDT), was manufactured at the facility from 1947 to 1954. Chemical base stocks used in the DDT manufacturing process included monochlorobenzene (MCB, or chlorobenzene), chloral, and sulfuric acid. Dry-processed DDT was placed in bags and shipped offsite by railcar. A small amount of DDT was dissolved in diesel fuel and loaded into trucks and possibly

railcars as a solution.

Manufacturing process residue (MPR) from DDT manufacturing was initially discharged to floor drains, apparently connected to a storm sewer that drained to the Willamette River (see figure 3a). From approximately 1948 until 1950, MPR was discharged to an unlined pond northeast of the manufacturing building. From 1950 until DDT manufacturing ceased in 1954, MPR was piped to a MCB recovery system for MCB recovery. Wastes in the recovery system were periodically drained to the MPR pond. The MCB recovery system was located immediately west of the former MPR pond. In 1951 or 1952, an 8-foot-wide by 285-foot-long trench was added to the north end of the disposal pond to increase capacity of the pond (DEQ 2003).

From 1958 to 1962, after DDT manufacturing ceased, ammonium perchlorate operations were conducted in the former DDT process building. During this period, sodium perchlorate was produced inside the chlorate cell-room. Sodium perchlorate was transferred to the acid plant area where it was converted to ammonium perchlorate by using ammonium chloride to form a solid propellant for guided missiles. The production of sodium perchlorate and ammonium perchlorate ceased in 1962.

Extensive, ongoing site investigations have occurred at Arkema since 1994. Arkema submitted an application to DEQ in June 1995 to participate in the Voluntary Cleanup Program (VCP). A Remedial Investigation (ERM 2004a) was initiated in 1998 and completed in January 2004.

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of the current and historic potential upland and overwater sources at the site is summarized in Table 1 and shown on Figure 4. Because the site has undergone extensive remediation and demolition, several of these areas are not considered current sources of contamination. The following sections provide a brief discussion of the potential sources at the site requiring additional discussion.

8.1. Uplands

- At the initiation of DDT manufacturing in late 1947, manufacturing process residue (MPR) was discharged to floor drains connected to a storm sewer that drained into the Willamette River. In 1948, MPR was conveyed to a newly constructed, shallow, unlined pond located northeast of the manufacturing building. Starting in 1950 until DDT manufacturing operations ceased in 1954, MPR was piped to an MCB recovery system, where chlorobenzene was removed from the residue and returned to the process. Occasionally, wastes from the recovery system were placed in the pond. In about 1951 or 1952, an 8-foot wide by 285-foot long trench was constructed north of the MPR pond to increase its capacity. Elevated concentrations of MCB and DDT were found in soil in this area prior to soil removal. In response to these elevated DDT and MCB concentrations, a two-phased soil removal/source control interim remedial measure (IRM) was implemented in 2000 and 2001. Impacted soil was removed in portions of the Acid Plant Area from depths of up to 12 feet below ground surface (bgs). Some DDT- and MCB-impacted soils remain on site in the Acid Plant Area (ERM 2004a).
- Sodium chlorate manufacturing started in 1941 in its current location (Figure 1). Chlorate was produced by electrolysis of a sodium chloride solution. Sodium bichromate was added to the process as a corrosion inhibitor and to improve the electrical efficiency of the process. Chlorate solutions were shipped either by truck or barge. Truck loading occurred on the southern side of the Chlorate Plant Area. Barge loading of chlorate solutions occurred at the No. 2 Dock.
- From 1958 to 1962, sodium perchlorate was produced inside the chlorate cell-room. This process was very similar to the sodium chlorate process. Sodium perchlorate was

only produced as a material input for the production of ammonium perchlorate. Production of all perchlorate products ceased in 1962.

- In 1958, ammonium perchlorate operations were conducted in the former DDT process building. Sodium perchlorate 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 1962. Some ammonium perchlorate handling took place in the No. 3 Warehouse, in the southeast corner of the Acid Plant Area (ERM 2004a).
- In 1994, Arkema excavated a trench on Lot 1 that contained DDT manufacturing process waste. Based on Section 5.1.2 of the Environmental Summary Report, Lots 1 and 2, the former DDT trench located on Lot 1 is a potential source area because very low concentrations of DDT, DDD, and DDE (all below DEQ industrial soil cleanup levels) are present in shallow soil in a discrete area between 3 and 14 feet bgs around the perimeter of the former trench. None of the 33 confirmation samples contained constituent pesticides greater than the USEPA Region 9 Preliminary Remediation Goal (PRG) for industrial soil. The report concluded that DDT is not likely to leach to groundwater (ERM 2003). Arkema has a DEQ approved Soil Management Plan to ensure proper management of these soils.
- Most of the former plant areas are covered with building foundations, asphalt paving, or gravel, which limits the potential for contact between stormwater and any remaining contaminated surface soils. Significant soil removals have occurred throughout the Arkema site during the remediation process. DDT- and chlorobenzene-impacted soil remains in the Acid Plant Area at depths up to 22 bgs. Soil containing DDT remains along the riverbank. Some chromium-impacted soil is found in the area of the Chlorate Cell Room (ERM 2004a).
- Chemical spills have occurred on the Arkema site over the years (see Section 8.3 below). For example, a 200-gallon spill of sodium hydroxide occurred in the old caustic tank farm (OCTF) in February 1996. Although most of the sodium hydroxide was recovered, some of the sodium hydroxide may have spilled on soils in this area (Elf Atochem 2000).
- A sandblast pile was located on the dirt surface north of Warehouse No. 3, adjacent to the plant's eastern fence line. Spent sand was routinely sampled for TCLP metals and recycled offsite. Sample results confirmed no or very low levels of metals detected in the sand.

8.2. Overwater Activities

Yes No

Shipments of sodium chloride (salt) were historically delivered by ship to either the Salt Dock or Dock 1. Sodium hydroxide, sodium chlorate solution, and chlorine were loaded onto barges for shipment from Dock 2. Inadvertent spills during transfer activities may have occurred, but it is not likely they could have been sources of sediment contamination, as these materials are highly water-soluble or immediately volatilize upon release to the atmosphere. Sources, potentially impacted media, and COIs for overland activities are summarized in Table 1.

Arkema maintains leases from the DSL for the docks in the Willamette River.

8.3. Spills

Known or documented spills at the Arkema site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland

Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence. These spills are summarized below:

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes/no)
2/13/86	Ammonium hydroxide	1,200	Sewer	No
11/87	Sodium chlorate	Unknown	Sewer	Yes
6/8/93	50% Sodium hydroxide	225	Containment area	Yes
3/9/95	Fuel Oil	1	Dock 1/outfall area	Yes
2/23/96	Sodium hydroxide	200	Containment area	Yes

9. PHYSICAL SITE SETTING

Numerous subsurface explorations have been conducted at the Arkema site since approximately 1994. Investigation techniques have included test pits, direct-push, hollow stem auger, and cable-tool borings, installation of monitoring wells, vapor extraction wells, air sparging wells, sonic drilling, several remediation pilot studies, and in-situ IRM injections.

9.1. Geology

Results of the investigation indicated the following regarding site geology:

- The surficial geology at the site is characterized by fill and alluvial deposits of the Willamette River.
- The eastern portion of the site generally between Docks 1 and 2 has been filled with plant debris consisting of asphalt, concrete, pipe, soil, and fill from other sources (e.g., City of Portland). These materials occur from the surface to depths of approximately 25 feet bgs.
- The native soil profile is generally characterized by laterally discontinuous, alternating layers of dark gray-brown sand with varying amounts of silt and thinner silt layers with varying amounts of fine sand.
- Underlying the deepest silt layer, at a depth of approximately 35 feet, is a sand layer with black sands on the northern end of Lots 3 and 4 and dark gray-brown sands toward the southern end of the plant.
- Columbia River Basalt is observed below the fill and alluvium at the Site at depths of 49 to 55 feet bgs.

A cross-section layout map and cross-sections diagrams are provided as Figures 2a through 2d.

Fill materials occur from the surface to depths of approximately 25 feet bgs and consist of brown clayey silt to silty sand with occasional wood, brick, concrete, metal piping, and asphalt. Historically, fill materials were used to extend the ground surface out into the Willamette River. Filling activities started in about 1947 with minor quantities of fill material being placed on the riverbank immediately north of the No. 1 dock. The filling continued throughout the 1950's and by the mid-1960's there was a large volume of fill south of Dock 2. Fill thickness ranges from a few feet in the former DDT manufacturing area to approximately 25 feet along the riverbank. In some areas of the site, this has resulted in an extension of the ground surface into the river by up

to 150 to 200 feet.

The native soil profile is generally characterized by laterally discontinuous, alternating layers of dark gray-brown sand with varying amounts of silt and thinner silt layers with varying amounts of fine sand. These sands and silts are massive to finely laminated and the contacts between the sand and silt can be gradational. In Lots 3 and 4, there are four alternating sand and silt layers; a sand layer occurs at the ground surface, underlain by a silt layer at approximately 8 feet bgs, which is underlain by additional sand and silt layers. The sand and silt layers are continuous over most of the site, with the exception of the southeast portion of the site where the silt layers become less continuous.

Underlying the deepest silt layer, at a depth of approximately 35 feet, is a sand layer with black sands on the northern end of Lots 3 and 4 and dark gray-brown sands toward the south. A deeper silt layer with some clay and fine sand is situated beneath the black and dark gray-brown sand and above the basalt bedrock.

Columbia River Basalt is inferred at a depth below the fill and alluvium throughout the area. Basalt was detected in three monitoring well borings conducted as part of the RI, at depths of 49 to 55 feet bgs. These borings are located downgradient (east) of the Acid Plant Area.

9.2. Hydrogeology

Groundwater occurs in fill materials and four distinct groundwater zones beneath the Site. In general, the depth to groundwater increases from west to east across the Site (from Front Avenue toward the Willamette River). The following tables provide a summary of the four groundwater zones and their characteristics.

Shallow Unconfined Alluvial Aquifer	
Monitoring Wells	>50 (includes wells installed for monitoring of pilot studies).
Depth of Aquifer	Unconfined – ground surface to 32 feet bgs.
Depth to First Groundwater	6 to 12 feet on the west portion of the site; 14 to 32 feet on the east portion of the site (adjacent)
Saturated Thickness	~20 feet on west portion of site; ~10-15 feet adjacent to river.
Groundwater Flow Direction	East-northeast in the Acid Plant Area; east-southeast in the Chlorate Plant Area.
Hydraulic Gradient	0.0024 to 0.0069 ft/ft
Hydraulic Conductivity	5.9 ft/day to 34 ft/day (17 ft/day average)

Intermediate Confined Alluvial Aquifer	
No. of Monitoring Wells	11
Depth of Aquifer	36 to 46 feet bgs in the Acid Plant and Chlorate Plant Areas.
Saturated Thickness	5 to 10 feet
Groundwater Flow Direction	East-northeast in the Acid Plant Area; east-southeast in the Chlorate Plant Area.
Hydraulic Gradient	0.0038 to 0.0069 ft/ft
Hydraulic Conductivity	0.04 ft/day to 21 ft/day (5.8 ft/day average)

Deep Confined Alluvial Aquifer	
No. of Monitoring Wells	1
Depth of Aquifer	40 to 45 bgs
Saturated Thickness	Unknown
Groundwater Flow Direction	East-northeast
Hydraulic Gradient	Unknown
Hydraulic Conductivity	0.3 ft/day

Basalt Bedrock Aquifer	
No. of Monitoring Wells	1
Depth of Aquifer	45 to >70 feet bgs (maximum depth explored)
Saturated Thickness	Unknown
Groundwater Flow Direction	Northeast
Hydraulic Gradient	Unknown
Hydraulic Conductivity	Unknown

On the upland portion of the site, vertical hydraulic gradients between groundwater zones are primarily downward, with occasional upward gradients observed for well pair near the Willamette River.

Recharge to shallow groundwater at the site likely occurs from precipitation that infiltrates to the west of the site.

The silts separating the groundwater zones (aquitards) vary in thickness from approximately several inches to 5 feet across the site. The distinct groundwater zones have been observed across the entire site, with the exception of the southeastern portion of the site. In that area, downgradient of the Chlorate Plant Area, the silt aquitards tend to become discontinuous and the shallow and intermediate groundwater zones tend to coalesce.

The shallow groundwater surface fluctuates seasonally, rising during periods of high rainfall and infiltration and decreasing during mid- to 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.

Prior to 2005, no seeps had ever been observed on Arkema property by Arkema personnel or during the Lower Willamette Group’s recently conducted seep survey of riverfront properties. DEQ was notified of a seep of colored water in the summer of 2005 between Dock 1 and the salt dock.

10. NATURE AND EXTENT (Current Understanding)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section.

10.1. Soil

10.1.1. Upland Soil Investigations

Yes No

During the RI (ERM 2004a), the primary chemicals of interest in soil were DDT and its metabolites, DDD and DDE; chlorobenzene; and hexavalent chromium. Numerous soil samples were collected, including samples taken from soil borings associated with remedial measures, a vapor extraction system, and monitoring well installation as well as

surface soil, soil borings, and riverbank samples.

The minimum and maximum soil detections at the Site for DDT, DDD, DDE, chlorobenzene, and total and hexavalent chromium are:

Constituent	Minimum	Maximum	Detection Limit
DDT (pre-RI)	Non-detect	150,000 mg/kg* (10 ft bgs)	0.0055 mg/kg
DDT	Non-detect	31,000 mg/kg (6-8 ft bgs)	0.0055 mg/kg
DDE (Pre-RI)	Non-detect	83 mg/kg (10 ft bgs)	0.0012 mg/kg
DDE	Non-detect	5,200 mg/kg (0.5-0.75 ft bgs)	0.0012 mg/kg
DDD (Pre-RI)	Non-detect	690 mg/kg (10 ft bgs)	0.0012 mg/kg
DDD	Non-detect	430 mg/kg (6-8 ft bgs)	0.0012 mg/kg
Chlorobenzene (Pre-RI)	Non-detect	43,000 mg/kg (10 ft bgs)	0.0011 mg/kg
Chlorobenzene	Non-detect	15,000 mg/kg (6-8 ft bgs)	0.0011 mg/kg
Total Chromium	9.5 mg/kg	1,600 mg/kg (10-12 ft bgs)	Unknown
Hex. Chromium	Non-detect	69 mg/kg (8-10 ft bgs)	1.6 mg/kg

* Removed during soil IRM.

DDT, DDD, and DDE – Surface soil samples were collected from seven locations, primarily in the vicinity of the Acid Plant and also south of Dock 1 and adjacent to the river [Supplemental Figure 4-10 from ERM (2004a)]. All of the elevated concentrations were located in the Acid Plant Area. Up to 1,600 mg/kg of DDT was detected in surface soil samples (defined as the top 4 inches of soil) collected at Stations S-7 and S-8 in the former MPR pond. Concentrations generally decrease with depth in the acid plant area except in the former MPR pond. DDT was also detected as high as 16,000 mg/kg at a depth of 4.5 to 6 feet bgs in soil boring B-53 in the former MPR pond (ERM 2004a). The soil from which this sample was collected was removed during a soil removal/source control IRM. Four thousand seven hundred tons of DDT-impacted soil was excavated and disposed of off-site. The IRM was conducted when the plant was still operating. The northwest and southeast corners of the pond were not excavated due to interferences with plant operations. The rest of the former MPR pond was excavated to a depth of 12 ft bgs. A trench off the northeast corner of the former MPR pond was also excavated to a depth of 8 ft bgs. The greatest DDT soil impacts occur in an area within 100 ft. of two sides of the former process building, the north and eastern sides. The highest DDT concentration currently existing in soil in this area is 13,000 mg/kg in the former MCB recovery system location (Boring IB-20, 3 to 4 feet bgs). Generally, DDD and DDE were detected at significantly lower concentrations (one to three orders of magnitude) than DDT throughout the Acid Plant Area. Depth to groundwater in the Acid Plant Area is approximately 20 feet bgs.

In 1992, a trench identified on the northern property (Lot 1) was found to contain what appeared to be pesticide residues. A sample from the trench confirmed the presence of DDT, as well as chlorobenzene. In the fall of 1992, Arkema conducted a soil exploration program to assess the horizontal and vertical extent of the affected soil in the trench. The investigation determined the top of the trench was approximately 30 feet wide by 80 feet long and approximately 10 to 11 feet deep. The top of the trench was located approximately 3 feet bgs. The trench was completely excavated in 1994 (CH2M Hill 1995). Removal of

DDT-impacted trench soils is discussed in Section 11.1.

Chlorobenzene (MCB) – During the RI and IRM activities, soil samples were collected from 62 borings and analyzed for VOCs. Concentrations of chlorobenzene up to 13,000 mg/kg (Boring VP-6, 7.5 to 8 feet bgs) were detected in the MCB recovery system location. The extent of highest chlorobenzene-impacted soil covers an area approximately 100 feet by 100 feet, just north of the former DDT process building in the MCB recovery system location. Soil in the vicinity of seven of the 32 borings installed as part of a vapor extraction system (VES) IRM was removed during the Phase I and II soil removal/source control IRMs. Additionally, temporary cover (asphalt paving) was installed over soil in the vicinity of three additional VES borings as part of the Phase II IRM. Chlorobenzene-impacted soils remain in a focused part of the Acid Plant Area at depths up to 16 feet bgs. Early RI activities performed in 1999 noted the presence of residual dense non-aqueous phase liquid (DNAPL) in soil in a shallow zone beneath the former MPR pond and in a thin zone downgradient of the former MPR pond and east of the Acid Plant Area. The detection of high concentrations of dissolved-phase chlorobenzene in monitoring wells in this area suggests that residual DNAPL might be a continuing source of dissolved chlorobenzene in groundwater (see Section 10.2.2). A pilot air sparge/soil vapor extraction system was installed in the fall of 2003 and has been operating since then with great success. Arkema installed a full-scale air sparge/soil vapor extraction system in the winter of 2004. The system consists of 21 air sparge wells, 17 soil vapor extraction wells, blowers, and 2 carbon absorbers.

Hexavalent Chromium – Chromium was observed in the Chlorate Plant Area soil at concentrations as high as 1,600 mg/kg in one sample up to 32 feet bgs. The highest concentrations were found near the Chlorate Cell Room and decreased to background concentrations within 250 feet of this area. Depth to groundwater in the Chlorate Plant Area is approximately 20 feet bgs.

10.1.2. Riverbank Samples Yes No

Exponent (1999) collected and analyzed seven riverbank samples from six locations (one was a duplicate sample) during the RI: three at the top of the slope, and three directly down slope, approximately 5 feet above the mean high-water elevation. All sample locations were between Dock 1 and 2 (Supplemental Figure 5). Samples were collected from between 0 and 6 inches bgs. DDT was detected in all samples at concentrations ranging from 2.3 to 120 mg/kg. The highest concentrations were detected in the northern sample location pair. Concentrations were higher in the top-of-slope sample than in the corresponding down-slope sample.

10.1.3. Summary

All ground surfaces within the former areas of the plant that were used for manufacturing are paved, covered by building foundations or have had temporary cover systems installed. Acid Plant Area soils still contain some DDT and MCB. Chlorate Plant Area soils still contain some hexavalent chromium. Because of the impervious nature of the ground surface over the areas with the most significant soil impacts, impacts to groundwater from soil-phase contamination is minimal.

10.2. Groundwater

10.2.1. Groundwater Investigations Yes No

The first groundwater investigation took place in 1994 in the Acid Plant Area to determine the presence and possible concentration of DDT and MCB in groundwater.

Since that time over 60 wells have been installed at the site. Wells have been installed for both general groundwater monitoring and performance monitoring of remedial technology pilot studies. Groundwater samples have been analyzed for organochlorine pesticides, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and other miscellaneous constituents. The most recently validated groundwater data set is from the June/July 2003 groundwater sampling event, included in Supplemental Tables 3 through 6 from ERM 2003. Additional performance monitoring data for groundwater IRM's is also available.

10.2.2. NAPL (Historic & Current) Yes No

Early RI activities conducted in 1999 noted the presence of historic, residual MCB dense non-aqueous phase liquid (DNAPL) in soil in the shallow zone beneath the former MPR pond and in a thin zone downgradient of the pond. The observed residual DNAPL was found primarily near the shallow zone/upper silt layer interface. The presence of elevated dissolved-phase chlorobenzene concentrations in MWA-15r (Section 4.0) suggested that residual DNAPL within the Acid Plant Area downgradient of the former MPR pond might be a continuing source of dissolved chlorobenzene in groundwater.

A two-phased DNAPL investigation was initiated in early 2002 in accordance with the *Work Plan for Dense Non-Aqueous Phase Liquid Investigation, Acid Plant Area, ATOFINA Facility, Portland, Oregon* (ERM 2002). The objective of the DNAPL investigation was to assess the extent of residual chlorobenzene DNAPL in the shallow and intermediate zones and to provide a basis for evaluating remedial alternatives. The Phase I field program utilized a combination of cone penetrometer testing, membrane interface probe (MIP) screening, and direct-push (Geoprobe®) groundwater sampling to characterize subsurface conditions. The Phase II field program was conducted to further characterize the nature and extent of residual MCB DNAPL in the shallow zone immediately downgradient of the former MPR pond and to evaluate the presence and extent of any residual MCB DNAPL in the intermediate zone.

The results of the Phase I DNAPL investigation indicate that the highest concentrations of chlorobenzene in shallow-zone groundwater occur immediately north and northeast of the former MPR pond, in a 5- to 6-foot thick zone directly above the shallow silt horizon. Residual DNAPL was detected at discrete depths in the shallow zone in each of the Phase II borings. Residual DNAPL was also detected at only one intermediate-zone elevation in one boring (of seven total borings) located near the middle of the former MPR pond. The DNAPL investigations concluded that the residual MCB DNAPL is distributed in the form of ganglia or microglobules coating soil particles, rather than in a continuous, pore-filling phase. DNAPL is primarily situated in the shallow zone, and, due to its residual nature, DNAPL is not likely migrating offsite. DNAPL has not been observed in the deep or basalt zones, nor was it observed in any of the borings along the shoreline during the In-Water Investigation (Integral 2003). A full-scale air sparge/soil vapor extraction system has been operating in the area of the former MPR pond since December 2004. Arkema started an in-situ oxidation interim remedial measure for treatment of chlorobenzene in groundwater in August 2005.

10.2.3. Dissolved Contaminant Plumes Yes No

There are four primary dissolved hazardous substance contaminant plumes on the site. The DDT and MCB plumes overlie each other in the Acid Plant Area, whereas the hexavalent chromium and perchlorate plumes overly each other in the Chlorate Plant Area. There is also a small perchlorate plume in the Acid Plant area most likely

associated with the past production of ammonium perchlorate. Chloride is present in groundwater over an extensive area of the site. The highest chloride concentrations in groundwater are found near the former salt pads. The greatest dissolved phase impacts to groundwater are in the shallow groundwater zone with decreasing impacts in the intermediate zone and minimal impacts in the deep zone. Plume maps are provided as Figures 3a through 3d.

Plume Characterization Status Complete Incomplete

The draft RI report has concluded that the investigations have adequately defined the nature and extent of COIs in upland groundwater and provide sufficient data for conducting the Baseline Risk Assessment and FS. The results of the upland RI are consistent with investigations conducted by Arkema in the nearshore area (in the vicinity of Docks 1 and 2).

Plume Extent

DDT (DDT, DDE, DDD)– DEQ’s Fresh Water Chronic Water Quality Criterion was used to delineate the DDT plume (0.001 µg/L). The shallow groundwater zone DDT plume extends from slightly north of Dock 2 to the salt dock on the south and from the western edge of the former MPR pond on the west to the river. DDT was not detected in the deep groundwater zone in the last groundwater sampling event. There is also a small DDT plume in the intermediate zone south of Dock 1.

Chlorobenzene – DEQ’s Fresh Water Chronic Water Quality Criterion was used to delineate the MCB plume (50 µg/L – for chlorinated benzenes). The shallow groundwater zone dissolved-phase chlorobenzene plume extends from just north of Dock 2 south to Dock 1 and from the mid-point of Warehouse No. 2 and the DDT process building to the Willamette River. The intermediate groundwater zone chlorobenzene plume is significantly smaller in extent than the shallow-zone plume. The intermediate zone chlorobenzene plume is situated between Docks 1 and 2 and is approximately 350 feet in width from north to south and extends from the west side of the former MPR pond east to the Willamette River. There is also a small chlorobenzene plume in the intermediate zone south of Dock 1.

Chromium – DEQ’s Fresh Water Chronic Water Quality Criterion was used to delineate the chromium plume (0.011 mg/L). The shallow and intermediate hexavalent chromium plumes are situated on the south portion of Lot 4, primarily south of Dock 1. The shallow zone hexavalent chromium plume originates in the area of the Chlorate Cell Room and extends east towards the Willamette River. The width of the shallow plume is approximated at 800 feet and extends from approximately 150 feet north of Dock 1 south towards the southern edge of the salt pads. The intermediate zone plume initiates further downgradient and is situated within the footprint of the shallow zone plume.

Perchlorate – In the absence of Fresh Water Chronic or Acute Water Quality Criteria, the DEQ SLV of 0.200 mg/L was used to delineate the perchlorate plumes. The primary shallow and intermediate perchlorate plumes are of similar size and orientation to the shallow and intermediate hexavalent chromium plumes, located south of Dock 1. Additional smaller plumes occur in both the shallow and intermediate zones in isolated areas just south of Dock 2.

Min/Max Detections (Current situation)

The minimum and maximum groundwater plume detections at the site for the most recent round of groundwater sampling (June and July 2003) are:

Constituent	Minimum	Maximum	Detection Limit
DDT	Non-detect	282 µg/L	0.08 µg/L
DDE	Non-detect	0.233 µg/L	0.08 µg/L
DDD	Non-detect	28.4 µg/L	0.04 µg/L
Chlorobenzene	Non-detect	185,000 µg/L	0.5 µg/L
Hex. Chrome	Non-detect	9.79 mg/L	0.001 mg/L
Perchlorate	Non-detect	290 mg/L	0.02 mg/L

Current Plume Data

The most recent complete data is for samples collected in June and July 2003. The dissolved phase DDT (DDT, DDE, DDD) and MCB plumes are generally found in the Acid Plant Area, migrating in the direction of east-northeast. The hexavalent chromium and perchlorate plumes are generally located beneath the Chlorate Plant Area and migrate in the direction of east-southeast. The lateral extent of groundwater impacts is greatest in the shallow groundwater zone and decreases significantly with depth (from the intermediate to the deep and basalt groundwater zones). The nature and extent of the groundwater plumes at the Site are stable and well understood. The trends in the data have shown reductions in DDT and MCB since the prior site-wide groundwater sampling event conducted in April 2002.

Three pilot studies have been conducted at the site, which have contributed to further decreases in constituent concentrations in groundwater: the In-Situ Persulfate Pilot Study, the DNAPL Air Sparge Pilot Study, and the Hexavalent Chromium Reduction Pilot Study. All three pilot studies demonstrated that the tested technologies were effective at significantly reducing concentrations of their target constituents (DDT, MCB, and hexavalent chromium) in groundwater. These pilot studies are discussed in greater detail in Section 11.2. In December 2004, the DNAPL Air Sparge Pilot Study System was replaced with a full-scale air sparge/soil vapor extraction system. Full-scale groundwater in situ treatment technologies were also initiated in 2005 for treatment of hexavalent chromium and chlorobenzene.

Preferential Pathways

In order to determine whether the storm drain system at the Site acts as a conduit for constituents in groundwater, storm drain system manhole elevations were compared to groundwater elevations in monitoring wells nearest to the manholes. Invert elevations at 11 manholes in the Acid Plant and Chlorate Plant Areas were compared to minimum and maximum groundwater depths observed over the duration of the RI. Based on the comparison, it has been determined that storm drain system invert elevations are uniformly above groundwater in both the Acid Plant and Chlorate Plant Areas. Therefore, the storm drain system is not a potential transport pathway for COIs in groundwater. There are no other buried utilities/structures at the facility that would serve as preferential groundwater flow pathways.

Downgradient Plume Monitoring Points (min/max detections)

The following maximum and minimum concentrations are for the wells situated along the top of the riverbank, downgradient from the Acid Plant and Chlorate Plant Areas.

Monitoring wells downgradient from the Acid Plant Area include: MWA-2, -3, -4, -5, and -6r in the shallow groundwater zone and MWA-8i, -9i, -10i, -14i, -16i, and -17si in the intermediate groundwater zone. Wells downgradient of the Chlorate Plant Area include: MWA-18, -19, -29, and -30 in the shallow groundwater zone and wells MWA-31i, -32i, and -34i in the intermediate groundwater zone. The following data is from the most recent groundwater sampling event (June and July 2003):

Constituent	Minimum	Maximum	Detection Limit
DDT	Non-detect	0.362 µg/L	0.08 µg/L
DDE	Non-detect	0.233 µg/L	0.08 µg/L
DDD	Non-detect	3.97 µg/L	0.04 µg/L
Chlorobenzene	Non-detect	73,200 µg/L	0.5 µg/L
Hex. Chrome	0.00236 mg/L	1.15 mg/L	0.001 mg/L
Perchlorate	Non-detect	200 mg/L	0.02 mg/L

Visual Seep Sample Data

Yes No

No seeps had been observed from the Arkema property until the summer of 2005. In July of 2005, DEQ was notified of a seep of colored water between Dock 1 and the Salt Dock.

Nearshore Porewater Data

Arkema has not collected any nearshore porewater data at the site.

Groundwater Plume Temporal Trend

- A decrease in dissolved-phase DDT and MCB concentrations has been observed during the most recent groundwater sampling event (comparison of June 2003 to April 2002).
- DDT concentrations have exhibited both slight increases and significant decreases since 1999. On average, DDT concentrations in Acid Plant Area wells have decreased by one half to one order of magnitude since 1999.
- MCB concentrations in wells adjacent to the riverbank have demonstrated slight increases since 1999, whereas MCB concentrations in the vicinity of the former MPR pond and MCB recovery area have decreased significantly.
- The data sets for chromium and perchlorate in groundwater are not extensive enough to discern temporal trends in their respective concentrations.

10.2.4. Summary

The dissolved groundwater plumes at the site are relatively stable and well-documented. Residual MCB DNAPL has been observed and a focused investigation has documented the nature and extent of DNAPL in the upland subsurface. DNAPL exists in residual form and is not readily mobile. DNAPL likely contributes to the continued presence of dissolved-phase MCB in groundwater. All initial upland sources have been removed; i.e., manufacturing processes are no longer occurring, thousands of tons of soil have been removed, and aggressive interim remedial source control measures have been pilot tested and full-scale in-situ treatment technologies have been implemented.

10.3. Surface Water

10.3.1. Surface Water Investigation Yes No

A surface water/stormwater outfall investigation was conducted and reported in the Draft RI Report.

10.3.2. General or Individual Stormwater Permit (Current or Past) Yes No

Individual NPDES Permit No. 100752 was issued to Arkema on January 2, 2004. The permit authorizes the discharge of stormwater from the facility through four outfalls known as Outfall Nos. 001 (WR-290), 002 (WR-362), 003 (WR-100), and 004 (WR-101). The permit requires Arkema to prepare and implement a stormwater pollution control plan. There are no City outfalls on Arkema’s property. There are several abandoned outfalls that have been permanently plugged with concrete.

Permit Type	File Number	Start Date	Outfalls	Parameters/Frequency
Individual	68471	1/22/04	001, 002, 003, 004	Standard ¹ /quarterly

¹Total suspended solids, pH, copper, lead, zinc, and oil and grease.

Arkema also was a required to conduct stormwater characterization for constituents related to historical activities and 303(d) constituents. Monthly monitoring was required of all four outfalls for the following constituents for a period of one year: total dissolved solids, iron, manganese, mercury, hexavalent chromium, DDT, DDD, DDE, PAHs, PCBs, chlorobenzene, pentachlorophenol, perchlorate, and chloride. A report summarizing the one year monitoring effort was submitted to DEQ on May 18, 2005.

Do other non-stormwater wastes discharge to the system? Yes No

No off-site stormwater or other types of wastewater enter the stormwater system.

10.3.3. Stormwater Data Yes No

Stormwater was sampled during the RI during four separate sampling events from 1999 to 2001. Stormwater samples were collected in the Acid Plant Area from a storm drain system, prior to mixing with non-contact cooling water. Total DDT and its metabolites were detected at concentrations exceeding the DEQ chronic water quality criteria, suggesting that some pesticide-containing material was present in the stormwater. However, significant reductions of these constituents were observed in stormwater after the Phase I soil removal interim remedial measure was completed (ERM 2004a).

10.3.4. Catch Basin Solids Data Yes No

10.3.5. Wastewater Permit Yes No

10.3.6. Wastewater Data Yes No

Permit Type	Permit Number	Start Date	Outfalls	Volumes	Parameters/Frequency
Individual	68471	1/29/93 (expired)	Same as above	NA	See below

Wastewater from Arkema was formerly discharged through four outfalls. Non-contact cooling water from the Acid Plant discharged through outfall #2. Combustion chamber cooling water from the Acid Plant was pumped to a wastewater treatment system

(provided pH neutralization) and discharged through outfall #4. Cooling water from caustic evaporators was conveyed to outfall #2. Cooling water from the Chlorine Cell Room was conveyed to outfalls #3 and 4, and from the chlorine finishing process to outfall #1.

The former individual NPDES waste discharge permit required monitoring for flow, pH, conductivity, suspended solids, temperature, residual chlorine, chromium, lead, zinc, copper, and nickel. Historic average metal discharge concentrations were as follows: chromium: 0.0029 mg/L; lead: 0.0008 mg/L; zinc: 0.484 mg/L; copper: 0.0043 mg/L, and nickel: 0.0023 mg/L.

10.3.7. Summary

Arkema completed a 1-year stormwater runoff characterization program in early 2005 and submitted a summary report to DEQ on May 18, 2005. Once the characterization program is completed, a summary report will be submitted to DEQ. Since the stormwater NPDES permit was issued in January 2004, there have been no exceedances of permit limits. The permit does not contain limits for 303(d) or legacy constituents.

10.4. Sediment

10.4.1. River Sediment Data

Yes No

Several river sediment investigations have occurred in the vicinity of the Arkema site since 1988. Sampling locations for each of these investigations are shown on Figure 1.

10.4.2. Summary

Table 2 presents a statistical summary for the analytes in surface and subsurface river sediment.

Integral (2003) performed site-specific sediment (and groundwater) sampling in the vicinity of Docks 1 and 2 in June 2002 and February through March 2003 (Figure 1, Table 2). Analytical results indicated that MCB and DDT are present in sediments and groundwater in this area. DDT concentrations greater than 1,000 µg/kg in surface sediment were found in samples collected from the landward side of the docks, with concentrations decreasing significantly beyond the docks. The highest DDT concentrations (>100,000 µg/kg) were found in samples collected from 7 to 14.5 feet below mudline on the landward side of Dock 1. These concentrations appear to be associated with a temporary MPR discharge pipe that was active in this vicinity as long as 50 years ago.

The highest and most frequently detected chemicals have been total DDT and PAH compounds as shown in Maps 4-13 and 4-31 of the Portland Harbor Programmatic Work Plan at locations between Docks 1 and 2 (Integral et. al 2004). As shown in Table 2, total DDT in surface sediment (defined as the top 12 inches) since 1988 have ranged from 8.2 to 84,909 µg/kg (Station OSS002 in 1999; Table 2). Subsurface total DDT concentrations have ranged from 18 to 4,764,000 µg/kg (Station WB-9 in 2003; Table 2). The highest concentrations at Station WB-9 are buried 8 to 10 feet below the surface sediment.

The highest 2,4-D (93 µg/kg) and 2,4-DB (130 µg/kg) concentrations in the initial study area (ISA) were found in surface sediment samples collected at Station SD080, located downstream of Arkema's property near the Bayer CropScience outfall (Figure 1, Table 2). Arkema never manufactured or handled these chemicals. Bayer CropScience is now Star Link Logistics Inc. DDT was handled and sold at the Star Link site. This sample

location is just upstream from one private and two municipal outfalls.

PAH compounds, particularly HPAHs, have also been consistently detected offshore of Arkema since 1988. Benzo(b)fluoranthene was detected as high as 11,000 µg/kg in surface sediment collected in 1999 at Station OSS004, located between the two docks (Figure 1, Table 2). The subsurface sediment sample collected at OSS004 contained 9,700 µg/kg benzo(b)fluoranthene (Table 2). Total PAHs for this same station ranged from 25.5 to 71,946 µg/kg in the surface sample and 14 to 135,180 µg/kg in the subsurface sample.

The highest chlorobenzene concentrations were found in surface (up to 34,000 µg/kg) and subsurface (up to 18,000 µg/kg) sediment samples collected in 1999 at Station OSS003, slightly east of Dock 2 (Table 2, Figure 1).

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Asbestos Trenches and Pond – Arkema operated asbestos diaphragm cells in the Chlorine Cell Room. These cells utilized an asbestos coated cathode and titanium anodes. The cells needed to be rebuilt periodically to improve their efficiency. Water was used to wash the asbestos diaphragm material from the cathode to two surface impoundments. 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 were periodically cleaned and the material was placed in trenches located on Lot 1 on the Site. This pond maintenance practice was reported to the DEQ (Elf Atochem 1999). By the late 1980s, approximately 12 trenches had been filled with asbestos-containing residue on the north end of the property. These trenches were believed to be approximately 60 ft long, 15 ft wide, and 15 ft deep. Pennwalt kept maps to identify the location of the trenches (ERM 2003).

In order to make the property useful for potential development, and to meet conditions in its renewed air permit, Arkema 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 DEQ 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 DEQ in a technical paper entitled *Excavation of Asbestos-Containing Material* (DEQ 1991) (ERM 2003).

DDT Trench – In 1992, a trench identified on the northern property was found to contain what appeared to be pesticide residues (ERM 2003). A sample of the trench residue was analyzed for organochlorine pesticides, semi-volatiles (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 that contained residue from a DDT manufacturing process.

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. 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).

Brine Residue Pile and Pond – Historically, sea salt (NaCl) was used as a raw material for products manufactured at the Arkema facility. The impurities calcium (Ca) and magnesium (Mg) were precipitated from the brine as calcium carbonate (CaCO₃) and magnesium hydroxide (Mg[OH]₂). 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 *Environmental Summary Report, Lots 1 and 2*; ERM 2003). In the early 1990s, the plant installed a filter press which eliminated the need to dispose of the material on the Site.

The brine pile was completely removed from the Site in February 1989 and the pond was completely removed in August 1992. A front-end loader was used to load the brine mud from the pile and pond into 10-yard truck and pups. The material in the pile was solid (no free liquids). Some free liquid was present in the pond from stormwater accumulation. 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. Over a foot of solids from the entire pond bottom and sidewall area was removed and mixed with the residue to 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.

Phase I and II Soil Removal Interim Remedial Measures – During the implementation of RI field activities, evidence of DDT- and chlorobenzene-contaminated soil was observed in the Acid Plant Area. Elevated DDT and chlorobenzene concentrations were primarily identified from near ground surface to approximately 8 feet bgs. DDT and chlorobenzene were observed up to 22 feet bgs in the immediate vicinity of the former Acid Plant (boring B-61). In response to these elevated DDT and chlorobenzene concentrations, Arkema implemented a two-phased IRM to mitigate potential environmental impacts.

The Phase I soil removal IRM was performed at the site between September and November 2000. A total of approximately 3,800 tons of soil was excavated and removed from the MPR pond and trench as part of the Phase I soil IRM. Additionally, a temporary surface cover was constructed in the unpaved area east of the Acid Plant Area, where unpaved soil samples had been collected.

The Phase II soil removal IRM was carried out between 5 and 16 November 2001 in the Acid Plant Area. A total of 915 tons of contaminated soil was removed during the Phase II soil IRM. The Draft RI report concluded that the Phase I and II IRMs were effective in removing significant quantities of soil containing DDT and chlorobenzene and reduced the potential for transport of constituents in shallow soils (ERM 2004a).

Soil Vapor Extraction System – The Phase I and II soil IRMs were conducted to remove DDT-contaminated soils in and around the Acid Plant Area. However, no soil removal was conducted in the former MCB Recovery Unit Area due to high concentrations of chlorobenzene in shallow soil. A soil VES was installed in December 2000 to extract chlorobenzene mass from subsurface soils, thereby reducing chlorobenzene concentrations to allow disposal of the soil as a non-hazardous waste following future excavation activities. The system was expanded incrementally over 2-1/2 years of operation and ultimately included 5 horizontal extraction wells. The system was installed, operated, and monitored in accordance with the *Work Plan for Full-Scale Vapor Extraction System* (ERM 2000) and

subsequent work plan addenda approved by DEQ. This system was shut down during 2003.

Stormwater System Improvements – At the completion of the Phase I and II Soil Removal IRM's mentioned above, asphalt paving was placed over the area to direct stormwater directly to surface drains. A fill area on the eastern boundary of the Acid Plant area was also provided with a temporary impermeable cover to divert storm runoff directly to surface drains.

11.2. **Groundwater Cleanup/Source Control**

Cleanup and source control actions to date include the following:

In-situ Persulfate Pilot Study – A pilot study was conducted in the vicinity of the former DDT manufacturing area, where MCB concentrations in groundwater have historically been the highest observed at the site. The study was initiated to determine the feasibility of persulfate injections on reduction of MCB mass in groundwater. During the pilot study, residual DNAPL was observed in one of the pilot study monitoring wells. Attempts were made to remove DNAPL, but none was recoverable. Although the pilot study was suspended because of the residual DNAPL and the DNAPL investigation was initiated, early results demonstrated that persulfate was a very effective in-situ technology for destruction of MCB and DDT in groundwater at the facility. A full-scale in-situ persulfate IRM/source control measure was approved by DEQ on July 13, 2005.

DNAPL Remediation Pilot Study – A pilot study was conducted in the location of the highest MCB concentrations observed during the DNAPL investigation. The pilot study was conducted to determine the feasibility and effectiveness of coupling air sparging with vapor extraction for remediation of DNAPL and dissolved-phase MCB. The pilot study was operated for approximately 5 months and resulted in the reduction of average MCB concentrations of about 60% (for the 10 wells sampled as part of the pilot study). The air sparge system was only operated for 2 months. Based on the success of the pilot study, a full-scale air sparging/vapor extraction IRM/source control measure was installed and has been operating since December 2004.

Hexavalent Chromium Reduction Pilot Study – A third pilot study was conducted at the site in the location of the highest chromium concentrations, downgradient of the Chlorate Cell Room. The study involved the injection of calcium polysulfide to reduce chromium from its hexavalent state to its trivalent state. Results of the study indicate that chromium concentrations decreased by an average of 95% approximately 15 weeks after the injection of calcium polysulfide. A full-scale Hexavalent Chromium Reduction IRM/source control measure was initiated during the summer of 2005 and is schedule for completion in 2006.

Bench Scale Perchlorate Pilot Study – A bench-scale study is currently being conducted to investigate the potential for bioremediation of perchlorate using native microbial populations and a variety of electron donors. The bench-scale study is nearing completion.

11.3. **Other**

Most buildings and plant structures were demolished during 2003 and 2004. The front office, docks, perimeter fence, and some concrete slabs were left in place as the RI/FS process proceeds.

11.4. **Potential for Recontamination from Upland Sources**

The majority of the DDT (DDT, DDE, DDD) in the sediments off-shore of the facility has been in place for over 50 years. The chlorobenzene present in the upland groundwater presents a source control issue because it is a cosolvent for DDT. The chlorobenzene in the

groundwater potentially could dissolve DDT. The perchlorate and chromium plumes may be a potential source via the groundwater to surface water pathway. Arkema is moving aggressively with significant success on programs to address chlorobenzene, DDT, chromium, and perchlorate in groundwater.

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- Figure 1. Site Features
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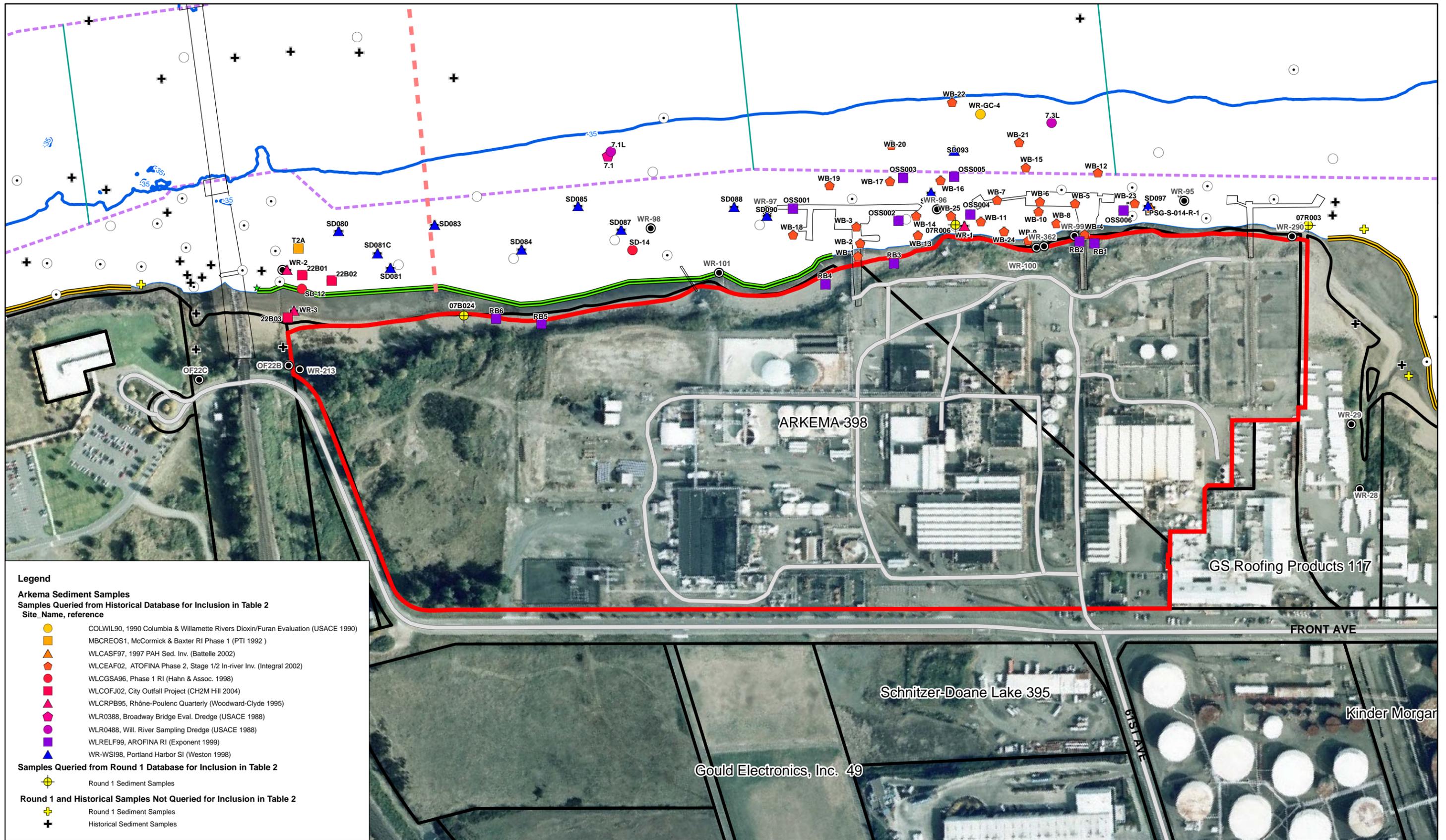
- Figure 4. Map of Site, Adjacent Properties, and Areas of Concern
- Figure 4-10. DDT, DDD, and DDE Concentrations in Surface Soil Samples (ERM 2004a)
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- Table 3. Inorganic Compounds, Natural Attenuation Parameters, and Conventional Analyte Results – June 2003 (ATOFINA 2003)
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FIGURES

- Figure 1. Site Features
- Figure 2a – 2d. Cross Section Figures (ERM 2004a)
- Figure 3a – 3d. Groundwater Plume Maps



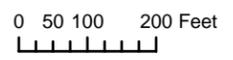
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Aerial Photo Date: October 2001.
 Base Map features from Portland Metro's RLIS.

Outfall information contained on this map is accurate according to available records; however, the City of Portland makes no warranty, expressed or implied, as to the completeness or accuracy of the information published (updated June 2005).

Legend

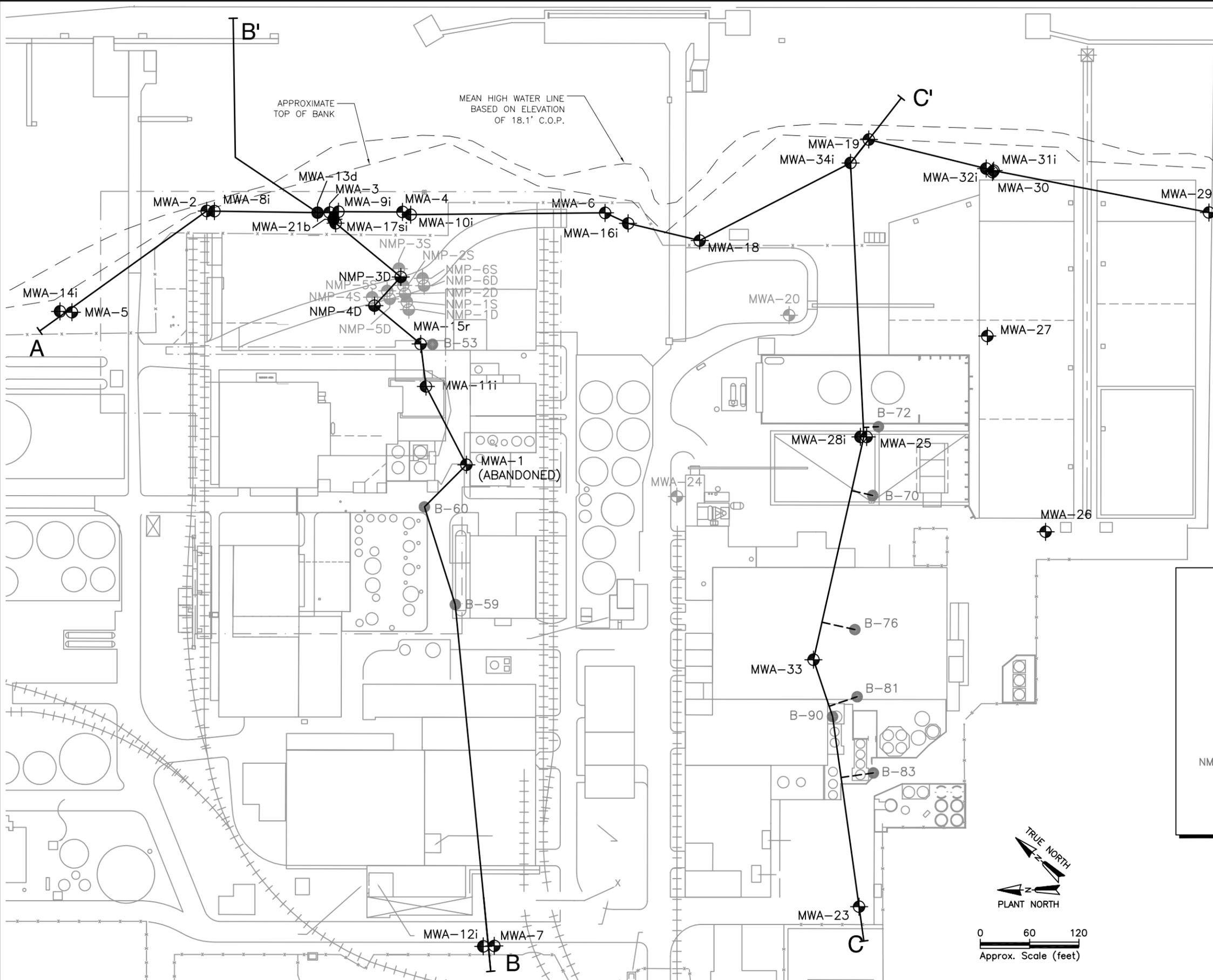
- Outfalls
- Seep Photo Location (Not location of actual Seep)
- Selected ECSI Site Property Boundary
- Navigation Channel
- Docks & In-water Structures
- River Miles
- 35ft. Contour (NAVD 88)
- Human Use Areas
- Dockside Worker
- Recreational Beach Use
- Transient
- LWG Round 2 Proposed Sediment Samples
- Surface Sample Only
- Core & Surface Sample



DRAFT

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Figure 1-Site Features
 Portland Harbor RI/FS
 Conceptual Site Model
 Arkema
 ECSI 398



Note: A number of buildings and structures noted on this diagram have been demolished and/or removed.

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Intermediate Zone
- Monitoring Well, Deep Zone
- Monitoring Well, Upper Portion Shallow Zone
- Monitoring Well, Lower Portion Shallow Zone
- Soil Boring
- Persulfate Pilot Study Monitoring Point
- Cross Section Line

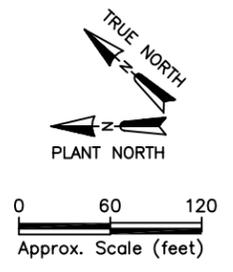
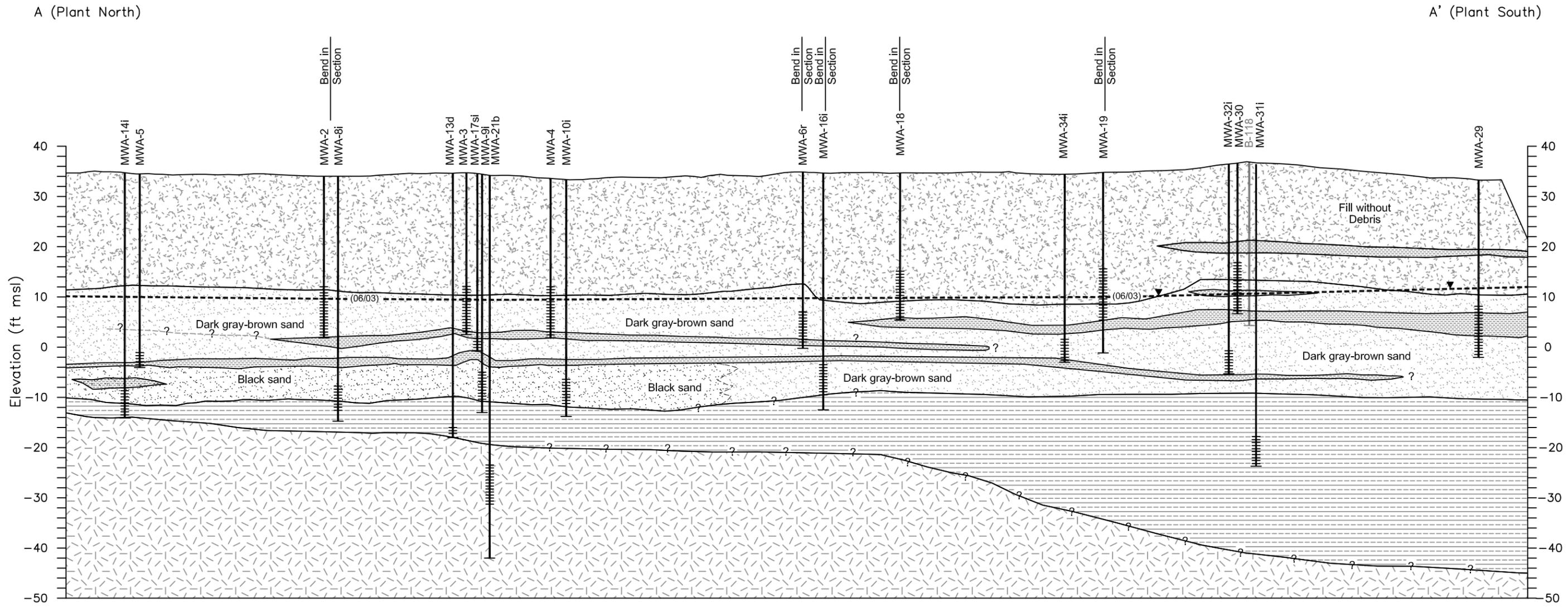


Figure 2a
Cross Section Location Map
 Arkema Inc.
 Portland, Oregon



LEGEND

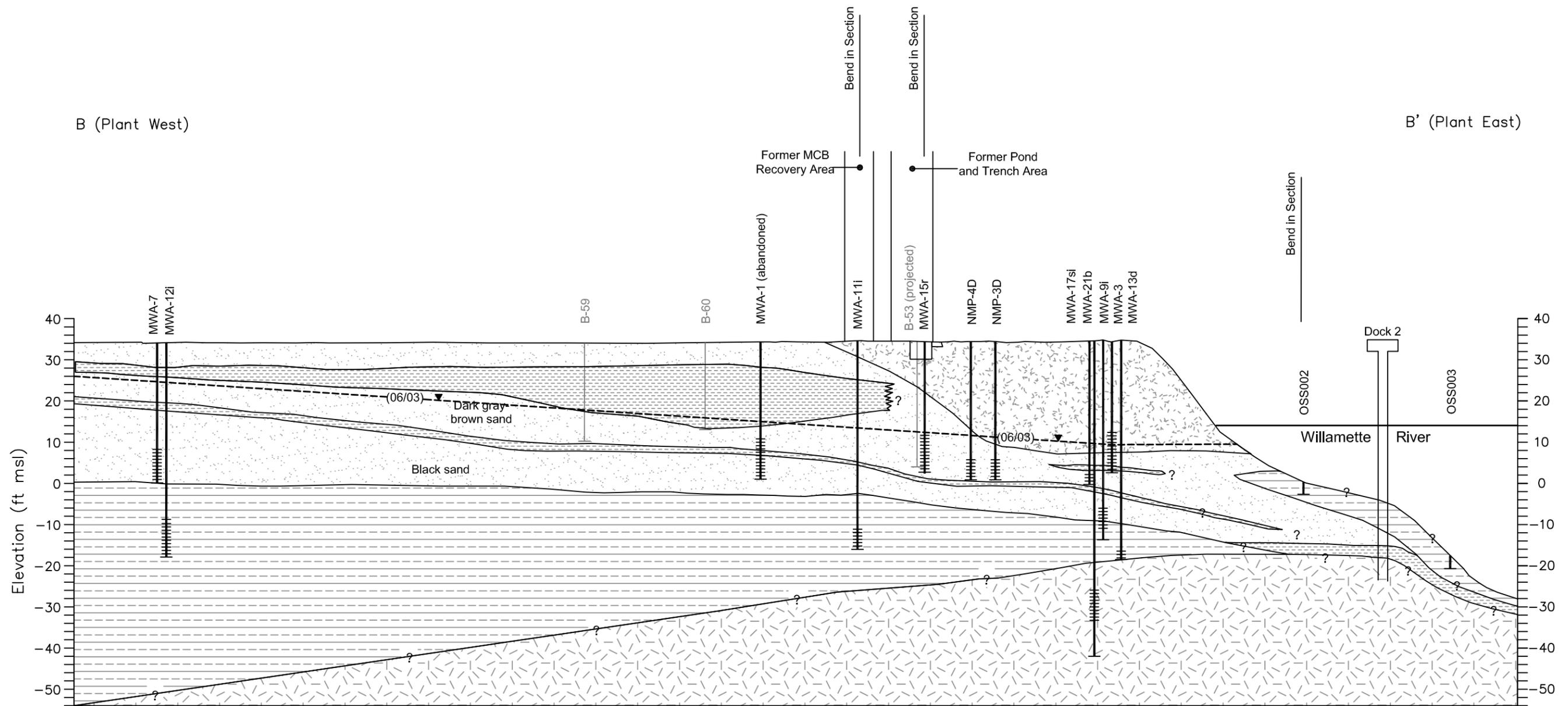
Fill with debris	B-59 — Geoprobe® boring number
Sand with varying amounts of silt	MWA-1 — Well number
Silt with varying amounts of fine sand	— Cased interval
Silt with some clay and fine sand	— Screen interval
Basalt	--- Shallow-zone groundwater surface (approximate); June 2003
Source: E ^x ponent	--- Inferred soil or geologic contact (queried where uncertain)

(Vertical Exaggeration = 5X)

VERTICAL SCALE IN FEET
1" = 20'

HORIZONTAL SCALE IN FEET
1" = 100'

Figure 2b
 Cross Section A-A'
 Arkema Inc.
 Portland, Oregon
 ERM 08/04



LEGEND

- | | | | |
|--|----------------------------------------|--------|-------------------------------------------------------------|
| | Fill with debris | B-59 | — Geoprobe® boring number |
| | Sand with varying amounts of silt | MWA-1 | — Well number |
| | Silt with varying amounts of fine sand | | Cased interval |
| | Silt with some clay and fine sand | | Screen interval |
| | Basalt | | Shallow-zone groundwater surface (approximate); June 2003 |
| | Source: E*ponent | | Inferred soil or geologic contact (queried where uncertain) |
| | | OSS002 | Offshore sediment sample location |

(Vertical Exaggeration = 4X)

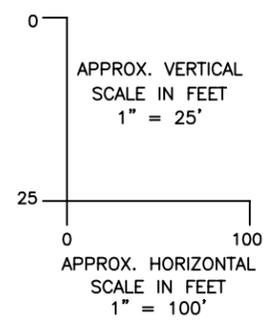
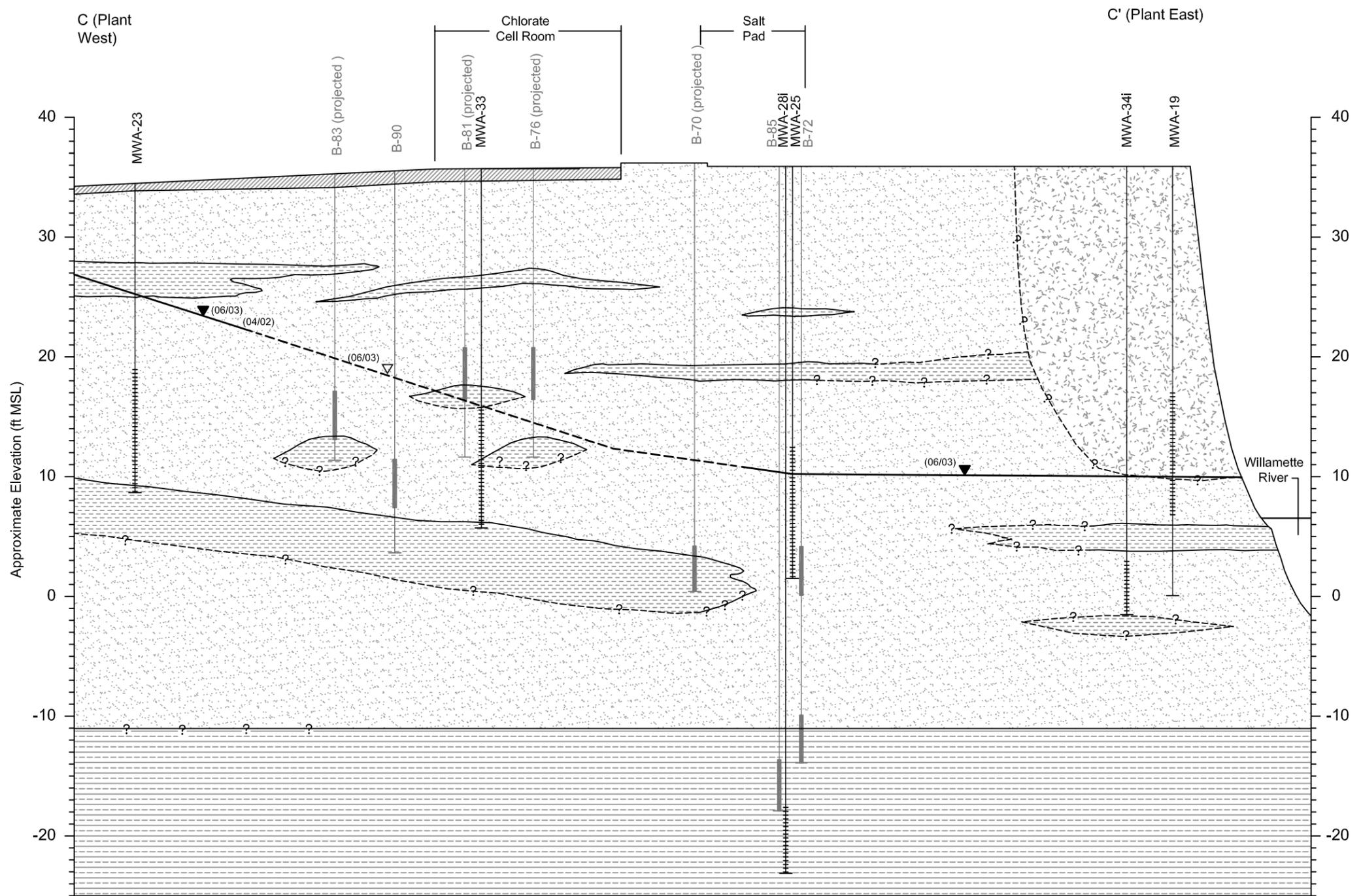


Figure 2c
 Cross Section B-B'
 Arkema Inc.
 Portland, Oregon



LEGEND

- Concrete or asphalt
- Fill with debris
- Sand with varying amounts of silt
- Silt with varying amounts of fine sand
- Silt with some clay and fine sand
- MW-30, B-74 Well or boring I.D. number
- Soil Boring with groundwater sample interval
- Monitoring well with screen casing
- Inferred soil contact (queried where uncertain)
- Shallow-zone groundwater surface (June 2003); dashed and open symbol where approximate; based on monitoring well data only

Source: E^xponent

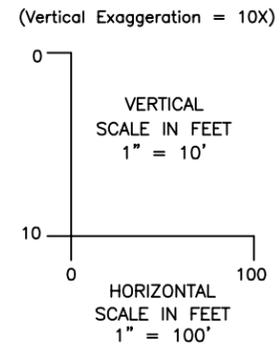
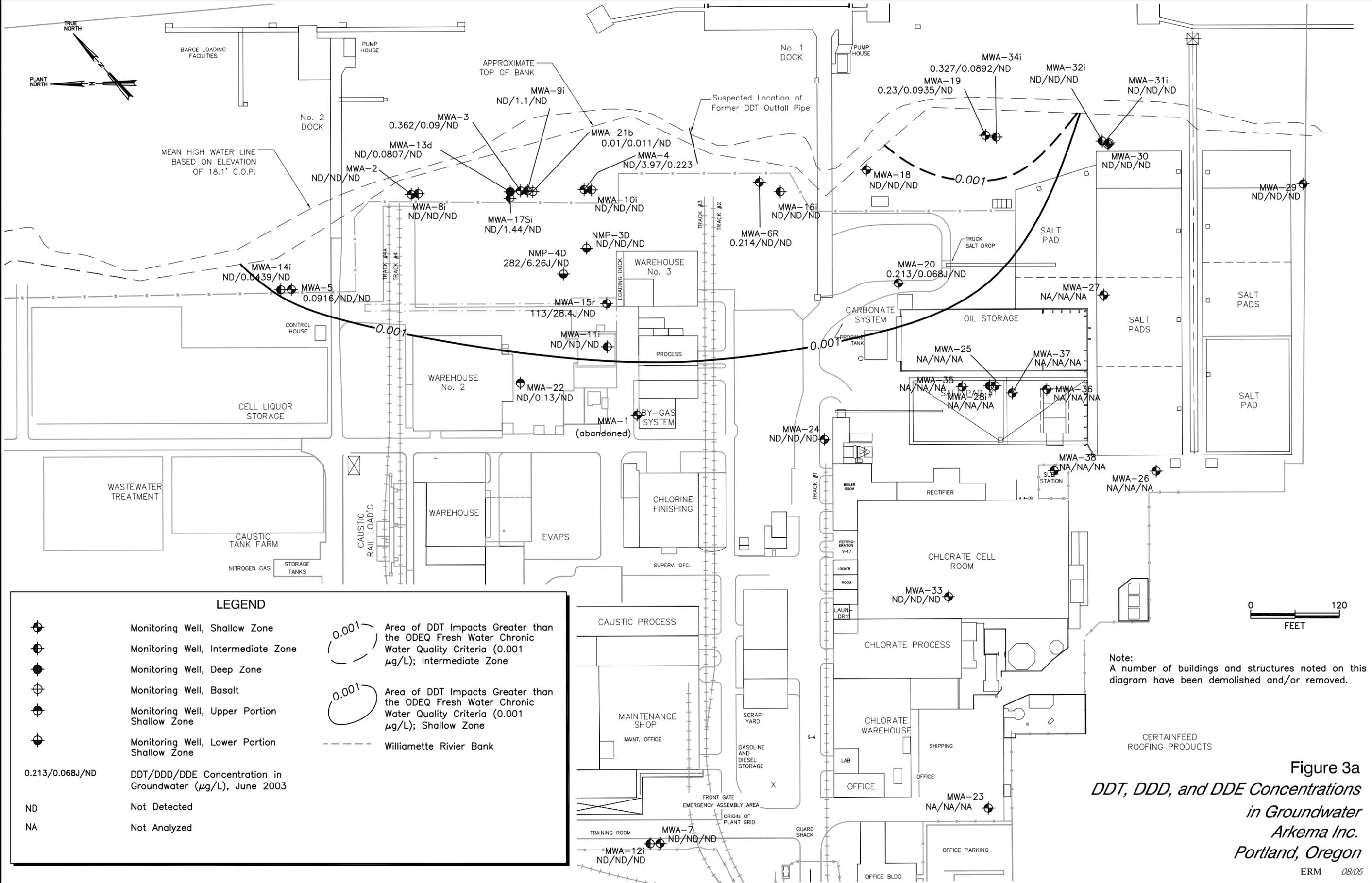


Figure 2d
 Cross Section C-C'
 Arkema Inc.
 Portland, Oregon



Note:
 A number of buildings and structures noted on this diagram have been demolished and/or removed.



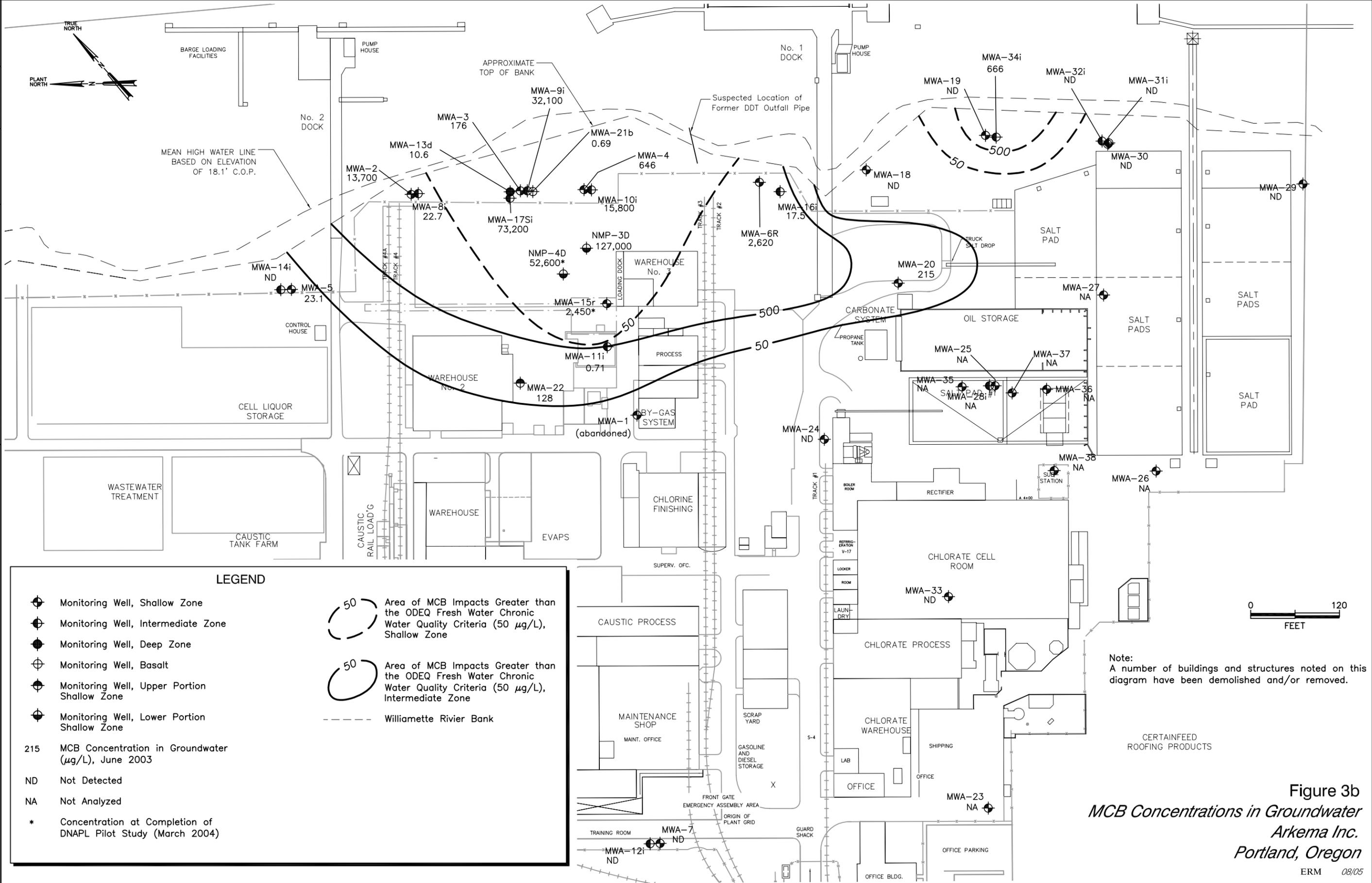
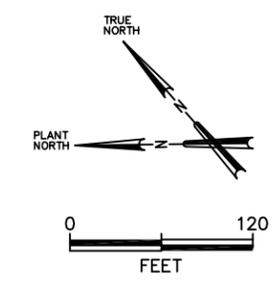
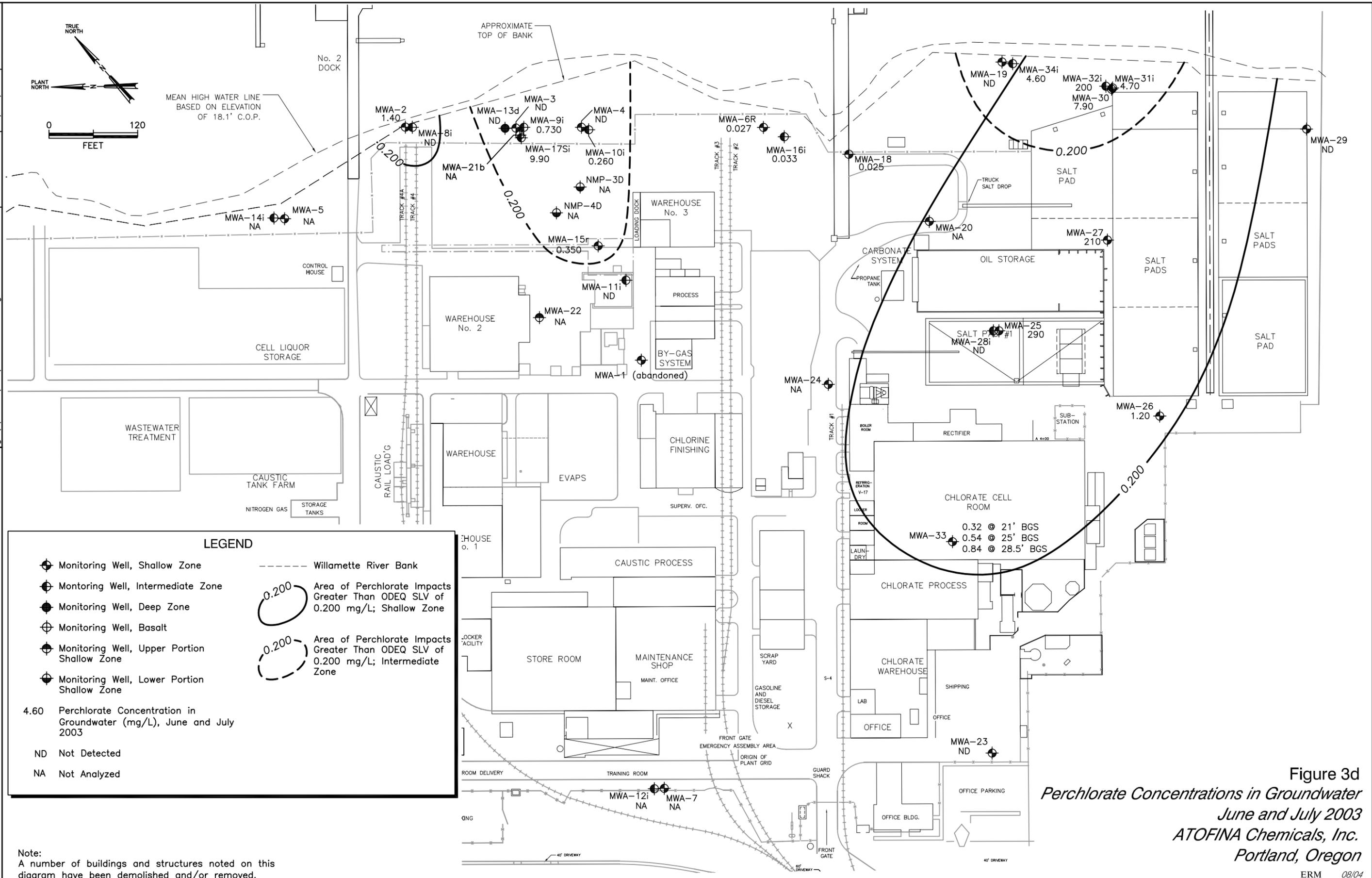


Figure 3b
MCB Concentrations in Groundwater
 Arkema Inc.
 Portland, Oregon
 ERM 08/05



MEAN HIGH WATER LINE
 BASED ON ELEVATION
 OF 18.1' C.O.P.

APPROXIMATE
 TOP OF BANK

No. 2
 DOCK

MWA-14i
 NA

MWA-5
 NA

CONTROL
 HOUSE

CELL LIQUOR
 STORAGE

WASTEWATER
 TREATMENT

CAUSTIC
 TANK FARM

NITROGEN GAS
 STORAGE
 TANKS

CAUSTIC
 RAIL LOAD'G

WAREHOUSE

EVAPS

CHLORINE
 FINISHING

SUPERV. OFC.

CAUSTIC PROCESS

STORE ROOM

MAINTENANCE
 SHOP

MAINT. OFFICE

SCRAP
 YARD

GASOLINE
 AND
 DIESEL
 STORAGE

FRONT GATE
 EMERGENCY ASSEMBLY AREA

ORIGIN OF
 PLANT GRID

ROOM DELIVERY

TRAINING ROOM

GUARD SHACK

MWA-12i
 NA

MWA-7
 NA

DRIVEWAY

40' DRIVEWAY

FRONT GATE

40' DRIVEWAY

MWA-2
 1.40

MWA-8i
 ND

MWA-13d
 ND

MWA-3
 ND
 0.730

MWA-9i
 ND

MWA-4
 ND

MWA-17Si
 9.90

MWA-10i
 0.260

MWA-6R
 0.027

MWA-16i
 0.033

MWA-21b
 NA

NMP-3D
 NA

NMP-4D
 NA

MWA-15r
 0.350

MWA-11i
 ND

MWA-22
 NA

MWA-1 (abandoned)

MWA-24
 NA

MWA-18
 0.025

MWA-20
 NA

MWA-27
 210

MWA-25
 290

MWA-28i
 ND

MWA-26
 1.20

MWA-33
 0.32 @ 21' BGS
 0.54 @ 25' BGS
 0.84 @ 28.5' BGS

MWA-19
 ND

MWA-34i
 4.60

MWA-32i
 200

MWA-31i
 4.70

MWA-30
 7.90

MWA-29
 ND

TRUCK
 SALT DROP

SALT PAD

CARBONATE
 SYSTEM

PROPANE
 TANK

OIL STORAGE

SALT PAD #1

SALT PAD

RECTIFIER

CHLORATE CELL ROOM

CHLORATE PROCESS

CHLORATE WAREHOUSE

LAB

OFFICE

OFFICE

SHIPPING

OFFICE BLDG.

OFFICE PARKING

MWA-23
 ND

FRONT GATE

40' DRIVEWAY

TABLES

Table 1. Potential Sources and Transport Pathways Assessment

Table 2. Surface and Subsurface Sediment Chemical Statistics near ARKEMA

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Arkema #398
Table 1. Potential Sources and Transport Pathways Assessment

Potential Sources	Media Impacted					COIs														Potential Complete Pathway				
						TPH			VOCs		SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Ammonia	Perchlorate	Overland Transport	Groundwater	Direct Discharge - Overwater
	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids														
Description of Potential Source																								
Upland Areas																								
Former unlined MPR pond and trench	✓	✓	✓						✓												✓			
Historic discharge through pipe									✓														✓	
Unpaved areas with contaminated soils	✓	✓																			?			?
Historic spill areas	✓	✓	✓																					?
Stormwater discharge outfalls				✓																				?
Contaminated groundwater plume			✓						✓	✓											✓			
Overwater Areas																								
Other Areas/Other Issues																								

Notes:
¹ All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.
 ? = There is not enough information to determine if source or COI is present or if pathway is complete
 Blank = Source, COI and Historic and Current pathways have been investigated and shown to be not present or incomplete

UST Underground storage Tank
 AST Above-ground Storage Tank
 TPH Total Petroleum Hydrocarbons
 VOCs Volatile Organic Compounds
 SVOCs Semi-volatile Organic Compounds
 PAHs Polycyclic aromatic hydrocarbons
 BTEX Benzene, toluene, ethylbenzene, and xylenes
 PCBs Polychlorinated biphenols

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Surface	Aroclor 1016	(ug/kg)	6	0							380 U	2000 U	955	980 U	1000 U
Surface	Aroclor 1242	(ug/kg)	6	0							380 U	2000 U	955	980 U	1000 U
Surface	Aroclor 1248	(ug/kg)	6	0							380 U	2000 U	955	980 U	1000 U
Surface	Aroclor 1254	(ug/kg)	6	0							380 U	2000 U	955	980 U	1000 U
Surface	Aroclor 1260	(ug/kg)	6	0							380 U	2000 U	955	980 U	1000 U
Surface	Aroclor 1221	(ug/kg)	6	0							750 U	4000 U	1920	2000 U	2000 U
Surface	Aroclor 1232	(ug/kg)	6	0							380 U	2000 U	955	980 U	1000 U
Surface	Polychlorinated biphenyl	(ug/kg)	9	0							4 UJ	4000 UA	1280	760 UA	2000 UA
Surface	Butyltin ion	(ug/kg)	1	0							5.7 U	5.7 U	5.7	5.7 U	5.7 U
Surface	Dibutyltin ion	(ug/kg)	1	0							5.7 U	5.7 U	5.7	5.7 U	5.7 U
Surface	Dibutyltin ion	(ug/l)	1	0							0.06 U	0.06 U	0.06	0.06 U	0.06 U
Surface	Tributyltin ion	(ug/kg)	1	1	100.0	44	44	44	44	44	44	44	44	44	44
Surface	Tributyltin ion	(ug/l)	1	0							0.02 U	0.02 U	0.02	0.02 U	0.02 U
Surface	Tetrabutyltin	(ug/kg)	1	0							5.7 U	5.7 U	5.7	5.7 U	5.7 U
Surface	Tetrabutyltin	(ug/l)	1	0							0.02 U	0.02 U	0.02	0.02 U	0.02 U
Surface	Total solids	(%)	4	4	100.0	26.5	73.8	59.7	65	73.5	26.5	73.8	59.7	65	73.5
Surface	Total organic carbon	(%)	35	35	100.0	0.06	4.51	1.2	1.3	2.3	0.06	4.51	1.2	1.3	2.3
Surface	Moisture	(%)	4	4	100.0	39	220	87.8	41	51	39	220	87.8	41	51
Surface	pH	(pH units)	4	4	100.0	6.4	7	6.6	6.4	6.6	6.4	7	6.6	6.4	6.6
Surface	Specific Gravity	(Std.units)	4	4	100.0	2.49	2.75	2.67	2.71	2.74	2.49	2.75	2.67	2.71	2.74
Surface	2,3,7,8-Tetrachlorodibenzo-p-dioxin	(ng/kg)	5	1	20.0	3.4	3.4	3.4	3.4	3.4	0.24 U	3.4	1.47	0.41 U	3 U
Surface	Tetrachlorodibenzo-p-dioxin	(ng/kg)	4	3	75.0	11	66	30.3	14	14	0.93 U	66	23	11	14
Surface	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	(ng/kg)	5	0							0.44 U	3 U	1.28	0.63 U	1.9 U
Surface	Pentachlorodibenzo-p-dioxin	(ng/kg)	4	0							0.85 U	3.6 U	1.69	1 U	1.3 U
Surface	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	(ng/kg)	5	0							0.4 U	4 U	1.69	0.58 U	3 U
Surface	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	(ng/kg)	5	2	40.0	2	15	8.5	2	2	1.3 U	15	4.48	2 U	2.1 U
Surface	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	(ng/kg)	5	2	40.0	1 J	9.4	5.2	1 J	1 J	1 J	9.4	2.82	1.2 U	1.4 U
Surface	Hexachlorodibenzo-p-dioxin	(ng/kg)	4	4	100.0	5	85	25.1	5.2	5.2	5	85	25.1	5.2	5.2
Surface	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	(ng/kg)	5	5	100.0	26	380	104	40	40	26	380	104	40	40
Surface	Heptachlorodibenzo-p-dioxin	(ng/kg)	4	4	100.0	83	740	250	87	88	83	740	250	87	88
Surface	Octachlorodibenzo-p-dioxin	(ng/kg)	5	5	100.0	250	3600	970	330	350	250	3600	970	330	350
Surface	2,3,7,8-Tetrachlorodibenzofuran	(ng/kg)	5	5	100.0	1.6	20	10.7	8.5	19	1.6	20	10.7	8.5	19
Surface	Tetrachlorodibenzofuran	(ng/kg)	4	4	100.0	6.1	91	46.8	20	70	6.1	91	46.8	20	70
Surface	1,2,3,7,8-Pentachlorodibenzofuran	(ng/kg)	5	4	80.0	5	86	34.3	6.2	40	0.97 U	86	27.6	6.2	40
Surface	2,3,4,7,8-Pentachlorodibenzofuran	(ng/kg)	5	2	40.0	10	22	16	10	10	0.65 U	22	7.75	3.8 U	10
Surface	Pentachlorodibenzofuran	(ng/kg)	4	4	100.0	6.2	180	64.1	9.2	61	6.2	180	64.1	9.2	61
Surface	1,2,3,4,7,8-Hexachlorodibenzofuran	(ng/kg)	5	4	80.0	6.7	140	51.9	11	50	1.2 U	140	41.8	11	50
Surface	1,2,3,6,7,8-Hexachlorodibenzofuran	(ng/kg)	5	2	40.0	10	65	37.5	10	10	1.9 U	65	17.8	9.6 U	10
Surface	1,2,3,7,8,9-Hexachlorodibenzofuran	(ng/kg)	5	0							0.18 U	3.5 U	1.48	0.41 U	3 U
Surface	2,3,4,6,7,8-Hexachlorodibenzofuran	(ng/kg)	5	2	40.0	7 J	13	10	7 J	7 J	0.41 U	13	4.9	3.3 U	7 J
Surface	Hexachlorodibenzofuran	(ng/kg)	4	4	100.0	5.2	260	88.7	6.7	83	5.2	260	88.7	6.7	83
Surface	1,2,3,4,6,7,8-Heptachlorodibenzofuran	(ng/kg)	5	4	80.0	6.3	90	31.2	8.3	20 J	6.3	90	40.1	20 J	76 U
Surface	1,2,3,4,7,8,9-Heptachlorodibenzofuran	(ng/kg)	5	3	60.0	5 J	33	14.7	6	6	1.1 U	33	9.34	5 J	6
Surface	Heptachlorodibenzofuran	(ng/kg)	4	4	100.0	12	160	88.8	33	150	12	160	88.8	33	150
Surface	Octachlorodibenzofuran	(ng/kg)	5	5	100.0	15	330	119	90 J	120	15	330	119	90 J	120
Surface	Gravel	(%)	29	29	100.0		13.3	1.89	0.29	6.47	0	13.3	1.89	0.29	6.47
Surface	Sand	(%)	28	28	100.0	16.8	99.7	55.7	46	99	16.8	99.7	55.7	46	99
Surface	Very coarse sand	(%)	1	1	100.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Surface	Coarse sand	(%)	1	1	100.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Surface	Medium sand	(%)	1	1	100.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Surface	Fine sand	(%)	1	1	100.0	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Surface	Very fine sand	(%)	1	1	100.0	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
Surface	Fines	(%)	28	28	100.0	0.083	83.2	42.4	40.7	76.1	0.083	83.2	42.4	40.7	76.1
Surface	Silt	(%)	28	28	100.0	0.02	70	36.6	35.9	67.93	0.02	70	36.6	35.9	67.93
Surface	Coarse silt	(%)	1	1	100.0	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9
Surface	Medium silt	(%)	1	1	100.0	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4
Surface	Fine silt	(%)	1	1	100.0	16	16	16	16	16	16	16	16	16	16
Surface	Very fine silt	(%)	1	1	100.0	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
Surface	Clay	(%)	28	28	100.0	0.033	13.2	5.78	4.8	11.51	0.033	13.2	5.78	4.8	11.51
Surface	8-9 Phi clay	(%)	1	1	100.0	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Surface	9-10 Phi clay	(%)	1	1	100.0	4	4	4	4	4	4	4	4	4	4
Surface	>10 Phi clay	(%)	1	1	100.0	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4
Surface	Dalapon	(ug/kg)	10	0							25 U	1000 U	188	31 U	500 U
Surface	Dicamba	(ug/kg)	10	0							2.6 U	100 U	18.9	3.3 U	50 U
Surface	MCPA	(ug/kg)	10	0							130 U	50000 U	8590	170 U	25000 U
Surface	Dichloroprop	(ug/kg)	10	0							2.6 U	250 U	48.6	15 U	120 U
Surface	2,4-D	(ug/kg)	10	3	30.0	21	93	46	24	24	2.6 U	250 U	56.7	24	120 U
Surface	Silvex	(ug/kg)	10	0							2.6 U	50 U	10.4	3.3 U	25 U
Surface	2,4,5-T	(ug/kg)	10	0							2.6 U	50 U	10.4	3.3 U	25 U
Surface	2,4-DB	(ug/kg)	10	3	30.0	13	130	55.3	23	23	3.9 U	1000 U	188	23	500 U
Surface	Dinoseb	(ug/kg)	10	0							3.9 UJ	250 U	44.8	5 UJ	120 U
Surface	MCPP	(ug/kg)	10	0							130 U	50000 U	8590	170 U	25000 U
Surface	Aluminum	(mg/kg)	16	16	100.0	14000	42700	33500	38900	42700	14000	42700	33500	38900	42700
Surface	Aluminum	(mg/l)	1	1	100.0	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Surface	Antimony	(mg/kg)	14	3	21.4	6.2 J	12 J	8.57	7.5 J	7.5 J	5 UJ	12 J	6.19	5 UJ	8 UJ
Surface	Antimony	(mg/l)	1	0							0.05 U	0.05 U	0.05	0.05 U	0.05 U
Surface	Arsenic	(mg/kg)	20	7	35.0	2.2 J	9.7 J	4.83	4.2 J	5.8 J	2.2 J	10 U	5.64	5 U	9.7 J
Surface	Arsenic	(mg/l)	1	1	100.0	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Surface	Cadmium	(mg/kg)	20	16	80.0	0.081	1.7	0.423	0.4	0.6	0.081	1.7	0.454	0.4	0.88 U
Surface	Cadmium	(mg/l)	1	0							0.002 U	0.002 U	0.002	0.002 U	0.002 U
Surface	Chromium	(mg/kg)	20	20	100.0	9.5 J	50.6	30	29.6	44.6	9.5 J	50.6	30	29.6	44.6
Surface	Chromium	(mg/l)	1	0							0.005 U	0.005 U	0.005	0.005 U	0.005 U
Surface	Copper	(mg/kg)	16	16	100.0	12	57.5	38.9	39.9	53.4	12	57.5	38.9	39.9	53.4
Surface	Copper	(mg/l)	1	1	100.0	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Surface	Lead	(mg/kg)	23	23	100.0	7.3	186	28.3	20.1	27	7.3	186	28.3	20.1	27
Surface	Lead	(mg/l)	1	1	100.0	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Surface	Manganese	(mg/kg)	16	16	100.0	335	693	537	560	683	335	693	537	560	683
Surface	Manganese	(mg/l)	1	1	100.0	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56
Surface	Mercury	(mg/kg)	20	17	85.0	0.01	0.36	0.0847	0.07	0.12	0.01	0.36	0.087	0.08	0.12
Surface	Mercury	(mg/l)	1	0							0.0001 U	0.0001 U	0.0001	0.0001 U	0.0001 U
Surface	Nickel	(mg/kg)	16	16	100.0	11	38.5	27.6	28.2	34	11	38.5	27.6	28.2	34
Surface	Nickel	(mg/l)	1	0							0.01 U	0.01 U	0.01	0.01 U	0.01 U
Surface	Selenium	(mg/kg)	16	13	81.3	10	16	12.7	13	15	0.36 UJ	16	10.4	12	15
Surface	Selenium	(mg/l)	1	0							0.001 U	0.001 U	0.001	0.001 U	0.001 U
Surface	Silver	(mg/kg)	16	13	81.3	0.9	1.6	1.18	1.2	1.4	0.73 UJ	1.6	1.13	1.2 UJ	1.4
Surface	Silver	(mg/l)	1	0							0.0002 U	0.0002 U	0.0002	0.0002 U	0.0002 U
Surface	Thallium	(mg/kg)	16	11	68.8	0.78	15	7.05	8	11	0.78	15	7.22	8 U	11
Surface	Thallium	(mg/l)	1	0							0.001 U	0.001 U	0.001	0.001 U	0.001 U
Surface	Zinc	(mg/kg)	20	20	100.0	50.1	422	123	105	190	50.1	422	123	105	190
Surface	Zinc	(mg/l)	1	1	100.0	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Surface	Barium	(mg/kg)	16	16	100.0	86.8	197	166	175	193	86.8	197	166	175	193
Surface	Barium	(mg/l)	1	1	100.0	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Surface	Beryllium	(mg/kg)	16	16	100.0	0.41	0.9	0.656	0.66	0.79	0.41	0.9	0.656	0.66	0.79
Surface	Beryllium	(mg/l)	1	0							0.001 U	0.001 U	0.001	0.001 U	0.001 U
Surface	Calcium	(mg/kg)	16	16	100.0	4500	8980	7390	7600	8730	4500	8980	7390	7600	8730
Surface	Calcium	(mg/l)	1	1	100.0	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3
Surface	Chromium hexavalent	(mg/kg)	2	2	100.0	0.15 G	0.17 G	0.16	0.15 G	0.15 G	0.15 G	0.17 G	0.16	0.15 G	0.15 G
Surface	Cobalt	(mg/kg)	16	16	100.0	12.1	27	18.5	17.7	26	12.1	27	18.5	17.7	26
Surface	Cobalt	(mg/l)	1	1	100.0	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Surface	Iron	(mg/kg)	16	16	100.0	35000	58600	43700	42500	51000	35000	58600	43700	42500	51000
Surface	Iron	(mg/l)	1	1	100.0	5.04	5.04	5.04	5.04	5.04	5.04	5.04	5.04	5.04	5.04
Surface	Magnesium	(mg/kg)	16	16	100.0	3500	7500	6120	6750	7240	3500	7500	6120	6750	7240
Surface	Magnesium	(mg/l)	1	1	100.0	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03
Surface	Potassium	(mg/kg)	16	16	100.0	320	1600	1110	1290	1440	320	1600	1110	1290	1440
Surface	Potassium	(mg/l)	1	1	100.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Surface	Sodium	(mg/kg)	16	16	100.0	330	12700	2370	1170	5760	330	12700	2370	1170	5760
Surface	Sodium	(mg/l)	1	1	100.0	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1
Surface	Titanium	(mg/kg)	2	2	100.0	1740	3200	2470	1740	1740	1740	3200	2470	1740	1740
Surface	Vanadium	(mg/kg)	16	16	100.0	87	160	106	99.6	147	87	160	106	99.6	147
Surface	Vanadium	(mg/l)	1	0							0.003 U	0.003 U	0.003	0.003 U	0.003 U
Surface	2-Methylnaphthalene	(ug/kg)	32	10	31.3	6	430	102	25	280	5 U	430	79.7	20 U	330 U
Surface	Acenaphthene	(ug/kg)	35	17	48.6	4	2400	219	46	370 J	4	2400	153	26	330 U
Surface	Acenaphthylene	(ug/kg)	35	6	17.1	5	250 J	91.8	53	140	5	330 U	66.1	19 U	330 U
Surface	Anthracene	(ug/kg)	35	17	48.6	9	550	122	60	420	5 U	550	104	41	330 U
Surface	Fluorene	(ug/kg)	35	19	54.3	7	1400	140	30	290 J	7	1400	120	27	330 U
Surface	Naphthalene	(ug/kg)	35	14	40.0	7 G	410 J	99.1	31	300	5 UG	410 J	85.5	20 U	330 U
Surface	Phenanthrene	(ug/kg)	35	25	71.4	11 J	2200	329	150	930 J	10 U	2200	276	130	930 J
Surface	Low Molecular Weight PAH	(ug/kg)	35	25	71.4	11 A	6860 A	744	241 A	2246 A	10 UA	6860 A	572	220 A	2246 A
Surface	Dibenz(a,h)anthracene	(ug/kg)	35	14	40.0	4	1700	171	34	150	4	1700	119	20 U	330 U
Surface	Benz(a)anthracene	(ug/kg)	35	27	77.1	10.5	9200	522	170	650 J	10 U	9200	444	170	650 J
Surface	Benzo(a)pyrene	(ug/kg)	35	29	82.9	12.5 J	5900	389	150	790	10 U	5900	360	150	790
Surface	Benzo(b)fluoranthene	(ug/kg)	32	27	84.4	11	11000	545	120	300	10 U	11000	501	140	330 U
Surface	Benzo(g,h,i)perylene	(ug/kg)	35	31	88.6	6.5 J	3100 G	210	76	420 J	6.5 J	3100 G	224	90	420 J
Surface	Benzo(k)fluoranthene	(ug/kg)	31	23	74.2	12.5 J	8300 G	491	110	310	10 U	8300 G	411	110	330 U
Surface	Chrysene	(ug/kg)	35	28	80.0	12.5 J	9500	577	240	860 J	10 U	9500	501	240	860 J
Surface	Fluoranthene	(ug/kg)	35	30	85.7	11.5 J	9100	643	260	1300 J	11.5 J	9100	590	290	1300 J
Surface	Indeno(1,2,3-cd)pyrene	(ug/kg)	35	30	85.7	7 J	4700 G	268	91	340	7 J	4700 G	269	95	340
Surface	Pyrene	(ug/kg)	35	29	82.9	11 J	7200	643	280 G	1400 J	10 U	7200	572	300	1400 J
Surface	Benzo(b+k)fluoranthene	(ug/kg)	34	29	85.3	11 A	19300 A	987	260 A	1100	10 UA	19300 A	881	300 A	1100
Surface	Benzo(j+k)fluoranthene	(ug/kg)	1	1	100.0	28	28	28	28	28	28	28	28	28	28
Surface	High Molecular Weight PAH	(ug/kg)	35	31	88.6	25.5 A	69700 A	4040	1540 A	6800 A	25.5 A	69700 A	3610	707 A	6800 A
Surface	Polycyclic Aromatic Hydrocarbons	(ug/kg)	35	31	88.6	25.5 A	71946 A	4640	1834 A	9360 A	25.5 A	71946 A	4150	778 A	9360 A
Surface	Anthanthrene	(ug/kg)	3	0							79 U	150 U	116	120 U	120 U
Surface	Benzo(e)pyrene	(ug/kg)	4	4	100.0	25	530	306	270	400	25	530	306	270	400
Surface	7,12-Dimethylbenz(a)anthracene	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	1-Chloronaphthalene	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	2-Naphthylamine	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	C1-Dibenzothiophene	(ug/kg)	1	1	100.0	5	5	5	5	5	5	5	5	5	5
Surface	C1-Chrysene	(ug/kg)	1	1	100.0	22	22	22	22	22	22	22	22	22	22
Surface	C1-Fluorene	(ug/kg)	1	1	100.0	3	3	3	3	3	3	3	3	3	3
Surface	C1-Naphthalene	(ug/kg)	1	1	100.0	4	4	4	4	4	4	4	4	4	4
Surface	C1-Fluoranthene/pyrene	(ug/kg)	1	1	100.0	37	37	37	37	37	37	37	37	37	37
Surface	C1-Phenanthrene/anthracene	(ug/kg)	1	1	100.0	20	20	20	20	20	20	20	20	20	20

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Surface	C2-Dibenzothiophene	(ug/kg)	1	1	100.0	10	10	10	10	10	10	10	10	10	10
Surface	C2-Chrysene	(ug/kg)	1	1	100.0	16	16	16	16	16	16	16	16	16	16
Surface	C2-Fluorene	(ug/kg)	1	1	100.0	8	8	8	8	8	8	8	8	8	8
Surface	C2-Naphthalene	(ug/kg)	1	1	100.0	10	10	10	10	10	10	10	10	10	10
Surface	C2-Fluoranthene/pyrene	(ug/kg)	1	1	100.0	27	27	27	27	27	27	27	27	27	27
Surface	C2-Phenanthrene/anthracene	(ug/kg)	1	1	100.0	29	29	29	29	29	29	29	29	29	29
Surface	C3-Dibenzothiophene	(ug/kg)	1	1	100.0	11	11	11	11	11	11	11	11	11	11
Surface	C3-Chrysene	(ug/kg)	1	1	100.0	11	11	11	11	11	11	11	11	11	11
Surface	C3-Fluorene	(ug/kg)	1	1	100.0	20	20	20	20	20	20	20	20	20	20
Surface	C3-Naphthalene	(ug/kg)	1	1	100.0	10	10	10	10	10	10	10	10	10	10
Surface	C3-Fluoranthene/pyrene	(ug/kg)	1	1	100.0	18	18	18	18	18	18	18	18	18	18
Surface	C3-Phenanthrene/anthracene	(ug/kg)	1	1	100.0	28	28	28	28	28	28	28	28	28	28
Surface	C4-Dibenzothiophene	(ug/kg)	1	1	100.0	12	12	12	12	12	12	12	12	12	12
Surface	C4-Chrysene	(ug/kg)	1	1	100.0	4	4	4	4	4	4	4	4	4	4
Surface	C4-Naphthalene	(ug/kg)	1	1	100.0	9	9	9	9	9	9	9	9	9	9
Surface	C4-Phenanthrene/anthracene	(ug/kg)	1	1	100.0	10	10	10	10	10	10	10	10	10	10
Surface	Total benzofluoranthenes (b+k (+j))	(ug/kg)	1	1	100.0	62	62	62	62	62	62	62	62	62	62
Surface	4,4'-DDD	(ug/kg)	32	26	81.3	8.2	11000	745	100 J	2300	0.4 UJ	11000	607	100	2300
Surface	4,4'-DDE	(ug/kg)	32	18	56.3	2.4 J	1480	186	34	522	0.54 U	1480	138	50 J	509
Surface	4,4'-DDT	(ug/kg)	32	29	90.6	17	81000	4360	490	10000	16 U	81000	3960	410	10000
Surface	Total of 3 isomers: pp-DDT,-DDD,-DDE	(ug/kg)	32	31	96.9	8.2 A	84909 A	4810	580 A	12822 A	8.2 A	84909 A	4660	566 A	12822 A
Surface	Aldrin	(ug/kg)	32	0							0.4 UJ	99 U	30	10 U	97 U
Surface	alpha-Hexachlorocyclohexane	(ug/kg)	20	0							0.4 UJ	99 U	33.9	19 U	99 U
Surface	beta-Hexachlorocyclohexane	(ug/kg)	32	0							0.4 UJ	99 U	28.7	10 U	97 U
Surface	delta-Hexachlorocyclohexane	(ug/kg)	32	0							0.4 UJ	99 U	29.1	10 U	97 U
Surface	gamma-Hexachlorocyclohexane	(ug/kg)	32	0							0.4 UJ	99 U	28.7	10 U	97 U
Surface	cis-Chlordane	(ug/kg)	28	0							0.45 U	110 U	34.2	19 U	99 U
Surface	Dieldrin	(ug/kg)	32	0							0.4 UJ	235 U	60.9	19 U	200 U
Surface	alpha-Endosulfan	(ug/kg)	32	0							0.4 UJ	99 U	28.7	10 U	97 U
Surface	beta-Endosulfan	(ug/kg)	32	0							0.4 UJ	200 U	49.9	19 U	190 U
Surface	Endosulfan sulfate	(ug/kg)	32	1	3.1	240	240	240	240	240	0.4 UJ	240	56.2	19 U	200 U
Surface	Endrin	(ug/kg)	32	0							0.4 UJ	200 U	49.9	19 U	190 U
Surface	Endrin aldehyde	(ug/kg)	32	2	6.3	0.56 J	215	108	0.56 J	0.56 J	0.56 J	215	54	19 U	200 U
Surface	Endrin ketone	(ug/kg)	32	0							0.45 U	200 U	49.9	19 U	190 U
Surface	Heptachlor	(ug/kg)	32	0							0.4 UJ	99 U	28.7	10 U	97 U
Surface	Heptachlor epoxide	(ug/kg)	32	0							0.4 UJ	360 U	39.7	10 U	99 U
Surface	Methoxychlor	(ug/kg)	32	0							0.8 UJ	990 U	223	80 U	970 U
Surface	Toxaphene	(ug/kg)	32	0							17 UJ	9900 U	2740	960 U	9700 U
Surface	Azinphosmethyl	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Bromoxynil	(ug/kg)	4	0							25 U	250 U	105	25 U	120 U
Surface	gamma-Chlordane	(ug/kg)	28	0							0.45 U	99 U	31.7	19 U	97 U
Surface	Chlordane (cis & trans)	(ug/kg)	4	0							80 U	80 U	80	80 U	80 U
Surface	Chlorpyrifos	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Coumaphos	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Demeton	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Diazinon	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Dichlorvos	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Diphenyl	(ug/kg)	1	1	100.0	2	2	2	2	2	2	2	2	2	2
Surface	Disulfoton	(ug/kg)	4	1	25.0	56	56	56	56	56	50 U	56	51.5	50 U	50 U
Surface	Ethoprop	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Fensulfothion	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Surface	Fenthion	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Hexachlorocyclohexanes	(ug/kg)	12	0							10 U	40 U	20	10 U	40 U
Surface	Malathion	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Merphos	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Methyl parathion	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Mevinphos	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Naled	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Perthane	(ug/kg)	4	0							100 U	100 U	100	100 U	100 U
Surface	Phorate	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Prothiophos	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Ronnel	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Stirofos	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Sulprofos	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Tetraethyl pyrophosphate	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Trichloronate	(ug/kg)	4	0							50 U	50 U	50	50 U	50 U
Surface	Diesel fuels	(mg/kg)	2	1	50.0	50 G	50 G	50	50 G	50 G	50 U	50 G	50	50 U	50 U
Surface	Heavy oil	(mg/kg)	1	1	100.0	96	96	96	96	96	96	96	96	96	96
Surface	Lube Oil	(mg/kg)	2	0							100 U	100 U	100	100 U	100 U
Surface	Natural gasoline	(mg/kg)	2	0							20 U	20 U	20	20 U	20 U
Surface	2,3,4,6-Tetrachlorophenol	(ug/kg)	7	0							79 UJ	1600 U	964	1600 U	1600 U
Surface	2,4,5-Trichlorophenol	(ug/kg)	32	0							40 U	330 U	118	96 U	330 U
Surface	2,4,6-Trichlorophenol	(ug/kg)	32	0							30 U	150 U	69.9	79 U	120 U
Surface	2,4-Dichlorophenol	(ug/kg)	32	0							23 U	300 U	87.3	60 U	160 U
Surface	2,4-Dimethylphenol	(ug/kg)	32	0							19 U	200 U	93.8	26 U	200 U
Surface	2,4-Dinitrophenol	(ug/kg)	23	0							23 U	300 UG	185	190 UJ	300 UJ
Surface	2-Chlorophenol	(ug/kg)	32	0							19 U	150 U	41.8	26 U	79 U
Surface	2-Methylphenol	(ug/kg)	28	0							19 U	590 U	102	100 U	320 U
Surface	2-Nitrophenol	(ug/kg)	20	0							23 U	150 U	87.6	97 U	120 U
Surface	4,6-Dinitro-2-methylphenol	(ug/kg)	32	0							45 U	590 U	168	120 U	320 U
Surface	4-Chloro-3-methylphenol	(ug/kg)	32	0							23 U	300 U	60.7	40 U	160 U
Surface	4-Methylphenol	(ug/kg)	16	12	75.0	42	580	289	260	570	19 U	580	250	200	570
Surface	4-Nitrophenol	(ug/kg)	29	0							45 U	300 U	111	100 UG	240 U
Surface	Pentachlorophenol	(ug/kg)	24	1	4.2	680	680	680	680	680	45 U	680	159	98 U	300 UG
Surface	Phenol	(ug/kg)	32	0							19 U	300 U	52.8	26 U	160 U
Surface	2,3,4,5-Tetrachlorophenol	(ug/kg)	3	0							79 UJ	150 U	116	120 U	120 U
Surface	2,4-Dichloro-6-methylphenol	(ug/kg)	4	0							200 U	570 U	300	200 U	230 U
Surface	2,6-Dichlorophenol	(ug/kg)	7	0							130 U	370 U	211	160 U	300 U
Surface	3- and 4-Methylphenol Coelution	(ug/kg)	6	0							200 U	200 U	200	200 UJ	200 UJ
Surface	4-Chloro-o-cresol	(ug/kg)	4	0							81 U	230 U	121	82 U	92 U
Surface	4-Chlorophenol	(ug/kg)	4	0							330 U	910 U	485	330 U	370 U
Surface	Cresol	(ug/kg)	4	0							41 U	110 U	59.5	41 U	46 U
Surface	Dimethyl phthalate	(ug/kg)	32	1	3.1	25	25	25	25	25	10 U	330 U	55.6	19 U	330 U
Surface	Diethyl phthalate	(ug/kg)	32	0							10 U	330 U	55.1	19 U	330 U
Surface	Dibutyl phthalate	(ug/kg)	32	8	25.0	12	640	135	39	180	10 UG	640	85.2	20 U	330 U
Surface	Butylbenzyl phthalate	(ug/kg)	32	2	6.3	15	17 G	16	15	15	10 U	330 U	55.5	19 U	330 U
Surface	Di-n-octyl phthalate	(ug/kg)	32	0							10 UG	330 U	55.1	19 U	330 U
Surface	Bis(2-ethylhexyl) phthalate	(ug/kg)	32	22	68.8	21	1800	404	260	1000	20 UG	1800	328	250	1000
Surface	1,2-Diphenylhydrazine	(ug/kg)	4	0							1600 U	1600 U	1600	1600 U	1600 U
Surface	Bis(2-chloro-1-methylethyl) ether	(ug/kg)	29	0							10 U	330 U	58.4	19 UJ	330 U
Surface	2,4-Dinitrotoluene	(ug/kg)	32	0							20 U	330 U	110	96 U	330 U
Surface	2,6-Dinitrotoluene	(ug/kg)	32	0							10 U	330 U	95.5	96 U	330 U

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Surface	2-Chloronaphthalene	(ug/kg)	32	0							5 U	330 U	53.2	19 U	330 U
Surface	2-Nitroaniline	(ug/kg)	32	0							10 U	3000 U	462	96 UJ	1600 U
Surface	3,3'-Dichlorobenzidine	(ug/kg)	32	0							40 UG	660 U	164	96 U	660 U
Surface	3-Nitroaniline	(ug/kg)	32	0							110 UJ	3000 U	542	200 UG	1600 U
Surface	4-Bromophenyl phenyl ether	(ug/kg)	32	0							10 U	330 U	63.8	19 U	330 U
Surface	4-Chloroaniline	(ug/kg)	32	0							50 U	590 U	127	58 U	330 U
Surface	4-Chlorophenyl phenyl ether	(ug/kg)	32	0							10 U	330 U	57.3	19 U	330 U
Surface	4-Nitroaniline	(ug/kg)	32	0							10 U	3000 U	462	96 U	1600 U
Surface	Aniline	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	Benzoic acid	(ug/kg)	29	1	3.4	1200	1200	1200	1200	1200	190 UJ	1200 U	320	250 U	790 U
Surface	Benzyl alcohol	(ug/kg)	32	0							19 UJ	330 U	89.8	50 UG	330 U
Surface	Bis(2-chloroethoxy) methane	(ug/kg)	32	0							10 U	330 U	55.1	19 U	330 U
Surface	Bis(2-chloroethyl) ether	(ug/kg)	32	0							10 U	330 U	65.2	38 U	330 U
Surface	Carbazole	(ug/kg)	28	8	28.6	13	700 J	147	40 J	260	10 UG	700 J	54.5	19 U	59
Surface	Dibenzofuran	(ug/kg)	33	12	36.4	4	170 J	69.9	47	160	4	330 U	72	20 U	330 U
Surface	Hexachlorobenzene	(ug/kg)	28	2	7.1	19 J	340	180	19 J	19 J	10 U	340	30	19 U	48 U
Surface	Hexachlorobutadiene	(ug/kg)	32	2	6.3	200	270	235	200	200	10 U	330 U	77.6	19 U	330 U
Surface	Hexachlorocyclopentadiene	(ug/kg)	20	0							94 U	330 U	159	99 U	330 U
Surface	Hexachloroethane	(ug/kg)	32	3	9.4	38	1600	562	49	49	19 U	1600	136	40 UG	330 U
Surface	Isophorone	(ug/kg)	32	0							10 U	330 U	55.1	19 U	330 U
Surface	Nitrobenzene	(ug/kg)	32	0							10 U	330 U	63.8	19 U	330 U
Surface	N-Nitrosodimethylamine	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	N-Nitrosodipropylamine	(ug/kg)	32	0							10 U	330 U	82.7	38 U	330 U
Surface	N-Nitrosodiphenylamine	(ug/kg)	32	0							10 U	330 U	57.4	19 U	330 U
Surface	1-Naphthylamine	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	2-Picoline	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	3-Methylcholanthrene	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	4-Aminobiphenyl	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	Acetophenone	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	alpha,alpha-Dimethylphenethylamine	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	Benzidine	(ug/kg)	4	0							1600 U	1600 U	1600	1600 U	1600 U
Surface	Bis(2-chloroisopropyl) ether	(ug/kg)	3	0							320 UJ	590 U	463	480 U	480 U
Surface	Dibenzothiophene	(ug/kg)	1	1	100.0	4	4	4	4	4	4	4	4	4	4
Surface	Diphenylamine	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	Ethyl methanesulfonate	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	Methyl methanesulfonate	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	N-Nitrosodibutylamine	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	N-Nitrosopiperidine	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	p-Dimethylaminoazobenzene	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	Pentachloronitrobenzene	(ug/kg)	4	0							1600 U	1600 U	1600	1600 U	1600 U
Surface	Perylene	(ug/kg)	1	1	100.0	24	24	24	24	24	24	24	24	24	24
Surface	Phenacetin	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	Pronamide	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	1,1,1,2-Tetrachloroethane	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	1,1,1-Trichloroethane	(ug/kg)	16	0							1 U	11 U	5.75	5 U	10 U
Surface	1,1,2,2-Tetrachloroethane	(ug/kg)	16	0							2 U	11 U	6	5 U	10 U
Surface	1,1,2-Trichloroethane	(ug/kg)	16	0							2 U	11 U	6	5 U	10 U
Surface	1,1-Dichloroethane	(ug/kg)	16	0							1 U	11 U	5.75	5 U	10 U
Surface	Vinylidene chloride	(ug/kg)	16	0							1 U	11 U	5.75	5 U	10 U
Surface	1,2,3-Trichloropropane	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	1,2-Dichloroethane	(ug/kg)	16	0							2 U	11 U	6	5 U	10 U

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Surface	1,2-Dichloropropane	(ug/kg)	16	0							2 U	11 U	6	5 U	10 U
Surface	2-Chloroethyl vinyl ether	(ug/kg)	4	0							10 U	10 U	10	10 U	10 U
Surface	Methyl N-butyl ketone	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	Benzene	(ug/kg)	18	2	11.1	1.3	1.4	1.35	1.3	1.3	1 U	300 U	38.5	5 U	300 U
Surface	Bromochloromethane	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	Bromodichloromethane	(ug/kg)	16	0							2 U	11 U	6	5 U	10 U
Surface	Bromoform	(ug/kg)	16	0							5 U	11 U	8	9 U	10 U
Surface	Bromomethane	(ug/kg)	16	0							5 UJ	11 U	8	9 UG	10 U
Surface	Carbon disulfide	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	Carbon tetrachloride	(ug/kg)	16	0							1 U	11 U	5.75	5 U	10 U
Surface	Chlorodibromomethane	(ug/kg)	16	0							2 U	11 U	6	5 U	10 U
Surface	Chloroethane	(ug/kg)	16	0							5 U	11 U	8	9 U	10 U
Surface	Chloroform	(ug/kg)	16	0							1 U	11 U	5.75	5 U	10 U
Surface	Chloromethane	(ug/kg)	16	0							5 UJ	11 U	8	9 UG	10 U
Surface	cis-1,3-Dichloropropene	(ug/kg)	16	0							4 U	11 U	6.5	5 U	10 U
Surface	Methylene bromide	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	Dichlorodifluoromethane	(ug/kg)	16	0							5 UJ	20 U	10.5	9 UG	20 U
Surface	Ethylbenzene	(ug/kg)	18	0							1 U	300 U	38.4	5 U	300 U
Surface	Isopropylbenzene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	m,p-Xylene	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	Methylene chloride	(ug/kg)	16	0							10 U	22 U	13.6	10 U	21 U
Surface	o-Xylene	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	Styrene	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	Tetrachloroethene	(ug/kg)	16	0							1 U	11 U	5.75	5 U	10 U
Surface	Toluene	(ug/kg)	18	0							1 U	300 U	38.4	5 U	300 U
Surface	trans-1,2-Dichloroethene	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	trans-1,3-Dichloropropene	(ug/kg)	16	0							2 U	11 U	6	5 U	10 U
Surface	Trichloroethene	(ug/kg)	16	0							1 U	11 U	5.75	5 U	10 U
Surface	Trichlorofluoromethane	(ug/kg)	16	0							5 UJ	20 U	10.5	9 UG	20 U
Surface	Vinyl chloride	(ug/kg)	16	0							2 U	11 U	6	5 U	10 U
Surface	1,1,2-Trichloro-1,2,2-trifluoroethane	(ug/kg)	4	0							10 U	10 U	10	10 U	10 U
Surface	1,1-Dichloropropene	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	1,2-Dibromo-3-chloropropane	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	1,3,5-Trimethylbenzene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	1,3-Dichloropropane	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	2,2-Dichloropropane	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	2-Chlorotoluene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	4-Chlorotoluene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	Bromobenzene	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	cis-1,2-Dichloroethene	(ug/kg)	12	0							5 U	11 U	7.33	5 U	10 U
Surface	Ethylene dibromide	(ug/kg)	16	0							4 U	44 U	23.1	20 U	42 U
Surface	n-Butylbenzene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	n-Propylbenzene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	Pseudocumene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	Sec-butylbenzene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 UJ
Surface	tert-Butylbenzene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	1,2-Dichloroethene	(ug/kg)	4	0							1 U	1 U	1	1 U	1 U
Surface	Cymene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	Xylene	(ug/kg)	6	0							2 U	300 U	101	2 U	300 U
Surface	Chlorobenzene	(ug/kg)	16	5	31.3	4.6	34000	6880	130	250	1 U	34000	2150	5 U	250
Surface	1,2-Dichlorobenzene	(ug/kg)	32	3	9.4	4.8	1700 J	576	22	22	2 U	1700 J	67.6	11 UG	48 UJ

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Surface	1,3-Dichlorobenzene	(ug/kg)	32	0							2 U	59 UJ	15.3	11 UG	32 UJ
Surface	1,4-Dichlorobenzene	(ug/kg)	32	2	6.3	4.8	530	267	4.8	4.8	2 U	530	30.9	11 UG	48 UJ
Surface	1,2,3-Trichlorobenzene	(ug/kg)	12	0							20 U	44 U	29.5	20 U	42 U
Surface	1,2,4-Trichlorobenzene	(ug/kg)	32	2	6.3	10	190	100	10	10	10 U	330 U	69.4	19 U	330 U
Surface	1,2,4,5-Tetrachlorobenzene	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Surface	Pentachlorobenzene	(ug/kg)	4	0							330 U	330 U	330	330 U	330 U
Subsurface	Aroclor 1016	(ug/kg)	5	0							80 UG	75000 U	16900	1600 U	7500 U
Subsurface	Aroclor 1242	(ug/kg)	5	0							80 UG	75000 U	16900	1600 U	7500 U
Subsurface	Aroclor 1248	(ug/kg)	5	0							80 UG	75000 U	16900	1600 U	7500 U
Subsurface	Aroclor 1254	(ug/kg)	5	0							80 UG	75000 U	16900	1600 U	7500 U
Subsurface	Aroclor 1260	(ug/kg)	5	0							80 UG	75000 U	16900	1600 U	7500 U
Subsurface	Aroclor 1221	(ug/kg)	3	0							3100 U	150000 U	56000	15000 U	15000 U
Subsurface	Aroclor 1232	(ug/kg)	3	0							1600 U	75000 U	28000	7500 U	7500 U
Subsurface	Polychlorinated biphenyl	(ug/kg)	5	0							80 UA	150000 UA	33700	3100 UA	15000 UA
Subsurface	Butyltin ion	(ug/kg)	1	0							14 U	14 U	14	14 U	14 U
Subsurface	Dibutyltin ion	(ug/kg)	1	0							14 U	14 U	14	14 U	14 U
Subsurface	Tributyltin ion	(ug/kg)	1	0							14 U	14 U	14	14 U	14 U
Subsurface	Tetrabutyltin	(ug/kg)	1	0							14 U	14 U	14	14 U	14 U
Subsurface	Total solids	(%)	40	40	100.0	46.4	80.9	63.6	64.5	78.4	46.4	80.9	63.6	64.5	78.4
Subsurface	Total organic carbon	(%)	22	20	90.9	0.08	2.8	1.48	1.4	2.7	0.05 U	2.8	1.35	1.4	2.42
Subsurface	Total volatile solids	(%)	3	3	100.0	7.2	8.2	7.67	7.6	7.6	7.2	8.2	7.67	7.6	7.6
Subsurface	Bromine	(ug/kg)	1	1	100.0	13	13	13	13	13	13	13	13	13	13
Subsurface	Chlorine	(ug/kg)	1	1	100.0	2380	2380	2380	2380	2380	2380	2380	2380	2380	2380
Subsurface	2,3,7,8-Tetrachlorodibenzo-p-dioxin	(ng/kg)	3	1	33.3	0.63	0.63	0.63	0.63	0.63	0.63	6.9 U	2.76	0.76 U	0.76 U
Subsurface	Tetrachlorodibenzo-p-dioxin	(ng/kg)	1	1	100.0	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Subsurface	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	(ng/kg)	3	1	33.3	1.2	1.2	1.2	1.2	1.2	1.2	6.9 U	3.23	1.6 U	1.6 U
Subsurface	Pentachlorodibenzo-p-dioxin	(ng/kg)	2	1	50.0	1.2	1.2	1.2	1.2	1.2	1.2	1.6 U	1.4	1.2	1.2
Subsurface	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	(ng/kg)	3	1	33.3	1.2	1.2	1.2	1.2	1.2	1.2	11 U	4.47	1.2 U	1.2 U
Subsurface	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	(ng/kg)	3	2	66.7	17	22	19.5	17	17	3.1 U	22	14	17	17
Subsurface	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	(ng/kg)	3	2	66.7	8.6	13	10.8	8.6	8.6	1.4 U	13	7.67	8.6	8.6
Subsurface	Hexachlorodibenzo-p-dioxin	(ng/kg)	1	1	100.0	130	130	130	130	130	130	130	130	130	130
Subsurface	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	(ng/kg)	3	3	100.0	29	290	176	210	210	29	290	176	210	210
Subsurface	Heptachlorodibenzo-p-dioxin	(ng/kg)	1	1	100.0	630	630	630	630	630	630	630	630	630	630
Subsurface	Octachlorodibenzo-p-dioxin	(ng/kg)	3	3	100.0	180	2700	1660	2100	2100	180	2700	1660	2100	2100
Subsurface	2,3,7,8-Tetrachlorodibenzofuran	(ng/kg)	3	3	100.0	84	15000	5060	110	110	84	15000	5060	110	110
Subsurface	Tetrachlorodibenzofuran	(ng/kg)	1	1	100.0	270	270	270	270	270	270	270	270	270	270
Subsurface	1,2,3,7,8-Pentachlorodibenzofuran	(ng/kg)	3	2	66.7	49	360	205	49	49	49	18000 U	6140	360	360
Subsurface	2,3,4,7,8-Pentachlorodibenzofuran	(ng/kg)	3	3	100.0	57	11000	3710	61	61	57	11000	3710	61	61
Subsurface	Pentachlorodibenzofuran	(ng/kg)	2	2	100.0	150	680	415	150	150	150	680	415	150	150
Subsurface	1,2,3,4,7,8-Hexachlorodibenzofuran	(ng/kg)	3	3	100.0	110 J	22000 J	7600	700	700	110 J	22000 J	7600	700	700
Subsurface	1,2,3,6,7,8-Hexachlorodibenzofuran	(ng/kg)	3	2	66.7	26 J	150	88	26 J	26 J	26 J	5600 UJ	1930	150	150
Subsurface	1,2,3,7,8,9-Hexachlorodibenzofuran	(ng/kg)	3	3	100.0	22	2700	916	25	25	22	2700	916	25	25
Subsurface	2,3,4,6,7,8-Hexachlorodibenzofuran	(ng/kg)	3	3	100.0	10	1300	443	18	18	10	1300	443	18	18
Subsurface	Hexachlorodibenzofuran	(ng/kg)	2	2	100.0	210	1200	705	210	210	210	1200	705	210	210
Subsurface	1,2,3,4,6,7,8-Heptachlorodibenzofuran	(ng/kg)	3	3	100.0	34	5400	1900	270	270	34	5400	1900	270	270
Subsurface	1,2,3,4,7,8,9-Heptachlorodibenzofuran	(ng/kg)	3	3	100.0	20	2200	790	150	150	20	2200	790	150	150
Subsurface	Heptachlorodibenzofuran	(ng/kg)	1	1	100.0	650	650	650	650	650	650	650	650	650	650
Subsurface	Octachlorodibenzofuran	(ng/kg)	3	3	100.0	82	4900	1840	530	530	82	4900	1840	530	530
Subsurface	Gravel	(%)	16	14	87.5	0.1	14.9	2.59	0.49	5.3	0.1	14.9	2.45	0.49	5.3
Subsurface	Sand	(%)	19	17	89.5	11.7	94.5	41.2	27.79	83.4	11.7	99.6 U	47.2	30.1	96.8 U
Subsurface	Fines	(%)	19	19	100.0	0.13	88.3	50.8	66.3	84.6	0.13	88.3	50.8	66.3	84.6

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Subsurface	Silt	(%)	19	17	89.5	0.12	77.3	47.9	57.4	73.1	0.08 U	77.3	42.9	53.73	73.1
Subsurface	Clay	(%)	19	17	89.5	0.12	17.34	8.77	8.9	15.2	0.05 U	17.34	7.86	6.9	15.2
Subsurface	Mean grain size	(mm)	3	3	100.0	0.03	0.04	0.0337	0.0312	0.0312	0.03	0.04	0.0337	0.0312	0.0312
Subsurface	Median grain size	(mm)	3	3	100.0	0.018	0.021	0.0197	0.02	0.02	0.018	0.021	0.0197	0.02	0.02
Subsurface	Aluminum	(mg/kg)	4	4	100.0	34100	39100	36800	36500	37500	34100	39100	36800	36500	37500
Subsurface	Antimony	(mg/kg)	4	0							4 UJ	5 UJ	4.75	5 UJ	5 UJ
Subsurface	Arsenic	(mg/kg)	6	2	33.3	3.5 G	5.1 G	4.3	3.5 G	3.5 G	3.5 G	5.1 G	4.6	5 U	5 U
Subsurface	Cadmium	(mg/kg)	6	6	100.0	0.36 G	0.8	0.558	0.4	0.7	0.36 G	0.8	0.558	0.4	0.7
Subsurface	Chromium	(mg/kg)	6	6	100.0	24 G	43.3	34.9	33	42.9	24 G	43.3	34.9	33	42.9
Subsurface	Copper	(mg/kg)	6	6	100.0	37.1	57.4	50.2	51.2	53.6	37.1	57.4	50.2	51.2	53.6
Subsurface	Lead	(mg/kg)	8	8	100.0	2.6	44	26.7	31	43	2.6	44	26.7	31	43
Subsurface	Manganese	(mg/kg)	6	6	100.0	435	676 G	532	475 G	663	435	676 G	532	475 G	663
Subsurface	Mercury	(mg/kg)	6	6	100.0	0.077 G	0.28	0.17	0.14 G	0.23	0.077 G	0.28	0.17	0.14 G	0.23
Subsurface	Nickel	(mg/kg)	6	6	100.0	27.9	60.7	38.7	31.4	42 G	27.9	60.7	38.7	31.4	42 G
Subsurface	Selenium	(mg/kg)	4	4	100.0	6	12	9.5	9	11	6	12	9.5	9	11
Subsurface	Silver	(mg/kg)	4	4	100.0	0.7	1.5	1.1	1.1	1.1	0.7	1.5	1.1	1.1	1.1
Subsurface	Thallium	(mg/kg)	4	1	25.0	12	12	12	12	12	4 U	12	6.5	5 U	5 U
Subsurface	Zinc	(mg/kg)	6	6	100.0	137 G	243	172	159 G	181	137 G	243	172	159 G	181
Subsurface	Barium	(mg/kg)	4	4	100.0	192	330	252	205	281	192	330	252	205	281
Subsurface	Beryllium	(mg/kg)	4	4	100.0	0.47	0.55	0.515	0.5	0.54	0.47	0.55	0.515	0.5	0.54
Subsurface	Calcium	(mg/kg)	4	4	100.0	7440	13800	9310	7560	8450	7440	13800	9310	7560	8450
Subsurface	Cobalt	(mg/kg)	4	4	100.0	16.2	17.8	16.9	16.7	16.9	16.2	17.8	16.9	16.7	16.9
Subsurface	Iron	(mg/kg)	6	6	100.0	33200 G	40000	38000	38200	39900	33200 G	40000	38000	38200	39900
Subsurface	Magnesium	(mg/kg)	4	4	100.0	6540	7370	6860	6740	6770	6540	7370	6860	6740	6770
Subsurface	Potassium	(mg/kg)	4	4	100.0	1140	1280	1210	1200	1200	1140	1280	1210	1200	1200
Subsurface	Sodium	(mg/kg)	4	4	100.0	1230 J	4480 J	2450	1910 J	2180 J	1230 J	4480 J	2450	1910 J	2180 J
Subsurface	Titanium	(mg/kg)	1	1	100.0	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Subsurface	Vanadium	(mg/kg)	4	4	100.0	99.7	107	102	99.8	101	99.7	107	102	99.8	101
Subsurface	2-Methylnaphthalene	(ug/kg)	16	11	68.8	8 J	610	122	20	250	5 U	610	85.4	15	250
Subsurface	Acenaphthene	(ug/kg)	20	13	65.0	12.5 J	820	163	71	290	10 U	820	125	50 U	290
Subsurface	Acenaphthylene	(ug/kg)	20	10	50.0	11	60	33.2	22.5 J	49	10 U	150 UG	37.6	20	150 UG
Subsurface	Anthracene	(ug/kg)	20	14	70.0	11 J	870	195	100	550	5 U	870	187	82	550
Subsurface	Fluorene	(ug/kg)	20	12	60.0	10.5 J	620	193	55	600	10 U	620	143	50 U	600
Subsurface	Naphthalene	(ug/kg)	22	12	54.5	9	1100	192	35	590	5 U	1100	121	35	240
Subsurface	Phenanthrene	(ug/kg)	20	14	70.0	97 J	15000	2540	260	13000	10 U	15000	1820	210	13000
Subsurface	Low Molecular Weight PAH	(ug/kg)	20	14	70.0	131 A	16780 A	3240	415 A	15288 A	10 UA	16780 A	2320	392 A	15288 A
Subsurface	Dibenz(a,h)anthracene	(ug/kg)	20	14	70.0	6 J	1800 G	251	63	990	5 U	1800 G	244	50 U	990
Subsurface	Benz(a)anthracene	(ug/kg)	20	16	80.0	14.5 J	13000	1200	330	1800	10 U	13000	1010	330	1800
Subsurface	Benzo(a)pyrene	(ug/kg)	20	16	80.0	13 J	9600	932	230	950	10 U	9600	817	230	950
Subsurface	Benzo(b)fluoranthene	(ug/kg)	18	17	94.4	14.5	9700	1180	230	5600	10 U	9700	1120	200	5600
Subsurface	Benzo(g,h,i)perylene	(ug/kg)	20	18	90.0	7 J	4300	556	140	1800	7 J	4300	641	200	1800
Subsurface	Benzo(k)fluoranthene	(ug/kg)	18	17	94.4	11 J	16000	1320	170	3000	10 U	16000	1250	150	3000
Subsurface	Chrysene	(ug/kg)	20	18	90.0	12 J	16000	1670	340	7100	10 U	16000	1530	340	7100
Subsurface	Fluoranthene	(ug/kg)	20	17	85.0	13.5 J	23000	2590	440	10000	10 U	23000	2280	440	10000
Subsurface	Indeno(1,2,3-cd)pyrene	(ug/kg)	20	18	90.0	7 J	7000	660	200	1400	7 J	7000	659	205 J	1400
Subsurface	Pyrene	(ug/kg)	20	17	85.0	13 J	18000	2160	590	6000	10 U	18000	1930	590	6000
Subsurface	Benzo(b+k)fluoranthene	(ug/kg)	20	19	95.0	27.5 A	25700 A	2370	610 G	8600 A	10 UA	25700 A	2250	400 A	8600 A
Subsurface	High Molecular Weight PAH	(ug/kg)	20	20	100.0	14 A	118400 A	10800	1982 A	38200 A	14 A	118400 A	10800	1982 A	38200 A
Subsurface	Polycyclic Aromatic Hydrocarbons	(ug/kg)	20	20	100.0	14 A	135180 A	13000	2281 A	53488 A	14 A	135180 A	13000	2281 A	53488 A
Subsurface	4,4'-DDD	(ug/kg)	55	48	87.3	10	690000	47100	310	240000	6.2 U	690000	41100	220	240000
Subsurface	4,4'-DDE	(ug/kg)	55	26	47.3	8.1	24000	2110	310	9000	5.4 UI	24000	1340	92 U	7500 U

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Subsurface	4,4'-DDT	(ug/kg)	218	83	38.1	11	4500000	148000	27000	200000	6.2 U	4500000	85700	50000 U	110000
Subsurface	Total of 3 isomers: pp-DDT,-DDD,-DDE	(ug/kg)	55	52	94.5	8.1 A	4764000 A	223000	1900 A	800000 A	6.2 UA	4764000 A	211000	1270 A	800000 A
Subsurface	Aldrin	(ug/kg)	55	0							0.96 U	3800 U	247	11 UJ	1800 U
Subsurface	alpha-Hexachlorocyclohexane	(ug/kg)	43	1	2.3	120	120	120	120	120	0.96 U	3800 U	229	70 U	380 U
Subsurface	beta-Hexachlorocyclohexane	(ug/kg)	55	2	3.6	77	120	98.5	77	77	0.96 U	3800 U	182	11 UJ	400 U
Subsurface	delta-Hexachlorocyclohexane	(ug/kg)	55	0							0.96 U	3800 UJ	181	11 UJ	400 U
Subsurface	gamma-Hexachlorocyclohexane	(ug/kg)	55	1	1.8	45.9	45.9	45.9	45.9	45.9	0.96 U	3800 U	182	11 UJ	400 U
Subsurface	cis-Chlordane	(ug/kg)	53	0							0.96 U	3800 UJ	189	11 UJ	400 U
Subsurface	trans-Chlordane	(ug/kg)	37	3	8.1	140 J	410 J	240	170 J	170 J	6.2 U	1800 U	173	11 UJ	440 U
Subsurface	Dieldrin	(ug/kg)	55	0							1.9 U	7500 U	257	11 UJ	750 U
Subsurface	alpha-Endosulfan	(ug/kg)	55	0							0.96 U	3800 U	185	12 UG	400 U
Subsurface	beta-Endosulfan	(ug/kg)	55	0							1.9 U	38000 U	922	11 UJ	750 U
Subsurface	Endosulfan sulfate	(ug/kg)	55	1	1.8	290	290	290	290	290	1.9 U	7500 UJ	260	11 UJ	750 UJ
Subsurface	Endrin	(ug/kg)	55	1	1.8	190 J	190 J	190	190 J	190 J	1.9 U	22000 U	634	11 UJ	750 U
Subsurface	Endrin aldehyde	(ug/kg)	53	0							1.9 U	7500 U	266	11 UJ	750 U
Subsurface	Endrin ketone	(ug/kg)	55	1	1.8	120	120	120	120	120	1.9 U	7500 UJ	257	11 UJ	750 UJ
Subsurface	Heptachlor	(ug/kg)	55	0							0.96 U	3800 U	181	11 UJ	400 U
Subsurface	Heptachlor epoxide	(ug/kg)	55	2	3.6	89	110	99.5	89	89	0.96 U	3800 U	182	11 UJ	400 U
Subsurface	Methoxychlor	(ug/kg)	55	0							6.2 U	38000 U	879	20 U	1400 U
Subsurface	Toxaphene	(ug/kg)	55	0							96 U	380000 U	15800	710 U	50000 U
Subsurface	gamma-Chlordane	(ug/kg)	16	0							0.96 U	3800 U	305	10 U	400 U
Subsurface	Chlordane (cis & trans)	(ug/kg)	2	0							40 UG	40 UG	40	40 UG	40 UG
Subsurface	Hexachlorocyclohexanes	(ug/kg)	12	0							10 U	400 U	51.3	10 U	40 U
Subsurface	Diesel fuels	(mg/kg)	1	0							50 U	50 U	50	50 U	50 U
Subsurface	Lube Oil	(mg/kg)	1	0							100 U	100 U	100	100 U	100 U
Subsurface	Natural gasoline	(mg/kg)	1	0							20 U	20 U	20	20 U	20 U
Subsurface	2,4,5-Trichlorophenol	(ug/kg)	16	1	6.3	73	73	73	73	73	40 U	230 U	69.3	40 U	170 U
Subsurface	2,4,6-Trichlorophenol	(ug/kg)	17	1	5.9	57	57	57	57	57	30 U	230 U	69.6	30 U	200 UG
Subsurface	2,4-Dichlorophenol	(ug/kg)	17	1	5.9	140	140	140	140	140	58 U	200 UG	106	100 U	140 U
Subsurface	2,4-Dimethylphenol	(ug/kg)	17	0							19 U	200 U	154	200 UJ	200 U
Subsurface	2,4-Dinitrophenol	(ug/kg)	9	2	22.2	18 J	12000 G	6010	18 J	18 J	18 J	12000 G	1570	300 UG	470 UJ
Subsurface	2-Chlorophenol	(ug/kg)	17	2	11.8	51	93	72	51	51	19 U	93	49.3	50 U	70 UG
Subsurface	2-Methylphenol	(ug/kg)	16	0							19 U	100 U	82.6	100 U	100 U
Subsurface	2-Nitrophenol	(ug/kg)	4	0							97 U	230 U	149	99 U	170 U
Subsurface	4,6-Dinitro-2-methylphenol	(ug/kg)	17	1	5.9	2700 G	2700 G	2700	2700 G	2700 G	100 U	2700 G	301	100 U	470 U
Subsurface	4-Chloro-3-methylphenol	(ug/kg)	17	0							39 U	93 U	54.2	50 U	80 UG
Subsurface	4-Methylphenol	(ug/kg)	4	4	100.0	100	250	153	130	130	100	250	153	130	130
Subsurface	4-Nitrophenol	(ug/kg)	15	0							97 U	400 UG	133	100 U	230 U
Subsurface	Pentachlorophenol	(ug/kg)	9	1	11.1	600 G	600 G	600	600 G	600 G	97 U	600 G	266	300 U	300 U
Subsurface	Phenol	(ug/kg)	17	1	5.9	300	300	300	300	300	19 U	300	60.8	50 UG	60 UG
Subsurface	3- and 4-Methylphenol Coelution	(ug/kg)	6	0							200 U	200 U	200	200 U	200 U
Subsurface	Dimethyl phthalate	(ug/kg)	16	0							10 U	47 U	15.1	10 U	35 U
Subsurface	Diethyl phthalate	(ug/kg)	16	0							10 U	47 U	15.1	10 U	35 U
Subsurface	Dibutyl phthalate	(ug/kg)	16	3	18.8	12 G	1500	511	20	20	10 U	1500	109	10 U	47 U
Subsurface	Butylbenzyl phthalate	(ug/kg)	16	3	18.8	10	42	21.7	13	13	10	47 U	17.3	10 U	42
Subsurface	Di-n-octyl phthalate	(ug/kg)	16	0							10 U	47 U	15.1	10 U	35 U
Subsurface	Bis(2-ethylhexyl) phthalate	(ug/kg)	16	11	68.8	140	4200	835	410 J	1300	20 U	4200	595	280 J	1300
Subsurface	Bis(2-chloro-1-methylethyl) ether	(ug/kg)	16	0							10 U	47 U	15.1	10 U	35 U
Subsurface	2,4-Dinitrotoluene	(ug/kg)	16	0							20 U	230 U	52.3	20 U	170 U
Subsurface	2,6-Dinitrotoluene	(ug/kg)	16	0							10 U	230 U	44.8	10 U	170 U
Subsurface	2-Chloronaphthalene	(ug/kg)	16	0							5 U	47 U	11.3	5 U	35 U

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Subsurface	2-Nitroaniline	(ug/kg)	16	0							10 U	230 U	44.8	10 U	170 U
Subsurface	3,3'-Dichlorobenzidine	(ug/kg)	16	0							40 U	230 U	67.3	40 U	170 U
Subsurface	3-Nitroaniline	(ug/kg)	16	0							120 U	280 U	196	200 U	210 U
Subsurface	4-Bromophenyl phenyl ether	(ug/kg)	16	0							10 U	47 U	15.1	10 U	35 U
Subsurface	4-Chloroaniline	(ug/kg)	16	0							50 U	140 U	59.9	50 U	100 U
Subsurface	4-Chlorophenyl phenyl ether	(ug/kg)	16	0							10 U	47 U	15.1	10 U	35 U
Subsurface	4-Nitroaniline	(ug/kg)	16	0							10 U	230 U	44.8	10 U	170 U
Subsurface	Benzoic acid	(ug/kg)	12	4	33.3	430	2600	1200	770	1000	250 U	2600	567	250 U	1000
Subsurface	Benzyl alcohol	(ug/kg)	16	0							19 U	50 U	45.1	50 U	50 U
Subsurface	Bis(2-chloroethoxy) methane	(ug/kg)	16	0							10 U	47 U	15.1	10 U	35 U
Subsurface	Bis(2-chloroethyl) ether	(ug/kg)	16	0							10 U	93 U	22.6	10 U	69 U
Subsurface	Carbazole	(ug/kg)	16	9	56.3	14	500	121	22	390	10 U	500	74.3	18	390
Subsurface	Dibenzofuran	(ug/kg)	16	11	68.8	7 J	630	147	16	360	5 U	630	103	10	360
Subsurface	Hexachlorobenzene	(ug/kg)	16	4	25.0	25	14000	3900	61	1500	10 U	14000	984	10 U	1500
Subsurface	Hexachlorobutadiene	(ug/kg)	18	4	22.2	19	34000	15000	57	26000	10 U	34000	3350	10 U	26000
Subsurface	Hexachlorocyclopentadiene	(ug/kg)	8	0							97 UJ	230 UJ	175	200 U	200 U
Subsurface	Hexachloroethane	(ug/kg)	16	6	37.5	31	20000	3410	95	160	31	20000	1300	40 U	160
Subsurface	Isophorone	(ug/kg)	16	1	6.3	43	43	43	43	43	10 U	47 U	17.1	10 U	43
Subsurface	Nitrobenzene	(ug/kg)	16	0							10 U	47 U	15.1	10 U	35 U
Subsurface	N-Nitrosodipropylamine	(ug/kg)	16	0							10 U	93 U	22.6	10 U	69 U
Subsurface	N-Nitrosodiphenylamine	(ug/kg)	16	0							10 U	47 U	15.1	10 U	35 U
Subsurface	1,1,1,2-Tetrachloroethane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	1,1,1-Trichloroethane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	1,1,2,2-Tetrachloroethane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	1,1,2-Trichloroethane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	1,1-Dichloroethane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Vinylidene chloride	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	1,2,3-Trichloropropane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	1,2-Dichloroethane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	1,2-Dichloropropane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Methyl N-butyl ketone	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	Benzene	(ug/kg)	14	0							5 U	300 U	52.1	9 U	300 U
Subsurface	Bromochloromethane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Bromodichloromethane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Bromoform	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Bromomethane	(ug/kg)	12	0							5 UJ	50 U	10.8	5 UJ	11 U
Subsurface	Carbon disulfide	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Carbon tetrachloride	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Chlorodibromomethane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Chloroethane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Chloroform	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Chloromethane	(ug/kg)	12	0							5 UJ	50 U	10.8	5 U	11 U
Subsurface	cis-1,3-Dichloropropene	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Methylene bromide	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Dichlorodifluoromethane	(ug/kg)	12	0							5 UJ	50 U	10.8	5 UJ	11 U
Subsurface	Ethylbenzene	(ug/kg)	14	0							5 U	300 U	52.1	9 U	300 U
Subsurface	Isopropylbenzene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	m,p-Xylene	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Methylene chloride	(ug/kg)	12	0							10 U	100 U	21.6	10 U	22 U
Subsurface	o-Xylene	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Styrene	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U

Table 2. Surface and Subsurface Sediment Chemical Statistics near Arkema.

Surface or Subsurface	Analyte	Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
						Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
Subsurface	Tetrachloroethene	(ug/kg)	12	1	8.3	8	8	8	8	8	5 U	50 U	11.1	8	11 U
Subsurface	Toluene	(ug/kg)	14	1	7.1	21	21	21	21	21	5 U	300 U	52.9	9 U	300 U
Subsurface	trans-1,2-Dichloroethene	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	trans-1,3-Dichloropropene	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Trichloroethene	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Trichlorofluoromethane	(ug/kg)	12	0							5 UJ	50 U	10.8	5 UJ	11 U
Subsurface	Vinyl chloride	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	1,1-Dichloropropene	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	1,2-Dibromo-3-chloropropane	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	1,3,5-Trimethylbenzene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	1,3-Dichloropropane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	2,2-Dichloropropane	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	2-Chlorotoluene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	4-Chlorotoluene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	Bromobenzene	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	cis-1,2-Dichloroethene	(ug/kg)	12	0							5 U	50 U	10.8	5 U	11 U
Subsurface	Ethylene dibromide	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	n-Butylbenzene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	n-Propylbenzene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	Pseudocumene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	Sec-butylbenzene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	tert-Butylbenzene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	Cymene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	Xylene	(ug/kg)	2	0							300 U	300 U	300	300 U	300 U
Subsurface	Chlorobenzene	(ug/kg)	12	2	16.7	1900	18000	9950	1900	1900	5 U	18000	1660	5 U	1900
Subsurface	1,2-Dichlorobenzene	(ug/kg)	18	0							5 U	50 U	15.1	10 UG	47 U
Subsurface	1,3-Dichlorobenzene	(ug/kg)	18	0							5 U	50 U	15.1	10 UG	47 U
Subsurface	1,4-Dichlorobenzene	(ug/kg)	18	0							5 U	50 U	15.1	10 UG	47 U
Subsurface	1,2,3-Trichlorobenzene	(ug/kg)	12	0							20 U	200 U	43.3	20 U	45 U
Subsurface	1,2,4-Trichlorobenzene	(ug/kg)	18	4	22.2	12	530	156	40 G	41	10 U	530	50.3	12	47 U

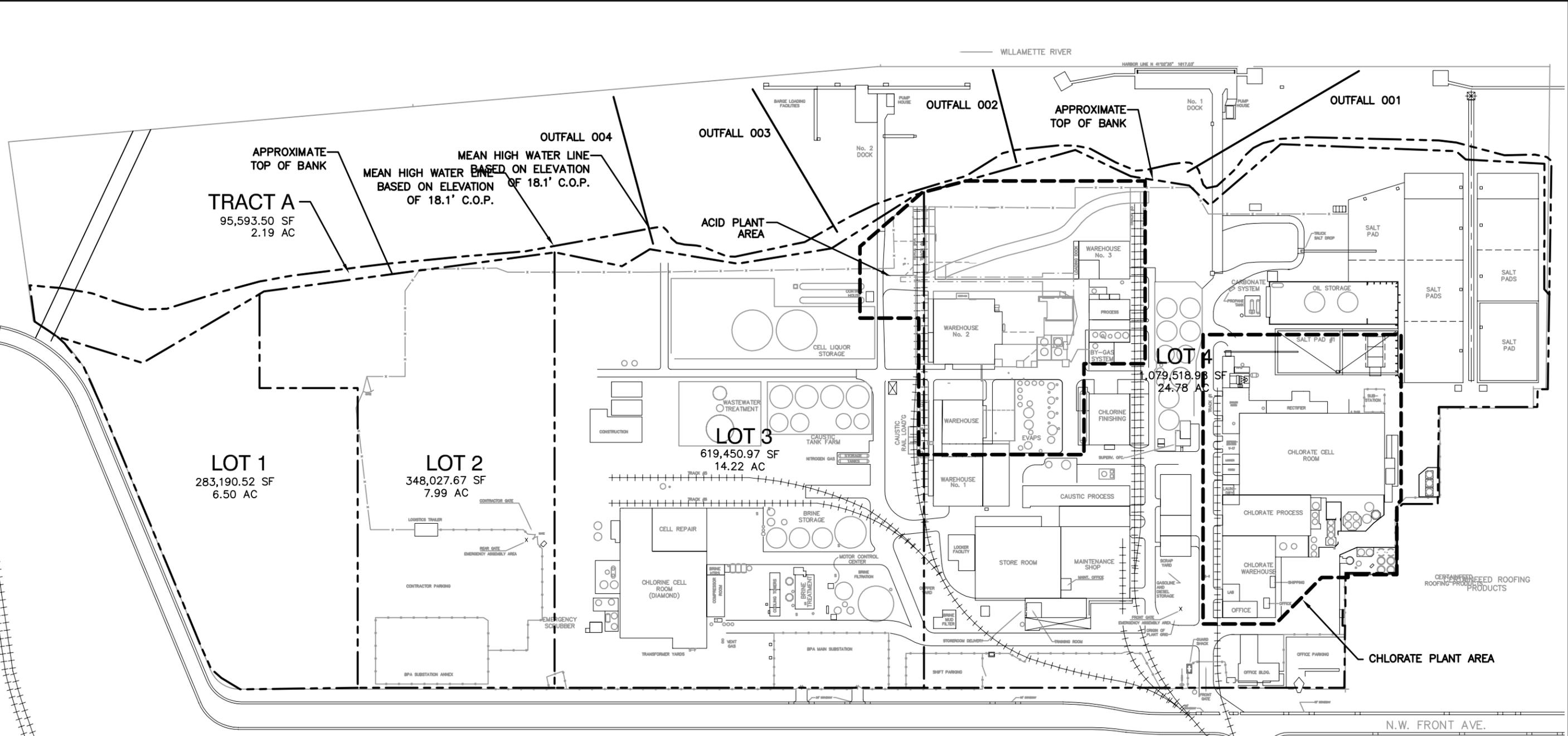
SUPPLEMENTAL FIGURES

- Figure 4. Map of Site, Adjacent Properties, and Areas of Concern
- Figure 4-10. DDT, DDD, and DDE Concentrations in Surface Soil Samples (ERM 2004a)
- Figure 5. DDT, DDD, and DDE Concentrations in Riverbank Soil Samples

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Project No. 5893.00
 Date: 08/10/04
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LEGEND
 AREA OF CONCERN
 APPROXIMATE LOT BOUNDARIES

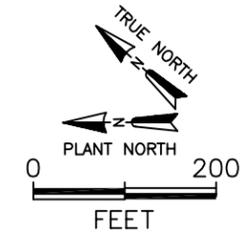
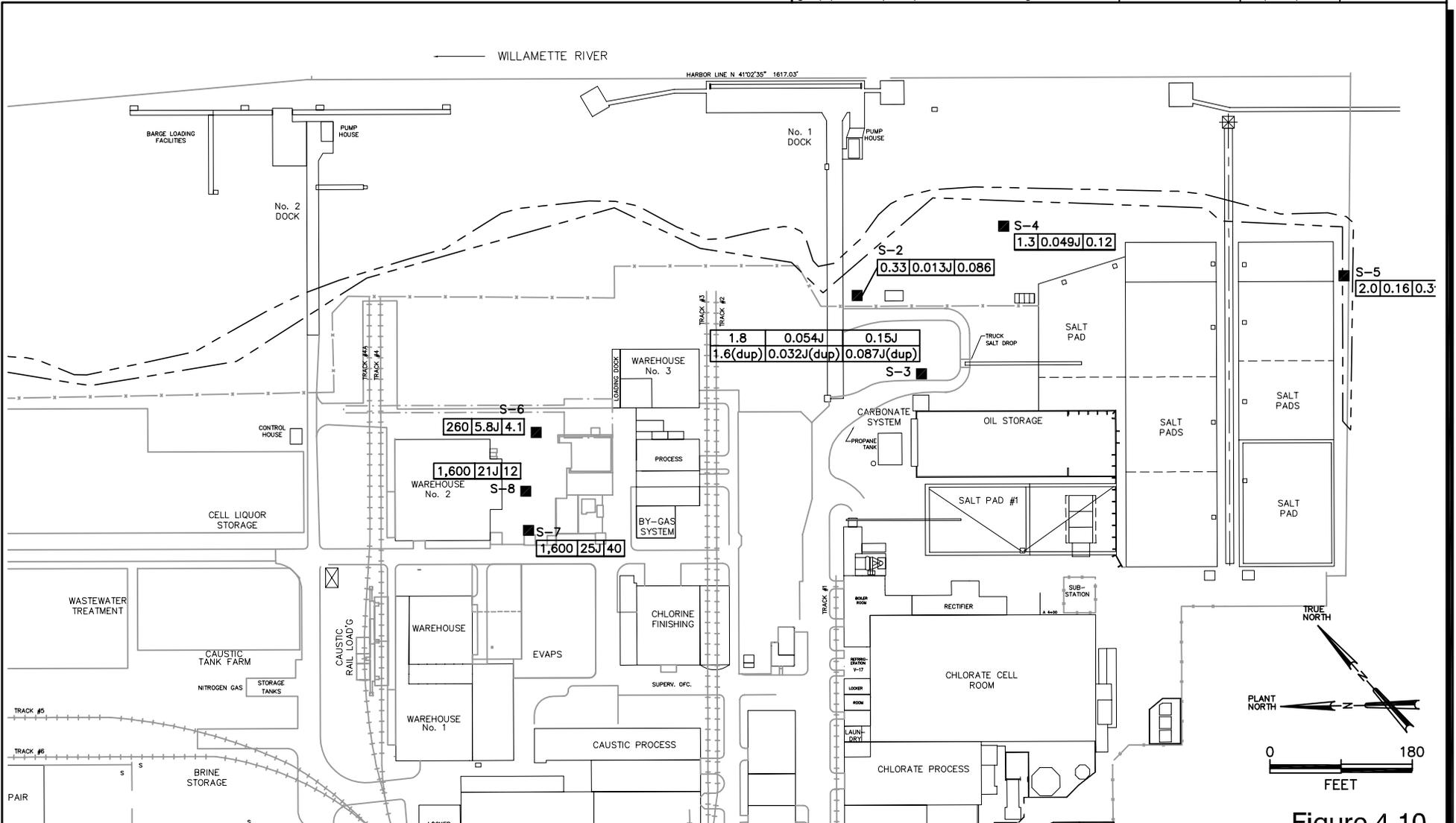


Figure 4
 Map of Site, Adjacent Properties, and
 Areas of Concern
 Arkema Inc.
 Portland, Oregon



LEGEND

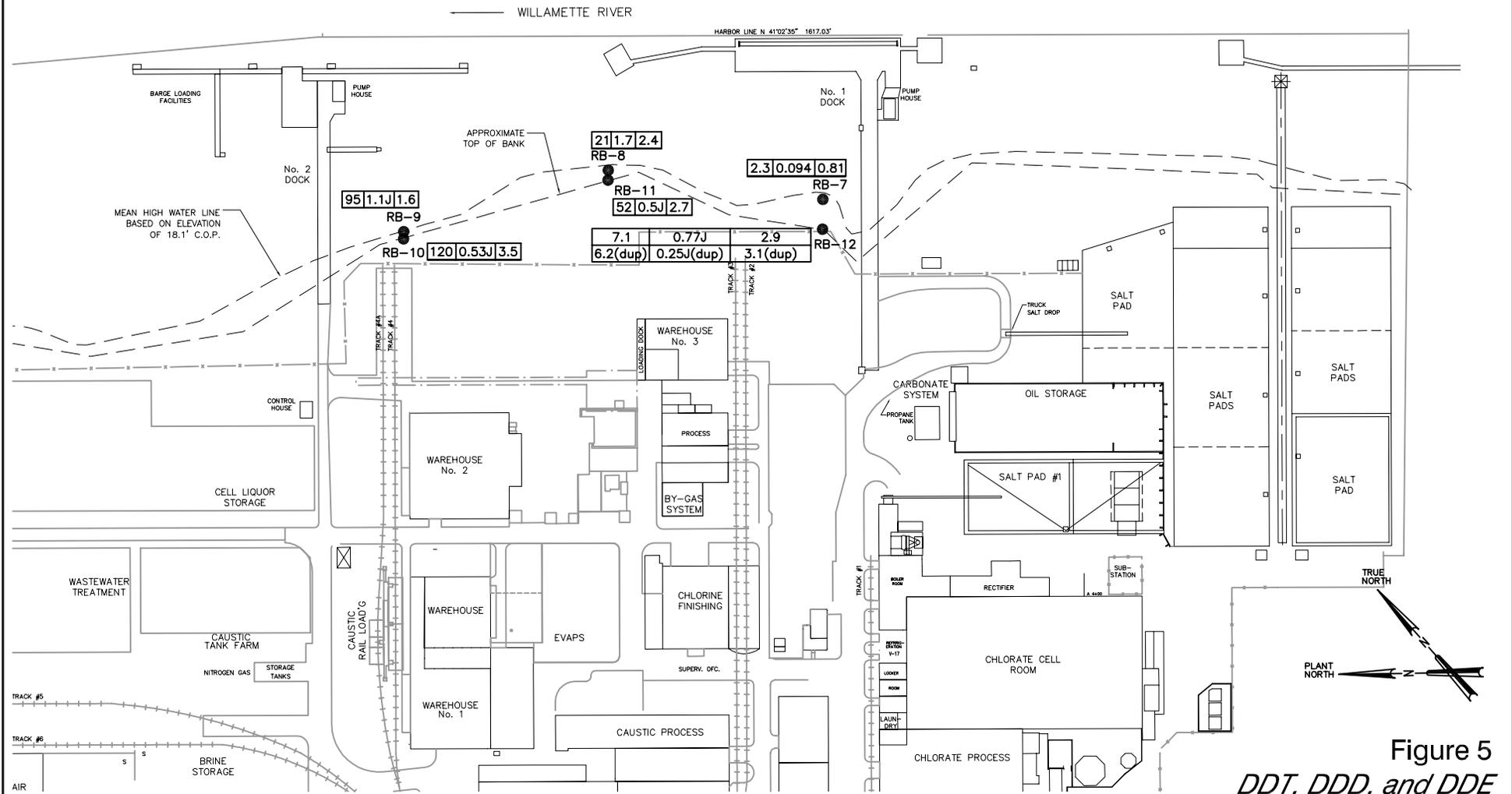
■ Surface Soil Sample Location

4,4'-DDT Concentration (mg/kg)
 4,4'-DDD Concentration (mg/kg)
 4,4'-DDE Concentration (mg/kg)

J=Estimated Concentration

1,600 | 25J | 40

Figure 4-10
DDT, DDD, and DDE Concentrations in Soil Surface Soil Samples Arkema Inc. Portland, Oregon



LEGEND

- Riverbank Soil Sample Location
- Willamette River Bank

95 1.1J 1.6	4,4'-DDT Concentration (mg/kg)
	4,4'-DDD Concentration (mg/kg)
	4,4'-DDE Concentration (mg/kg)

J=Estimated Concentration



Note:
A number of buildings and structures noted on this diagram have been demolished and/or removed.

Figure 5
DDT, DDD, and DDE Concentrations in Soil Riverbank Soil Samples Arkema Inc. Portland, Oregon

SUPPLEMENTAL TABLES

- Table 3. Inorganic Compounds, Natural Attenuation Parameters, and Conventional Analyte Results – June 2003 (ATOFINA 2003)
- Table 4. Volatile Organic Compound Results – June 2003 (ATOFINA 2003)
- Table 5. Polynuclear Aromatic Hydrocarbon and Total Petroleum Hydrocarbon Results – June 2003 (ATOFINA 2003)
- Table 6. Pesticide Results – June 2003 (ATOFINA 2003)

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Table 3
ATOFINA Chemicals, Inc. - Portland, Oregon
Inorganic Compounds, Natural Attenuation Parameters, and Conventional Analyte Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-2	MWA-3	MWA-4	MWA-5	MWA-6r	MWA-7
			6/9/2003	6/9/2003	6/9/2003	6/6/2003	6/5/2003	6/4/2003
			GW-060903-01	GW-060903-04	GW-060903-07	GW-060603-06	GW-060503-02	GW-060403-01
Chromium	6020	mg/L	NA	NA	0.00236	NA	0.0189	NA
Iron	6010B	mg/L	11.8	0.100 U	NA	NA	NA	NA
Manganese	6010B	mg/L	1.16	0.189	NA	NA	NA	NA
Chloride	300.0	mg/L	981	107	234	859	1850	175
Nitrate-Nitrogen	300.0	mg/L	1.00 U	2.02	1.00 U	1.00 R	0.18	0.100 U
Nitrite-Nitrogen	300.0	mg/L	1.00 U	0.100 U	1.00 U	1.00 R	10.0 U	0.100 U
Sulfate	300.0	mg/L	490 J	46	299 J	10.0 UJ	110	69.8
Total Alkalinity	310.1	mg/L as CaCO ₃	43.5	314	500	742	894	378
Methane	RSK 175	µg/L	1.20 U	112	NA	NA	NA	2590
Total Organic Carbon	415.1	mg/L	6.05	3.74	23.8	23.2	16.2	13.8
Perchlorate	314.0	µg/L	1400	92 UF	100 UF	NA	27 UF	NA

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed
NV - Not validated

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Inorganic Compounds, Natural Attenuation Parameters, and Conventional Analyte Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-8i	MWA-9i	MWA-10i	MWA-11i	MWA-12i	MWA-13d
			6/9/2003	6/9/2003	6/10/2003	6/10/2003	6/3/2003	6/9/2003
			GW-060903-02	GW-060903-06	GW-061003-01	GW-061003-03	GW-060303-01	GW-060903-03
Chromium	6020	mg/L	NA	NA	NA	NA	NA	NA
Iron	6010B	mg/L	NA	NA	NA	NA	NA	NA
Manganese	6010B	mg/L	NA	NA	NA	NA	NA	NA
Chloride	300.0	mg/L	2380	2860	1240	550	14.5	3240
Nitrate-Nitrogen	300.0	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	0.100 UJ	1.00 U
Nitrite-Nitrogen	300.0	mg/L	1.00 U	10.0 U	1.00 U	1.00 U	0.100 UJ	1.00 U
Sulfate	300.0	mg/L	141 J	495 J	242	10.0 U	1.00 U	264 J
Total Alkalinity	310.1	mg/L as CaCO ₃	1100	650	548	308	445	454
Methane	RSK 175	µg/L	NA	NA	NA	NA	NA	NA
Total Organic Carbon	415.1	mg/L	43.9	49.6	13.7	5.19	5.38	8.86
Perchlorate	314.0	µg/L	20 U	730	260	20 U	NA	20 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed
NV - Not validated

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Inorganic Compounds, Natural Attenuation Parameters, and Conventional Analyte Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-14i	MWA-15r	MWA-16i	MWA-17si	MWA-18	MWA-19
			6/6/2003	6/10/2003	6/5/2003	6/9/2003	6/6/2003	6/6/2003
			GW-060603-07	GW-061003-04	GW-060503-01	GW-060903-05	GW-060603-03	GW-060603-04
Chromium	6020	mg/L	NA	NA	0.992	NA	NA	NA
Iron	6010B	mg/L	NA	3.43	NA	NA	NA	NA
Manganese	6010B	mg/L	NA	0.0788	NA	NA	NA	NA
Chloride	300.0	mg/L	1720	388	2180	1970	1410	5180
Nitrate-Nitrogen	300.0	mg/L	1 J	10.4	0.100 U	1.6	2.9 J	1.8 J
Nitrite-Nitrogen	300.0	mg/L	1.00 R	1.00 U	10.0 U	10.0 U	1.00 R	10.0 R
Sulfate	300.0	mg/L	105 J	283	73	1900 J	37.4 J	61.2 J
Total Alkalinity	310.1	mg/L as CaCO ₃	668	865	710	10.0 U	211	243
Methane	RSK 175	µg/L	NA	121	NA	NA	NA	NA
Total Organic Carbon	415.1	mg/L	18.9	50.6	29.7	19.4	4.89	7.05
Perchlorate	314.0	µg/L	NA	350	33 UF	9900	NA	82 UF

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed
NV - Not validated

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Inorganic Compounds, Natural Attenuation Parameters, and Conventional Analyte Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-20	MWA-22	MWA-23	MWA-23	MWA-24	MWA-25
			6/5/2003	6/10/2003	6/4/2003	7/29/2003	6/5/2003	6/6/2003
			GW-060503-03	GW-061003-02	GW-060403-02	GW-072903-01	GW-060503-04	GW-060603-02
Chromium	6020	mg/L	NA	NA	0.00117	NA	NA	9.79
Iron	6010B	mg/L	NA	NA	12.7	NA	NA	0.100 U
Manganese	6010B	mg/L	NA	NA	4.22	NA	NA	0.173
Chloride	300.0	mg/L	1500	6210	43.4	NA	583	2980
Nitrate-Nitrogen	300.0	mg/L	0.77	1.00 U	0.69	NA	0.100 U	1.00 R
Nitrite-Nitrogen	300.0	mg/L	10.0 U	10.0 U	0.100 U	NA	10.0 U	10.0 R
Sulfate	300.0	mg/L	52.3	1190	154	NA	202	351 J
Total Alkalinity	310.1	mg/L as CaCO ₃	780	5720	153	NA	7230	986
Methane	RSK 175	µg/L	NA	NA	80.9	NA	NA	2470
Total Organic Carbon	415.1	mg/L	20.8	439	4.59	NA	889	29
Perchlorate	314.0	µg/L	NA	NA	NA	20 U,NV	NA	NA

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed
NV - Not validated

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Inorganic Compounds, Natural Attenuation Parameters, and Conventional Analyte Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-25	MWA-26	MWA-26	MWA-27	MWA-28i	MWA-28i
			7/29/2003	6/4/2003	7/29/2003	6/4/2003	6/6/2003	7/29/2003
			GW-072903-04	GW-060403-03	GW-072903-02	GW-060403-04	GW-060603-01	GW-072903-03
Chromium	6020	mg/L	NA	1.02	NA	4.3	0.00100 U	NA
Iron	6010B	mg/L	NA	NA	NA	0.100 U	NA	NA
Manganese	6010B	mg/L	NA	NA	NA	0.732	NA	NA
Chloride	300.0	mg/L	NA	632	NA	9360	5.36	NA
Nitrate-Nitrogen	300.0	mg/L	NA	0.65	NA	10.0 U	0.100 R	NA
Nitrite-Nitrogen	300.0	mg/L	NA	0.100 U	NA	10.0 U	0.100 R	NA
Sulfate	300.0	mg/L	NA	73.6	NA	290	1.00 UJ	NA
Total Alkalinity	310.1	mg/L as CaCO ₃	NA	219	NA	398	295	NA
Methane	RSK 175	µg/L	NA	NA	NA	148	NA	NA
Total Organic Carbon	415.1	mg/L	NA	8.32	NA	14.5	4.01	NA
Perchlorate	314.0	µg/L	290000 NV	NA	1200 NV	210000	NA	20 U,NV

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed
NV - Not validated

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Inorganic Compounds, Natural Attenuation Parameters, and Conventional Analyte Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-29	MWA-30	MWA-31i	MWA-32ia	MWA-33	MWA-33
			6/4/2003	6/4/2003	6/4/2003	6/4/2003	6/11/2003	6/11/2003
			GW-060403-06	GW-060403-08	GW-060403-07	GW-060403-10	GW-061103-02	GW-061103-03
Chromium	6020	mg/L	0.0284	0.562	1.15	0.238	0.226	0.601
Iron	6010B	mg/L	NA	0.264	NA	NA	5.59	9.99
Manganese	6010B	mg/L	NA	1.19	NA	NA	0.142	0.219
Chloride	300.0	mg/L	11700	164000	61100	31000	286	210
Nitrate-Nitrogen	300.0	mg/L	10.0 U	100 U	100 U	100 U	1.00 U	1.00 U
Nitrite-Nitrogen	300.0	mg/L	10.0 U	100 U	100 U	100 U	1.00 U	1.00 U
Sulfate	300.0	mg/L	291	1530	381	399	156	167
Total Alkalinity	310.1	mg/L as CaCO ₃	212	78.8	147	286	1110	1190
Methane	RSK 175	µg/L	NA	2.18 J	NA	NA	4900	6450
Total Organic Carbon	415.1	mg/L	7.53	1.00 U	1.00 U	15.7	17.5	40.7
Perchlorate	314.0	µg/L	110 UF	7900	4700	200000	320	840

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed
NV - Not validated

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Inorganic Compounds, Natural Attenuation Parameters, and Conventional Analyte Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-33a	MWA-33 (Dup)	MWA-34ia	NMP-3D	NMP-4D	NMP-4D (Dup)
			6/5/2003	6/5/2003	6/6/2003	6/11/2003	6/10/2003	6/10/2003
			GW-060503-05	GW-060503-06	GW-060603-05	GW-061103-01	GW-061003-06	GW-061003-07
Chromium	6020	mg/L	0.532	0.514	0.142	NA	NA	NA
Iron	6010B	mg/L	2.27	NA	NA	1.04	3.71	3.49
Manganese	6010B	mg/L	0.068	NA	NA	0.781	0.473	0.559
Chloride	300.0	mg/L	198	208	3040	2260	2180	2150
Nitrate-Nitrogen	300.0	mg/L	3.42 J	0.100 UJ	1.00 R	3	1.00 U	1.00 U
Nitrite-Nitrogen	300.0	mg/L	0.100 UJ	0.100 UJ	1.00 R	1.00 U	1.00 U	1.00 U
Sulfate	300.0	mg/L	177	196	80.3 J	2900	3470	3500
Total Alkalinity	310.1	mg/L as CaCO ₃	1200	1210	1950	50.0 U	25.4	22.5
Methane	RSK 175	µg/L	NA	NA	NA	1440	1030	1060
Total Organic Carbon	415.1	mg/L	22.9	22.3	34.5	28.8	37.6	39.9
Perchlorate	314.0	µg/L	540	570	4600	NA	NA	NA

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed
NV - Not validated

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Inorganic Compounds, Natural Attenuation Parameters, and Conventional Analyte Results
June 2003 Groundwater Sampling

Analyte	Method	Units	Rinsate	Rinsate	Rinsate	Trip Blank	Trip Blank
			6/4/2003	6/9/2003	6/10/2003	6/3/2003	6/10/2003
			GW-060403-05	GW-060903-08	GW-061003-05	Trip Blank-01	Trip Blank-05
Chromium	6020	mg/L	0.00100 U	0.00100 U	NA	NA	NA
Iron	6010B	mg/L	NA	NA	NA	NA	NA
Manganese	6010B	mg/L	NA	NA	NA	NA	NA
Chloride	300.0	mg/L	NA	NA	NA	NA	NA
Nitrate-Nitrogen	300.0	mg/L	NA	NA	NA	NA	NA
Nitrite-Nitrogen	300.0	mg/L	NA	NA	NA	NA	NA
Sulfate	300.0	mg/L	NA	NA	NA	NA	NA
Total Alkalinity	310.1	mg/L as CaCO ₃	NA	NA	NA	NA	NA
Methane	RSK 175	µg/L	NA	NA	NA	1.20 U	1.20 U
Total Organic Carbon	415.1	mg/L	NA	NA	1.20 U	NA	NA
Perchlorate	314.0	µg/L	31	NA	20 U	NA	NA

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed
NV - Not validated

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-2	MWA-3	MWA-4	MWA-5
			6/9/2003	6/9/2003	6/9/2003	6/6/2003
			GW-060903-01	GW-060903-04	GW-060903-07	GW-060603-06
1,1,1,2-Tetrachloroethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,1,1-Trichloroethane	8260B	µg/L	50.0 U	0.53	2.50 U	0.500 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,1,2-Trichloroethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,1-Dichloroethane	8260B	µg/L	50.0 U	1.62	2.50 U	2.61
1,1-Dichloroethene	8260B	µg/L	50.0 U	0.500 U	2.50 U	1.39
1,1-Dichloropropene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,2,3-Trichlorobenzene	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
1,2,3-Trichloropropane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,2,4-Trichlorobenzene	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
1,2,4-Trimethylbenzene	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	200 U	2.00 U	10.0 U	2.00 U
1,2-Dibromoethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,2-Dichlorobenzene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,2-Dichloroethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,2-Dichloropropane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,3,5-Trimethylbenzene	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
1,3-Dichlorobenzene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,3-Dichloropropane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
1,4-Dichlorobenzene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
2,2-Dichloropropane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
2-Butanone	8260B	µg/L	1000 U	10.0 U	50.0 U	10.0 U
2-Chlorotoluene	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
2-Hexanone	8260B	µg/L	1000 U	10.0 U	50.0 U	10.0 U
4-Chlorotoluene	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
4-Methyl-2-pentanone	8260B	µg/L	500 U	5.00 U	25.0 U	5.00 U
Acetone	8260B	µg/L	2000 U	20.0 U	100 U	20.0 U
Benzene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Bromobenzene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Bromochloromethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Bromodichloromethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Bromoform	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Bromomethane	8260B	µg/L	200 U	2.00 U	10.0 U	2.00 U
Carbon disulfide	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
Carbon tetrachloride	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Chlorobenzene	8260B	µg/L	13700	176	646	23.1
Chloroethane	8260B	µg/L	50.0 U	0.74	2.50 U	1.62
Chloroform	8260B	µg/L	144 U	7.65 U	4.55 U	0.500 U
Chloromethane	8260B	µg/L	200 U	2.00 U	10.0 U	2.00 U
cis-1,2-Dichloroethene	8260B	µg/L	50.0 U	4.45	2.50 U	0.500 U
cis-1,3-Dichloropropene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Dibromochloromethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Dibromomethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Dichlorodifluoromethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-2	MWA-3	MWA-4	MWA-5
			6/9/2003	6/9/2003	6/9/2003	6/6/2003
			GW-060903-01	GW-060903-04	GW-060903-07	GW-060603-06
Ethylbenzene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Hexachlorobutadiene	8260B	µg/L	200 U	2.00 U	10.0 U	2.00 U
Isopropylbenzene	8260B	µg/L	200 U	2.00 U	10.0 U	2.00 U
m,p-Xylene	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
Methyl tert-butyl ether	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
Methylene chloride	8260B	µg/L	500 U	5.00 U	25.0 U	5.00 U
Naphthalene	8260B	µg/L	200 U	2.00 U	10.0 U	2.00 U
n-Butylbenzene	8260B	µg/L	500 U	5.00 U	25.0 U	5.00 U
n-Propylbenzene	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
o-Xylene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
p-Isopropyltoluene	8260B	µg/L	200 U	2.00 U	10.0 U	2.00 U
sec-Butylbenzene	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
Styrene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
tert-Butylbenzene	8260B	µg/L	100 U	1.00 U	5.00 U	1.00 U
Tetrachloroethene	8260B	µg/L	50.0 U	14.7	2.75	0.500 U
Toluene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
trans-1,2-Dichloroethene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
trans-1,3-Dichloropropene	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Trichloroethene	8260B	µg/L	50.0 U	5.54	2.50 U	0.500 U
Trichlorofluoromethane	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U
Vinyl chloride	8260B	µg/L	50.0 U	0.500 U	2.50 U	0.500 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-6r	MWA-7	MWA-8i	MWA-9i
			6/5/2003	6/4/2003	6/9/2003	6/9/2003
			GW-060503-02	GW-060403-01	GW-060903-02	GW-060903-06
1,1,1,2-Tetrachloroethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,1,1-Trichloroethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,1,2-Trichloroethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,1-Dichloroethane	8260B	µg/L	10.0 U	0.500 U	1	100 U
1,1-Dichloroethene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,1-Dichloropropene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,2,3-Trichlorobenzene	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
1,2,3-Trichloropropane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,2,4-Trichlorobenzene	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
1,2,4-Trimethylbenzene	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	40.0 U	2.00 U	2.00 U	400 U
1,2-Dibromoethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,2-Dichlorobenzene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,2-Dichloroethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,2-Dichloropropane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,3,5-Trimethylbenzene	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
1,3-Dichlorobenzene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,3-Dichloropropane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
1,4-Dichlorobenzene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
2,2-Dichloropropane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
2-Butanone	8260B	µg/L	200 U	10.0 U	10.0 U	2000 U
2-Chlorotoluene	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
2-Hexanone	8260B	µg/L	200 U	10.0 U	10.0 U	2000 U
4-Chlorotoluene	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
4-Methyl-2-pentanone	8260B	µg/L	100 U	5.00 U	5.00 U	1000 U
Acetone	8260B	µg/L	400 U	20.0 R	20.0 U	4000 U
Benzene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Bromobenzene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Bromochloromethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Bromodichloromethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Bromoform	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Bromomethane	8260B	µg/L	40.0 U	2.00 U	2.00 U	400 U
Carbon disulfide	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
Carbon tetrachloride	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Chlorobenzene	8260B	µg/L	2620	0.500 U	22.7	32100
Chloroethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Chloroform	8260B	µg/L	14.2 U	0.500 U	0.500 U	100 U
Chloromethane	8260B	µg/L	40.0 U	2.00 U	2.00 U	400 U
cis-1,2-Dichloroethene	8260B	µg/L	67.2	0.500 U	0.500 U	100 U
cis-1,3-Dichloropropene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Dibromochloromethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Dibromomethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Dichlorodifluoromethane	8260B	µg/L	10.0 U	0.500 UJ	0.500 U	100 U

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-6r	MWA-7	MWA-8i	MWA-9i
			6/5/2003	6/4/2003	6/9/2003	6/9/2003
			GW-060503-02	GW-060403-01	GW-060903-02	GW-060903-06
Ethylbenzene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Hexachlorobutadiene	8260B	µg/L	40.0 U	2.00 U	2.00 U	400 U
Isopropylbenzene	8260B	µg/L	40.0 U	2.00 U	2.00 U	400 U
m,p-Xylene	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
Methyl tert-butyl ether	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
Methylene chloride	8260B	µg/L	100 U	5.00 U	5.00 U	1000 U
Naphthalene	8260B	µg/L	40.0 U	2.00 U	2.00 U	400 U
n-Butylbenzene	8260B	µg/L	100 U	5.00 U	5.00 U	1000 U
n-Propylbenzene	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
o-Xylene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
p-Isopropyltoluene	8260B	µg/L	40.0 U	2.00 U	2.00 U	400 U
sec-Butylbenzene	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
Styrene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
tert-Butylbenzene	8260B	µg/L	20.0 U	1.00 U	1.00 U	200 U
Tetrachloroethene	8260B	µg/L	223	0.500 U	0.500 U	100 U
Toluene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
trans-1,2-Dichloroethene	8260B	µg/L	12.6	0.500 U	0.500 U	100 U
trans-1,3-Dichloropropene	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Trichloroethene	8260B	µg/L	38.8	0.500 U	0.500 U	100 U
Trichlorofluoromethane	8260B	µg/L	10.0 U	0.500 U	0.500 U	100 U
Vinyl chloride	8260B	µg/L	28.4	0.500 U	0.500 U	100 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-10i	MWA-11i	MWA-12i	MWA-13d
			6/10/2003	6/10/2003	6/3/2003	6/9/2003
			GW-061003-01	GW-061003-03	GW-060303-01	GW-060903-03
1,1,1,2-Tetrachloroethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,1,1-Trichloroethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,1,2-Trichloroethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,1-Dichloroethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.68
1,1-Dichloroethene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,1-Dichloropropene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,2,3-Trichlorobenzene	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
1,2,3-Trichloropropane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,2,4-Trichlorobenzene	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
1,2,4-Trimethylbenzene	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	200 U	2.00 U	2.00 U	2.00 U
1,2-Dibromoethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,2-Dichlorobenzene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,2-Dichloroethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,2-Dichloropropane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,3,5-Trimethylbenzene	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
1,3-Dichlorobenzene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,3-Dichloropropane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
1,4-Dichlorobenzene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
2,2-Dichloropropane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
2-Butanone	8260B	µg/L	1000 U	10.0 U	10.0 U	10.0 U
2-Chlorotoluene	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
2-Hexanone	8260B	µg/L	1000 U	10.0 U	10.0 U	10.0 U
4-Chlorotoluene	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
4-Methyl-2-pentanone	8260B	µg/L	500 U	5.00 U	5.00 U	5.00 U
Acetone	8260B	µg/L	2000 U	20.0 U	20.0 R	20.0 U
Benzene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Bromobenzene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Bromochloromethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Bromodichloromethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Bromoform	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Bromomethane	8260B	µg/L	200 U	2.00 U	2.00 U	2.00 U
Carbon disulfide	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
Carbon tetrachloride	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Chlorobenzene	8260B	µg/L	15800	0.71 U	0.500 U	10.6
Chloroethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Chloroform	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Chloromethane	8260B	µg/L	200 U	2.00 U	2.00 U	2.00 U
cis-1,2-Dichloroethene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
cis-1,3-Dichloropropene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Dibromochloromethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Dibromomethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Dichlorodifluoromethane	8260B	µg/L	50.0 U	0.500 U	0.500 UJ	0.500 U

Table 4
A TOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-10i	MWA-11i	MWA-12i	MWA-13d
			6/10/2003	6/10/2003	6/3/2003	6/9/2003
			GW-061003-01	GW-061003-03	GW-060303-01	GW-060903-03
Ethylbenzene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Hexachlorobutadiene	8260B	µg/L	200 U	2.00 U	2.00 U	2.00 U
Isopropylbenzene	8260B	µg/L	200 U	2.00 U	2.00 U	2.00 U
m,p-Xylene	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
Methyl tert-butyl ether	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
Methylene chloride	8260B	µg/L	500 U	5.00 U	5.00 U	5.00 U
Naphthalene	8260B	µg/L	200 U	2.00 U	2.00 U	2.00 U
n-Butylbenzene	8260B	µg/L	500 U	5.00 U	5.00 U	5.00 U
n-Propylbenzene	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
o-Xylene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
p-Isopropyltoluene	8260B	µg/L	200 U	2.00 U	2.00 U	2.00 U
sec-Butylbenzene	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
Styrene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
tert-Butylbenzene	8260B	µg/L	100 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Toluene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
trans-1,2-Dichloroethene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
trans-1,3-Dichloropropene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Trichloroethene	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Trichlorofluoromethane	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U
Vinyl chloride	8260B	µg/L	50.0 U	0.500 U	0.500 U	0.500 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-14i	MWA-15r	MWA-16i	MWA-17si
			6/6/2003	6/10/2003	6/5/2003	6/9/2003
			GW-060603-07	GW-061003-04	GW-060503-01	GW-060903-05
1,1,1,2-Tetrachloroethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,1,1-Trichloroethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,1,2-Trichloroethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,1-Dichloroethane	8260B	µg/L	1.7	50.0 U	0.82	500 U
1,1-Dichloroethene	8260B	µg/L	1.25	50.0 U	0.500 U	500 U
1,1-Dichloropropene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
1,2,3-Trichloropropane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.00 U	200 U	2.00 U	2000 U
1,2-Dibromoethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,2-Dichlorobenzene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,2-Dichloroethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,2-Dichloropropane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
1,3-Dichlorobenzene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,3-Dichloropropane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
1,4-Dichlorobenzene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
2,2-Dichloropropane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
2-Butanone	8260B	µg/L	10.0 U	1000 U	10.0 U	10000 U
2-Chlorotoluene	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
2-Hexanone	8260B	µg/L	10.0 U	1000 U	10.0 U	10000 U
4-Chlorotoluene	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
4-Methyl-2-pentanone	8260B	µg/L	5.00 U	500 U	5.00 U	5000 U
Acetone	8260B	µg/L	20.0 U	2000 U	20.0 U	20000 U
Benzene	8260B	µg/L	0.500 U	50.0 U	0.87	500 U
Bromobenzene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Bromochloromethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Bromodichloromethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Bromoform	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Bromomethane	8260B	µg/L	2.00 U	200 U	2.00 U	2000 U
Carbon disulfide	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
Carbon tetrachloride	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Chlorobenzene	8260B	µg/L	0.5 U	13300	17.5	73200
Chloroethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Chloroform	8260B	µg/L	0.500 U	219 U	0.71 U	550 U
Chloromethane	8260B	µg/L	2.00 U	200 U	2.00 U	2000 U
cis-1,2-Dichloroethene	8260B	µg/L	0.500 U	50.0 U	0.51	500 U
cis-1,3-Dichloropropene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Dibromochloromethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Dibromomethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Dichlorodifluoromethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-14i	MWA-15r	MWA-16i	MWA-17si
			6/6/2003	6/10/2003	6/5/2003	6/9/2003
			GW-060603-07	GW-061003-04	GW-060503-01	GW-060903-05
Ethylbenzene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Hexachlorobutadiene	8260B	µg/L	2.00 U	200 U	2.00 U	2000 U
Isopropylbenzene	8260B	µg/L	2.00 U	200 U	2.00 U	2000 U
m,p-Xylene	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
Methyl tert-butyl ether	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
Methylene chloride	8260B	µg/L	5.00 U	500 U	5.00 U	5000 U
Naphthalene	8260B	µg/L	2.00 U	200 U	2.00 U	2000 U
n-Butylbenzene	8260B	µg/L	5.00 U	500 U	5.00 U	5000 U
n-Propylbenzene	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
o-Xylene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
p-Isopropyltoluene	8260B	µg/L	2.00 U	200 U	2.00 U	2000 U
sec-Butylbenzene	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
Styrene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
tert-Butylbenzene	8260B	µg/L	1.00 U	100 U	1.00 U	1000 U
Tetrachloroethene	8260B	µg/L	0.500 U	50.0 U	5.78	500 U
Toluene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
trans-1,2-Dichloroethene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
trans-1,3-Dichloropropene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Trichloroethene	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Trichlorofluoromethane	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U
Vinyl chloride	8260B	µg/L	0.500 U	50.0 U	0.500 U	500 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-18	MWA-19	MWA-20	MWA-22
			6/6/2003	6/6/2003	6/5/2003	6/10/2003
			GW-060603-03	GW-060603-04	GW-060503-03	GW-061003-02
1,1,1,2-Tetrachloroethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,1,1-Trichloroethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,1,2-Trichloroethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,1-Dichloroethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,1-Dichloroethene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,1-Dichloropropene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
1,2,3-Trichloropropane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.00 U	2.00 U	4.00 U	4.00 U
1,2-Dibromoethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,2-Dichlorobenzene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,2-Dichloroethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,2-Dichloropropane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
1,3-Dichlorobenzene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,3-Dichloropropane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
1,4-Dichlorobenzene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
2,2-Dichloropropane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
2-Butanone	8260B	µg/L	10.0 U	10.0 U	20.0 U	20.0 U
2-Chlorotoluene	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
2-Hexanone	8260B	µg/L	10.0 U	10.0 U	20.0 U	20.0 U
4-Chlorotoluene	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
4-Methyl-2-pentanone	8260B	µg/L	5.00 U	5.00 U	10.0 U	10.0 U
Acetone	8260B	µg/L	20.0 U	20.0 U	40.0 U	40.0 U
Benzene	8260B	µg/L	0.500 U	0.500 U	3.32	1.00 U
Bromobenzene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Bromochloromethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Bromodichloromethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Bromoform	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Bromomethane	8260B	µg/L	2.00 U	2.00 U	4.00 U	4.00 U
Carbon disulfide	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
Carbon tetrachloride	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Chlorobenzene	8260B	µg/L	3.06 U	0.64 U	215	128
Chloroethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Chloroform	8260B	µg/L	11.7 U	1.8 U	1.00 U	1.00 U
Chloromethane	8260B	µg/L	2.00 U	2.00 U	4.00 U	4.00 U
cis-1,2-Dichloroethene	8260B	µg/L	0.500 U	0.500 U	1.00 U	25.5
cis-1,3-Dichloropropene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Dibromochloromethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Dibromomethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Dichlorodifluoromethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-18	MWA-19	MWA-20	MWA-22
			6/6/2003	6/6/2003	6/5/2003	6/10/2003
			GW-060603-03	GW-060603-04	GW-060503-03	GW-061003-02
Ethylbenzene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Hexachlorobutadiene	8260B	µg/L	2.00 U	2.00 U	4.00 U	4.00 U
Isopropylbenzene	8260B	µg/L	2.00 U	2.00 U	4.00 U	4.00 U
m,p-Xylene	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
Methyl tert-butyl ether	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
Methylene chloride	8260B	µg/L	5.00 U	5.00 U	10.0 U	10.0 U
Naphthalene	8260B	µg/L	2.00 U	2.00 U	4.00 U	4.00 U
n-Butylbenzene	8260B	µg/L	5.00 U	5.00 U	10.0 U	10.0 U
n-Propylbenzene	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
o-Xylene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
p-Isopropyltoluene	8260B	µg/L	2.00 U	2.00 U	4.00 U	4.00 U
sec-Butylbenzene	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
Styrene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
tert-Butylbenzene	8260B	µg/L	1.00 U	1.00 U	2.00 U	2.00 U
Tetrachloroethene	8260B	µg/L	22	64	1.00 U	1.00 U
Toluene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
trans-1,2-Dichloroethene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
trans-1,3-Dichloropropene	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Trichloroethene	8260B	µg/L	2.2	9.25	1.00 U	1.00 U
Trichlorofluoromethane	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.00 U
Vinyl chloride	8260B	µg/L	0.500 U	0.500 U	1.00 U	1.36

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-33a	MWA-34ia	NMP-3D	NMP-4D
			6/5/2003	6/6/2003	6/11/2003	6/10/2003
			GW-060503-05	GW-060603-05	GW-061103-01	GW-061003-06
1,1,1,2-Tetrachloroethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,1,1-Trichloroethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,1,2-Trichloroethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,1-Dichloroethane	8260B	µg/L	1.04	2.50 U	500 U	500 U
1,1-Dichloroethene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,1-Dichloropropene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
1,2,3-Trichloropropane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.00 U	10.0 U	2000 U	2000 U
1,2-Dibromoethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,2-Dichlorobenzene	8260B	µg/L	2.13	2.50 U	500 U	500 U
1,2-Dichloroethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,2-Dichloropropane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
1,3-Dichlorobenzene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,3-Dichloropropane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
1,4-Dichlorobenzene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
2,2-Dichloropropane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
2-Butanone	8260B	µg/L	10.0 U	50.0 U	10000 U	10000 U
2-Chlorotoluene	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
2-Hexanone	8260B	µg/L	10.0 U	50.0 U	10000 U	10000 U
4-Chlorotoluene	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
4-Methyl-2-pentanone	8260B	µg/L	5.00 U	25.0 U	5000 U	5000 U
Acetone	8260B	µg/L	20.0 U	100 U	20000 U	20000 U
Benzene	8260B	µg/L	1.35	2.6	500 U	500 U
Bromobenzene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Bromochloromethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Bromodichloromethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Bromoform	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Bromomethane	8260B	µg/L	2.00 U	10.0 U	2000 U	2000 U
Carbon disulfide	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
Carbon tetrachloride	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Chlorobenzene	8260B	µg/L	2.51 U	666	127000	185000
Chloroethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Chloroform	8260B	µg/L	0.8 U	10.2 U	510 U	1250 U
Chloromethane	8260B	µg/L	2.00 U	10.0 U	2000 U	2000 U
cis-1,2-Dichloroethene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
cis-1,3-Dichloropropene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Dibromochloromethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Dibromomethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Dichlorodifluoromethane	8260B	µg/L	0.500 U	2.50 U	500 UJ	500 UJ

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-33a	MWA-34ia	NMP-3D	NMP-4D
			6/5/2003	6/6/2003	6/11/2003	6/10/2003
			GW-060503-05	GW-060603-05	GW-061103-01	GW-061003-06
Ethylbenzene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Hexachlorobutadiene	8260B	µg/L	2.00 U	10.0 U	2000 U	2000 U
Isopropylbenzene	8260B	µg/L	2.00 U	10.0 U	2000 U	2000 U
m,p-Xylene	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
Methyl tert-butyl ether	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
Methylene chloride	8260B	µg/L	5.00 U	25.0 U	5000 U	5000 U
Naphthalene	8260B	µg/L	2.00 U	10.0 U	2000 U	2000 U
n-Butylbenzene	8260B	µg/L	5.00 U	25.0 U	5000 U	5000 U
n-Propylbenzene	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
o-Xylene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
p-Isopropyltoluene	8260B	µg/L	2.00 U	10.0 U	2000 U	2000 U
sec-Butylbenzene	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
Styrene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
tert-Butylbenzene	8260B	µg/L	1.00 U	5.00 U	1000 U	1000 U
Tetrachloroethene	8260B	µg/L	0.500 U	3.3	500 U	500 U
Toluene	8260B	µg/L	0.91	2.50 U	500 U	500 U
trans-1,2-Dichloroethene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
trans-1,3-Dichloropropene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Trichloroethene	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Trichlorofluoromethane	8260B	µg/L	0.500 U	2.50 U	500 U	500 U
Vinyl chloride	8260B	µg/L	0.500 U	2.50 U	500 U	500 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	NMP-4D(Dup)	Rinsate	Trip Blank	Trip Blank
			6/10/2003	6/10/2003	6/3/2003	6/5/2003
			GW-061003-07	GW-061003-05	Trip Blank-01	Trip Blank-02
1,1,1,2-Tetrachloroethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,1,1-Trichloroethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,1,2-Trichloroethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,1-Dichloroethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,1-Dichloroethene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,1-Dichloropropene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,2,3-Trichlorobenzene	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
1,2,3-Trichloropropane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,2,4-Trichlorobenzene	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
1,2,4-Trimethylbenzene	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2000 U	2.00 U	2.00 U	2.00 U
1,2-Dibromoethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,2-Dichlorobenzene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,2-Dichloroethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,2-Dichloropropane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,3,5-Trimethylbenzene	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
1,3-Dichlorobenzene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,3-Dichloropropane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
1,4-Dichlorobenzene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
2,2-Dichloropropane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
2-Butanone	8260B	µg/L	10000 U	10.0 U	10.0 U	10.0 U
2-Chlorotoluene	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
2-Hexanone	8260B	µg/L	10000 U	10.0 U	10.0 U	10.0 U
4-Chlorotoluene	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
4-Methyl-2-pentanone	8260B	µg/L	5000 U	5.00 U	5.00 U	5.00 U
Acetone	8260B	µg/L	20000 U	20.0 U	20.0 R	20.0 U
Benzene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Bromobenzene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Bromochloromethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Bromodichloromethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Bromoform	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Bromomethane	8260B	µg/L	2000 U	2.00 U	2.00 U	2.00 U
Carbon disulfide	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
Carbon tetrachloride	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Chlorobenzene	8260B	µg/L	146000	0.71	0.500 U	0.500 U
Chloroethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Chloroform	8260B	µg/L	1130 U	2.5	0.500 U	0.500 U
Chloromethane	8260B	µg/L	2000 U	2.00 U	2.00 U	2.00 U
cis-1,2-Dichloroethene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
cis-1,3-Dichloropropene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Dibromochloromethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Dibromomethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Dichlorodifluoromethane	8260B	µg/L	500 UJ	0.500 U	0.500 UJ	0.500 U

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	NMP-4D(Dup)	Rinsate	Trip Blank	Trip Blank
			6/10/2003	6/10/2003	6/3/2003	6/5/2003
			GW-061003-07	GW-061003-05	Trip Blank-01	Trip Blank-02
Ethylbenzene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Hexachlorobutadiene	8260B	µg/L	2000 U	2.00 U	2.00 U	2.00 U
Isopropylbenzene	8260B	µg/L	2000 U	2.00 U	2.00 U	2.00 U
m,p-Xylene	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
Methyl tert-butyl ether	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
Methylene chloride	8260B	µg/L	5000 U	5.00 U	5.00 U	5.00 U
Naphthalene	8260B	µg/L	2000 U	2.00 U	2.00 U	2.00 U
n-Butylbenzene	8260B	µg/L	5000 U	5.00 U	5.00 U	5.00 U
n-Propylbenzene	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
o-Xylene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
p-Isopropyltoluene	8260B	µg/L	2000 U	2.00 U	2.00 U	2.00 U
sec-Butylbenzene	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
Styrene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
tert-Butylbenzene	8260B	µg/L	1000 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Toluene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
trans-1,2-Dichloroethene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
trans-1,3-Dichloropropene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Trichloroethene	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Trichlorofluoromethane	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U
Vinyl chloride	8260B	µg/L	500 U	0.500 U	0.500 U	0.500 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	Trip Blank	Trip Blank
			6/10/2003	6/10/2003
			Trip Blank-05	Trip Blank-09
1,1,1,2-Tetrachloroethane	8260B	µg/L	0.500 U	0.500 U
1,1,1-Trichloroethane	8260B	µg/L	0.500 U	0.500 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	0.500 U	0.500 U
1,1,2-Trichloroethane	8260B	µg/L	0.500 U	0.500 U
1,1-Dichloroethane	8260B	µg/L	0.500 U	0.500 U
1,1-Dichloroethene	8260B	µg/L	0.500 U	0.500 U
1,1-Dichloropropene	8260B	µg/L	0.500 U	0.500 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.00 U	1.00 U
1,2,3-Trichloropropane	8260B	µg/L	0.500 U	0.500 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.00 U	1.00 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.00 U	1.00 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.00 U	2.00 U
1,2-Dibromoethane	8260B	µg/L	0.500 U	0.500 U
1,2-Dichlorobenzene	8260B	µg/L	0.500 U	0.500 U
1,2-Dichloroethane	8260B	µg/L	0.500 U	0.500 U
1,2-Dichloropropane	8260B	µg/L	0.500 U	0.500 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.00 U	1.00 U
1,3-Dichlorobenzene	8260B	µg/L	0.500 U	0.500 U
1,3-Dichloropropane	8260B	µg/L	0.500 U	0.500 U
1,4-Dichlorobenzene	8260B	µg/L	0.500 U	0.500 U
2,2-Dichloropropane	8260B	µg/L	0.500 UJ	0.500 U
2-Butanone	8260B	µg/L	10.0 U	10.0 U
2-Chlorotoluene	8260B	µg/L	1.00 U	1.00 U
2-Hexanone	8260B	µg/L	10.0 U	10.0 U
4-Chlorotoluene	8260B	µg/L	1.00 U	1.00 U
4-Methyl-2-pentanone	8260B	µg/L	5.00 U	5.00 U
Acetone	8260B	µg/L	20.0 U	20.0 U
Benzene	8260B	µg/L	0.500 U	0.500 U
Bromobenzene	8260B	µg/L	0.500 U	0.500 U
Bromochloromethane	8260B	µg/L	0.500 U	0.500 U
Bromodichloromethane	8260B	µg/L	0.500 U	0.500 U
Bromoform	8260B	µg/L	0.500 U	0.500 U
Bromomethane	8260B	µg/L	2.00 U	2.00 U
Carbon disulfide	8260B	µg/L	1.00 U	1.00 U
Carbon tetrachloride	8260B	µg/L	0.500 U	0.500 U
Chlorobenzene	8260B	µg/L	0.500 U	0.500 U
Chloroethane	8260B	µg/L	0.500 U	0.500 U
Chloroform	8260B	µg/L	0.500 U	0.500 U
Chloromethane	8260B	µg/L	2.00 U	2.00 U
cis-1,2-Dichloroethene	8260B	µg/L	0.500 U	0.500 U
cis-1,3-Dichloropropene	8260B	µg/L	0.500 U	0.500 U
Dibromochloromethane	8260B	µg/L	0.500 U	0.500 U
Dibromomethane	8260B	µg/L	0.500 U	0.500 U
Dichlorodifluoromethane	8260B	µg/L	0.500 U	0.500 U

Table 4
ATOFINA Chemicals, Inc. - Portland, Oregon
Volatile Organic Compound Results
June 2003 Groundwater Sampling

Analyte	Method	Units	Trip Blank	Trip Blank
			6/10/2003	6/10/2003
			Trip Blank-05	Trip Blank-09
Ethylbenzene	8260B	µg/L	0.500 U	0.500 U
Hexachlorobutadiene	8260B	µg/L	2.00 U	2.00 U
Isopropylbenzene	8260B	µg/L	2.00 U	2.00 U
m,p-Xylene	8260B	µg/L	1.00 U	1.00 U
Methyl tert-butyl ether	8260B	µg/L	1.00 U	1.00 U
Methylene chloride	8260B	µg/L	5.00 U	5.00 U
Naphthalene	8260B	µg/L	2.00 U	2.00 U
n-Butylbenzene	8260B	µg/L	5.00 U	5.00 U
n-Propylbenzene	8260B	µg/L	1.00 U	1.00 U
o-Xylene	8260B	µg/L	0.500 U	0.500 U
p-Isopropyltoluene	8260B	µg/L	2.00 U	2.00 U
sec-Butylbenzene	8260B	µg/L	1.00 U	1.00 U
Styrene	8260B	µg/L	0.500 U	0.500 U
tert-Butylbenzene	8260B	µg/L	1.00 U	1.00 U
Tetrachloroethene	8260B	µg/L	0.500 U	0.500 U
Toluene	8260B	µg/L	0.500 U	0.500 U
trans-1,2-Dichloroethene	8260B	µg/L	0.500 U	0.500 U
trans-1,3-Dichloropropene	8260B	µg/L	0.500 UJ	0.500 U
Trichloroethene	8260B	µg/L	0.500 U	0.500 U
Trichlorofluoromethane	8260B	µg/L	0.500 U	0.500 U
Vinyl chloride	8260B	µg/L	0.500 U	0.500 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 5
A TOFINA Chemicals, Inc. - Portland, Oregon
Polynuclear Aromatic Hydrocarbon and Total Petroleum Hydrocarbon Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-30	MWA-32ia	MWA-32 (Dup)	Rinsate
			6/4/2003	6/4/2003	6/4/2003	6/4/2003
			GW-060403-08	GW-060403-10	GW-060403-11	GW-060403-09
<u>TPH</u>						
Diesel Range Organics	NWTPH-Dx	mg/L	0.642	0.342	0.32	0.25 U
Heavy Oil Range Hydrocarbon	NWTPH-Dx	mg/L	0.500 U	0.500 U	0.500 U	0.500 U
<u>PAHs</u>						
Acenaphthene	8270 Mod	µg/L	0.100 U	0.272	0.256	0.125 U
Acenaphthylene	8270 Mod	µg/L	0.100 U	0.100 U	0.100 U	0.125 U
Anthracene	8270 Mod	µg/L	0.100 U	0.118	0.101	0.125 U
Benzo (a) anthracene	8270 Mod	µg/L	0.100 U	0.100 U	0.100 U	0.125 U
Benzo (a) pyrene	8270 Mod	µg/L	0.100 U	0.100 U	0.100 U	0.125 U
Benzo (b) fluoranthene	8270 Mod	µg/L	0.100 U	0.100 U	0.100 U	0.125 U
Benzo (ghi) perylene	8270 Mod	µg/L	0.100 U	0.100 UJ	0.100 UJ	0.125 UJ
Benzo (k) fluoranthene	8270 Mod	µg/L	0.100 U	0.100 U	0.100 U	0.125 U
Chrysene	8270 Mod	µg/L	0.100 U	0.100 U	0.100 U	0.125 U
Dibenzo (a,h) anthracene	8270 Mod	µg/L	0.200 U	0.200 U	0.200 U	0.250 U
Fluoranthene	8270 Mod	µg/L	0.100 U	0.100 U	0.100 U	0.125 U
Fluorene	8270 Mod	µg/L	0.100 U	0.269	0.229	0.125 U
Indeno (1,2,3-cd) pyrene	8270 Mod	µg/L	0.100 U	0.100 UJ	0.100 UJ	0.125 UJ
Naphthalene	8270 Mod	µg/L	0.100 U	0.531	0.494	0.125 U
Phenanthrene	8270 Mod	µg/L	0.110 U	0.579	0.548	0.125 U
Pyrene	8270 Mod	µg/L	0.100 U	0.241	0.185	0.125 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 6
ATOFINA Chemicals, Inc. - Portland, Oregon
Pesticide Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-2	MWA-3	MWA-4	MWA-5	MWA-6r	MWA-7	MWA-8i
			6/9/2003	6/9/2003	6/9/2003	6/6/2003	6/5/2003	6/4/2003	6/9/2003
			GW-060903-01	GW-060903-04	GW-060903-07	GW-060603-06	GW-060503-02	GW-060403-01	GW-060903-02
4,4'-DDD	8081A	µg/L	4.00 U	0.0861	3.97	0.0400 U	0.0400 R	0.0400 UJ	0.0400 U
4,4'-DDE	8081A	µg/L	8.00 U	0.0800 U	0.233	0.0800 U	0.0800 R	0.0800 UJ	0.0800 U
4,4'-DDT	8081A	µg/L	8.00 U	0.362	0.0899 U	0.0916	0.214 J	0.0800 UJ	0.0800 U
Aldrin	8081A	µg/L	8.00 U	0.0800 U	0.0899 U	0.0800 U	0.0800 R	0.0800 UJ	0.0800 U
alpha-BHC	8081A	µg/L	4.00 U	0.0400 U	0.0449 U	0.0400 U	0.0400 R	0.0400 UJ	0.0400 U
alpha-Chlordane	8081A	µg/L	4.00 U	0.0400 U	0.0449 U	0.0400 U	0.0400 R	0.0400 UJ	0.0400 U
beta-BHC	8081A	µg/L	4.00 U	0.0400 U	0.0449 U	0.0400 U	0.0400 R	0.0400 UJ	0.0400 U
Chlordane (tech)	8081A	µg/L	50.0 U	0.500 U	0.562 U	0.500 U	0.500 R	0.500 UJ	0.500 U
delta-BHC	8081A	µg/L	10.0 U	0.100 U	0.112 U	0.100 U	0.100 R	0.100 UJ	0.100 U
Dieldrin	8081A	µg/L	8.00 U	0.0800 U	0.0899 U	0.0800 U	0.0800 R	0.0800 UJ	0.0800 U
Endosulfan I	8081A	µg/L	2.00 U	0.0200 U	0.0225 U	0.0200 U	0.0200 R	0.0200 UJ	0.0200 U
Endosulfan II	8081A	µg/L	8.00 U	0.0800 U	0.0899 U	0.0800 U	0.0800 R	0.0800 UJ	0.0800 U
Endosulfan sulfate	8081A	µg/L	10.0 U	0.100 U	0.112 U	0.100 U	0.100 R	0.100 UJ	0.100 U
Endrin	8081A	µg/L	8.00 U	0.0800 U	0.0899 U	0.0800 U	0.0800 R	0.0800 UJ	0.0800 U
Endrin aldehyde	8081A	µg/L	16.0 U	0.160 U	0.180 U	0.160 U	0.160 R	0.160 UJ	0.160 U
Endrin ketone	8081A	µg/L	8.00 U	0.0800 U	0.0899 U	0.0800 U	0.0800 R	0.0800 UJ	0.0800 U
gamma-BHC (Lindane)	8081A	µg/L	4.00 U	0.0400 U	0.0449 U	0.0400 U	0.0400 R	0.0400 UJ	0.0400 U
gamma-Chlordane	8081A	µg/L	4.00 U	0.0400 U	0.0449 U	0.0400 U	0.0400 R	0.0400 UJ	0.0400 U
Heptachlor	8081A	µg/L	8.00 U	0.0800 U	0.0899 U	0.0800 U	0.0800 R	0.0800 UJ	0.0800 U
Heptachlor epoxide	8081A	µg/L	4.00 U	0.0400 U	0.0449 U	0.0400 U	0.0400 R	0.0400 UJ	0.0400 U
Methoxychlor	8081A	µg/L	50.0 U	0.500 U	0.562 U	0.500 U	0.500 R	0.500 UJ	0.500 U
Toxaphene	8081A	µg/L	200 U	2.00 U	2.25 U	2.00 U	2.00 R	2.00 UJ	2.00 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 6
ATOFINA Chemicals, Inc. - Portland, Oregon
Pesticide Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-9i	MWA-10i	MWA-11i	MWA-12i	MWA-13d	MWA-14i	MWA-15r
			6/9/2003	6/10/2003	6/10/2003	6/3/2003	6/9/2003	6/6/2003	6/10/2003
			GW-060903-06	GW-061003-01	GW-061003-03	GW-060303-01	GW-060903-03	GW-060603-07	GW-061003-04
4,4'-DDD	8081A	µg/L	1.1	0.0455 UJ	1.2	0.0400 UJ	0.0807	0.0439	28.4 J
4,4'-DDE	8081A	µg/L	0.0899 U	0.0909 UJ	0.0800 U	0.0800 UJ	0.0800 U	0.0800 U	16.0 U
4,4'-DDT	8081A	µg/L	0.0899 U	0.0909 UJ	0.573 U	0.0800 UJ	0.0800 U	0.0800 U	113
Aldrin	8081A	µg/L	0.0899 U	0.0909 UJ	0.0800 U	0.0800 UJ	0.0800 U	0.0800 U	16.0 U
alpha-BHC	8081A	µg/L	0.0449 U	0.0455 UJ	0.0400 U	0.0400 UJ	0.0400 U	0.0400 U	8.00 U
alpha-Chlordane	8081A	µg/L	0.0449 U	0.0455 UJ	0.0400 U	0.0400 UJ	0.0400 U	0.0400 U	8.00 U
beta-BHC	8081A	µg/L	0.0449 U	0.0455 UJ	0.0400 U	0.0400 UJ	0.0400 U	0.0400 U	8.00 U
Chlordane (tech)	8081A	µg/L	0.562 U	0.568 UJ	0.500 U	0.500 UJ	0.500 U	0.500 U	100 U
delta-BHC	8081A	µg/L	0.112 U	0.114 UJ	0.100 U	0.100 UJ	0.100 U	0.100 U	20.0 U
Dieldrin	8081A	µg/L	0.0899 U	0.0909 UJ	0.0800 U	0.0800 UJ	0.0800 U	0.0800 U	16.0 U
Endosulfan I	8081A	µg/L	0.0225 U	0.0227 UJ	0.0200 U	0.0200 UJ	0.0200 U	0.0200 U	4.38
Endosulfan II	8081A	µg/L	0.0899 U	0.0909 UJ	0.0800 U	0.0800 UJ	0.0800 U	0.0800 U	16.0 U
Endosulfan sulfate	8081A	µg/L	0.112 U	0.114 UJ	0.100 U	0.100 UJ	0.100 U	0.100 U	20.0 U
Endrin	8081A	µg/L	0.0899 U	0.0909 UJ	0.0800 U	0.0800 UJ	0.0800 U	0.0800 U	16.0 U
Endrin aldehyde	8081A	µg/L	0.180 U	0.182 UJ	0.160 U	0.160 UJ	0.160 U	0.160 U	32.0 U
Endrin ketone	8081A	µg/L	0.0899 U	0.0909 UJ	0.0800 U	0.0800 UJ	0.0800 U	0.0800 U	16.0 U
gamma-BHC (Lindane)	8081A	µg/L	0.0449 U	0.0455 UJ	0.0400 U	0.0400 UJ	0.0400 U	0.0400 U	8.00 U
gamma-Chlordane	8081A	µg/L	0.0449 U	0.0455 UJ	0.0400 U	0.0400 UJ	0.0400 U	0.0400 U	8.00 U
Heptachlor	8081A	µg/L	0.0899 U	0.0909 UJ	0.0800 U	0.0800 UJ	0.0800 U	0.0800 U	16.0 U
Heptachlor epoxide	8081A	µg/L	0.0449 U	0.0455 UJ	0.0400 U	0.0400 UJ	0.0400 U	0.0400 U	8.00 U
Methoxychlor	8081A	µg/L	0.562 U	0.568 UJ	0.500 U	0.500 UJ	0.500 U	0.500 U	100 U
Toxaphene	8081A	µg/L	2.25 U	2.27 UJ	2.00 U	2.00 UJ	2.00 U	2.00 U	400 U

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Table 6
ATOFINA Chemicals, Inc. - Portland, Oregon
Pesticide Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-16i	MWA-17si	MWA-18	MWA-19	MWA-20	MWA-22	MWA-24
			6/5/2003	6/9/2003	6/6/2003	6/6/2003	6/5/2003	6/10/2003	6/5/2003
			GW-060503-01	GW-060903-05	GW-060603-03	GW-060603-04	GW-060503-03	GW-061003-02	GW-060503-04
4,4'-DDD	8081A	µg/L	0.0400 R	1.44	0.0400 U	0.0935	0.0688 J	0.13 U	0.232 U
4,4'-DDE	8081A	µg/L	0.0800 R	0.400 U	0.0800 U	0.0800 U	0.0800 R	0.0800 UJ	0.160 U
4,4'-DDT	8081A	µg/L	0.0800 R	0.400 U	0.0800 U	0.23	0.213 J	0.348 U	0.160 U
Aldrin	8081A	µg/L	0.0800 R	0.400 U	0.0800 U	0.0800 U	0.0800 R	0.0800 UJ	0.160 U
alpha-BHC	8081A	µg/L	0.0400 R	0.200 U	0.0400 U	0.0400 U	0.0400 R	0.0400 UJ	0.0800 U
alpha-Chlordane	8081A	µg/L	0.0400 R	0.200 U	0.0400 U	0.0400 U	0.0400 R	0.0400 UJ	0.0800 U
beta-BHC	8081A	µg/L	0.0400 R	0.200 U	0.0400 U	0.0400 U	0.0400 R	0.0400 UJ	0.0800 U
Chlordane (tech)	8081A	µg/L	0.500 R	2.50 U	0.500 U	0.500 U	0.500 R	0.500 UJ	1.00 U
delta-BHC	8081A	µg/L	0.100 R	0.500 U	0.100 U	0.100 U	0.100 R	0.100 UJ	0.200 U
Dieldrin	8081A	µg/L	0.0800 R	0.400 U	0.0800 U	0.0800 U	0.0800 R	0.0800 UJ	0.160 U
Endosulfan I	8081A	µg/L	0.0200 R	0.100 U	0.0200 U	0.0200 U	0.0200 R	0.0200 UJ	0.0400 U
Endosulfan II	8081A	µg/L	0.0800 R	0.400 U	0.0800 U	0.0800 U	0.0800 R	0.0800 UJ	0.160 U
Endosulfan sulfate	8081A	µg/L	0.100 R	0.500 U	0.100 U	0.100 U	0.100 R	0.100 UJ	0.200 U
Endrin	8081A	µg/L	0.0800 R	0.400 U	0.0800 U	0.0800 U	0.0800 R	0.0800 UJ	0.160 U
Endrin aldehyde	8081A	µg/L	0.160 R	0.800 U	0.160 U	0.160 U	0.160 R	0.160 UJ	0.320 U
Endrin ketone	8081A	µg/L	0.0800 R	0.400 U	0.0800 U	0.0800 U	0.0800 R	0.0800 UJ	0.160 U
gamma-BHC (Lindane)	8081A	µg/L	0.0400 R	0.389	0.0400 U	0.0400 U	0.0400 R	0.0400 UJ	0.0800 U
gamma-Chlordane	8081A	µg/L	0.0400 R	0.200 U	0.0400 U	0.0400 U	0.0400 R	0.0400 UJ	0.0800 U
Heptachlor	8081A	µg/L	0.0800 R	0.400 U	0.0800 U	0.0800 U	0.0800 R	0.0800 UJ	0.160 U
Heptachlor epoxide	8081A	µg/L	0.0400 R	0.428	0.0400 U	0.0400 U	0.0400 R	0.0400 UJ	0.0800 U
Methoxychlor	8081A	µg/L	0.500 R	2.50 U	0.500 U	0.500 U	0.500 R	0.500 UJ	1.00 U
Toxaphene	8081A	µg/L	2.00 R	10.0 U	2.00 U	2.00 U	2.00 R	2.00 UJ	4.00 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 6
ATOFINA Chemicals, Inc. - Portland, Oregon
Pesticide Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-29	MWA-30	MWA-31i	MWA-32ia	MWA-33a	MWA-33	MWA-33
			6/4/2003	6/4/2003	6/4/2003	6/4/2003	6/5/2003	6/11/2003	6/11/2003
			GW-060403-06	GW-060403-08	GW-060403-07	GW-060403-10	GW-060503-05	GW-061103-02	GW-061103-03
4,4'-DDD	8081A	µg/L	0.0400 UJ	0.0400 UJ	0.0400 U	0.0400 UJ	0.0400 R	0.0400 UJ	0.0400 UJ
4,4'-DDE	8081A	µg/L	0.0800 UJ	0.0800 UJ	0.0800 U	0.0800 UJ	0.0800 R	0.0800 UJ	0.0800 UJ
4,4'-DDT	8081A	µg/L	0.0800 UJ	0.0800 UJ	0.0800 U	0.0800 UJ	0.0800 R	0.518 U	0.678 U
Aldrin	8081A	µg/L	0.0800 UJ	0.0800 UJ	0.0800 U	0.0800 UJ	0.0800 R	0.0800 UJ	0.0800 UJ
alpha-BHC	8081A	µg/L	0.0400 UJ	0.0400 UJ	0.0400 U	0.0400 UJ	0.0400 R	0.0400 UJ	0.0400 UJ
alpha-Chlordane	8081A	µg/L	0.0400 UJ	0.0400 UJ	0.0400 U	0.0400 UJ	0.0400 R	0.0400 UJ	0.0400 UJ
beta-BHC	8081A	µg/L	0.0400 UJ	0.0400 UJ	0.0400 U	0.0400 UJ	0.0400 R	0.0400 UJ	0.0400 UJ
Chlordane (tech)	8081A	µg/L	0.500 UJ	0.500 UJ	0.500 U	0.500 UJ	0.500 R	0.500 UJ	0.500 UJ
delta-BHC	8081A	µg/L	0.100 UJ	0.100 UJ	0.100 U	0.100 UJ	0.100 R	0.100 UJ	0.100 UJ
Dieldrin	8081A	µg/L	0.0800 UJ	0.0800 UJ	0.0800 U	0.0800 UJ	0.0800 R	0.0800 UJ	0.0800 UJ
Endosulfan I	8081A	µg/L	0.0200 UJ	0.0200 UJ	0.0200 U	0.0200 UJ	0.0200 R	0.0200 UJ	0.0200 UJ
Endosulfan II	8081A	µg/L	0.0800 UJ	0.0800 UJ	0.0800 U	0.0800 UJ	0.0800 R	0.0800 UJ	0.0800 UJ
Endosulfan sulfate	8081A	µg/L	0.100 UJ	0.100 UJ	0.100 U	0.100 UJ	0.100 R	0.100 UJ	0.100 UJ
Endrin	8081A	µg/L	0.0800 UJ	0.0800 UJ	0.0800 U	0.0800 UJ	0.0800 R	0.0800 UJ	0.0800 UJ
Endrin aldehyde	8081A	µg/L	0.160 UJ	0.160 UJ	0.160 U	0.160 UJ	0.160 R	0.160 UJ	0.160 UJ
Endrin ketone	8081A	µg/L	0.0800 UJ	0.0800 UJ	0.0800 U	0.0800 UJ	0.0800 R	0.0800 UJ	0.0800 UJ
gamma-BHC (Lindane)	8081A	µg/L	0.0400 UJ	0.0400 UJ	0.0400 U	0.0400 UJ	0.0400 R	0.0400 UJ	0.0400 UJ
gamma-Chlordane	8081A	µg/L	0.0400 UJ	0.0400 UJ	0.0400 U	0.0400 UJ	0.0400 R	0.0400 UJ	0.0400 UJ
Heptachlor	8081A	µg/L	0.0800 UJ	0.0800 UJ	0.0800 U	0.0800 UJ	0.0800 R	0.0800 UJ	0.0800 UJ
Heptachlor epoxide	8081A	µg/L	0.0400 UJ	0.0400 UJ	0.0400 U	0.0400 UJ	0.0400 R	0.0400 UJ	0.0400 UJ
Methoxychlor	8081A	µg/L	0.500 UJ	0.500 UJ	0.500 U	0.500 UJ	0.500 R	0.500 UJ	0.500 UJ
Toxaphene	8081A	µg/L	2.00 UJ	2.00 UJ	2.00 U	2.00 UJ	2.00 R	2.00 UJ	2.00 UJ

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed

Table 6
ATOFINA Chemicals, Inc. - Portland, Oregon
Pesticide Results
June 2003 Groundwater Sampling

Analyte	Method	Units	MWA-34ia	NMP-3D	NMP-4D	NMP-4D (Dup)	Rinsate	Rinsate
			6/6/2003	6/11/2003	6/10/2003	6/10/2003	6/5/2003	6/10/2003
			GW-060603-05	GW-061103-01	GW-061003-06	GW-061003-07	GW-060503-07	GW-061003-05
4,4'-DDD	8081A	µg/L	0.0892	0.800 U	6.26 J	8.86 J	0.0400 U	0.0412 J
4,4'-DDE	8081A	µg/L	0.0800 U	1.60 U	8.00 U	8.00 U	0.0800 U	0.0800 U
4,4'-DDT	8081A	µg/L	0.327	5.8 U	282	235	0.0800 U	1.19
Aldrin	8081A	µg/L	0.0800 U	1.60 U	8.00 U	8.00 U	0.0800 U	0.0800 U
alpha-BHC	8081A	µg/L	0.0400 U	0.800 U	4.00 U	4.00 U	0.0400 U	0.0400 U
alpha-Chlordane	8081A	µg/L	0.0400 U	0.800 U	4.00 U	4.00 U	0.0400 U	0.0400 U
beta-BHC	8081A	µg/L	0.0400 U	0.800 U	4.00 U	4.00 U	0.0400 U	0.0400 U
Chlordane (tech)	8081A	µg/L	0.500 U	10.0 U	50.0 U	50.0 U	0.500 U	0.500 U
delta-BHC	8081A	µg/L	0.100 U	2.00 U	10.0 U	10.0 U	0.100 U	0.100 U
Dieldrin	8081A	µg/L	0.0800 U	1.60 U	8.00 U	8.00 U	0.0800 U	0.0800 U
Endosulfan I	8081A	µg/L	0.0200 U	0.400 U	2.00 U	2.00 U	0.0200 U	0.0200 U
Endosulfan II	8081A	µg/L	0.0800 U	1.60 U	8.00 U	8.00 U	0.0800 U	0.0800 U
Endosulfan sulfate	8081A	µg/L	0.100 U	2.00 U	10.0 U	10.0 U	0.100 U	0.100 U
Endrin	8081A	µg/L	0.0800 U	1.60 U	8.00 U	8.00 U	0.0800 U	0.0800 U
Endrin aldehyde	8081A	µg/L	0.160 U	3.20 U	16.0 U	16.0 U	0.160 U	0.160 U
Endrin ketone	8081A	µg/L	0.0800 U	1.60 U	8.00 U	8.00 U	0.0800 U	0.0800 U
gamma-BHC (Lindane)	8081A	µg/L	0.0400 U	0.800 U	4.00 U	4.00 U	0.0400 U	0.0400 U
gamma-Chlordane	8081A	µg/L	0.0400 U	0.800 U	4.00 U	4.00 U	0.0400 U	0.0400 U
Heptachlor	8081A	µg/L	0.0800 U	1.60 U	8.00 U	8.00 U	0.0800 U	0.0800 U
Heptachlor epoxide	8081A	µg/L	0.0400 U	1.15	4.00 U	4.00 U	0.0400 U	0.0400 U
Methoxychlor	8081A	µg/L	0.500 U	10.0 U	50.0 U	50.0 U	0.500 U	0.500 U
Toxaphene	8081A	µg/L	2.00 U	40.0 U	200 U	200 U	2.00 U	2.00 U

Notes: F - Field quality control sample criteria not met
J - Estimated
R - Rejected
U - Undetected at detection limit shown
NA - Not analyzed