Expanded Site Inspection
Final Report

Cosden Oil and Chemical Co.
Calumet City, Illinois
ILD 091 766 410

November 9, 1995

Prepared for:
U.S. Environmental Protection Agency
under Alternative Remedial Contracting Strategy (ARCS)
Contract 68-W8-0064, Work Assignment 33-5JZZ
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1.0 Introduction

On February 4, 1993, the Alternative Remedial Contracting Strategy (ARCS) contractor was authorized, by approval of the work plan amendment by the U.S. Environmental Protection Agency (USEPA) Region V, to conduct an expanded site inspection (ESI) of the Cosden Oil and Chemical Co. (Cosden) site in Calumet City, Cook County, Illinois.

The site was initially placed on the Comprehensive Environmental Response, Compensation, and Liability Act Information System on August 1, 1980, as a result of a request for discovery action initiated by the USEPA.

The site received its initial Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) evaluation in the form of a site inspection report completed by a field investigation team (FIT) contractor for USEPA on April 30, 1985. The FIT contractor completed a CERCLA preliminary assessment report for the site on September 30, 1991. The sampling portion of the ESI was conducted on July 28 and 29, 1993; a field team collected three surface water, eleven sediment, nine soil, and three groundwater samples.

The purposes of the ESI have been stated by USEPA in a directive outlining site inspection performed under CERCLA. The directive states:

> The objective of the ESI is to provide documentation for the Hazard Ranking System (HRS) package to support National Priority List (NPL) rulemaking. Remaining HRS information requirements are addressed and site hypotheses not completely supported during previous investigations are evaluated. ESI sampling is designed to satisfy HRS data requirements by documenting observed releases, observed contamination, and levels of actual contamination at targets. In addition, investigators collect remaining non-sampling information. Sampling during the ESI includes background and quality assurance/quality control samples to fully document releases and attribute them to the site. Following the ESI, USEPA site assessment managers assign the site a priority for HRS package preparation and proposal to the NPL.

USEPA Region V requested identification of sites during the ESI that may require removal action to remediate an immediate human health or environmental threat.

2.0 Site Background

2.1 Introduction

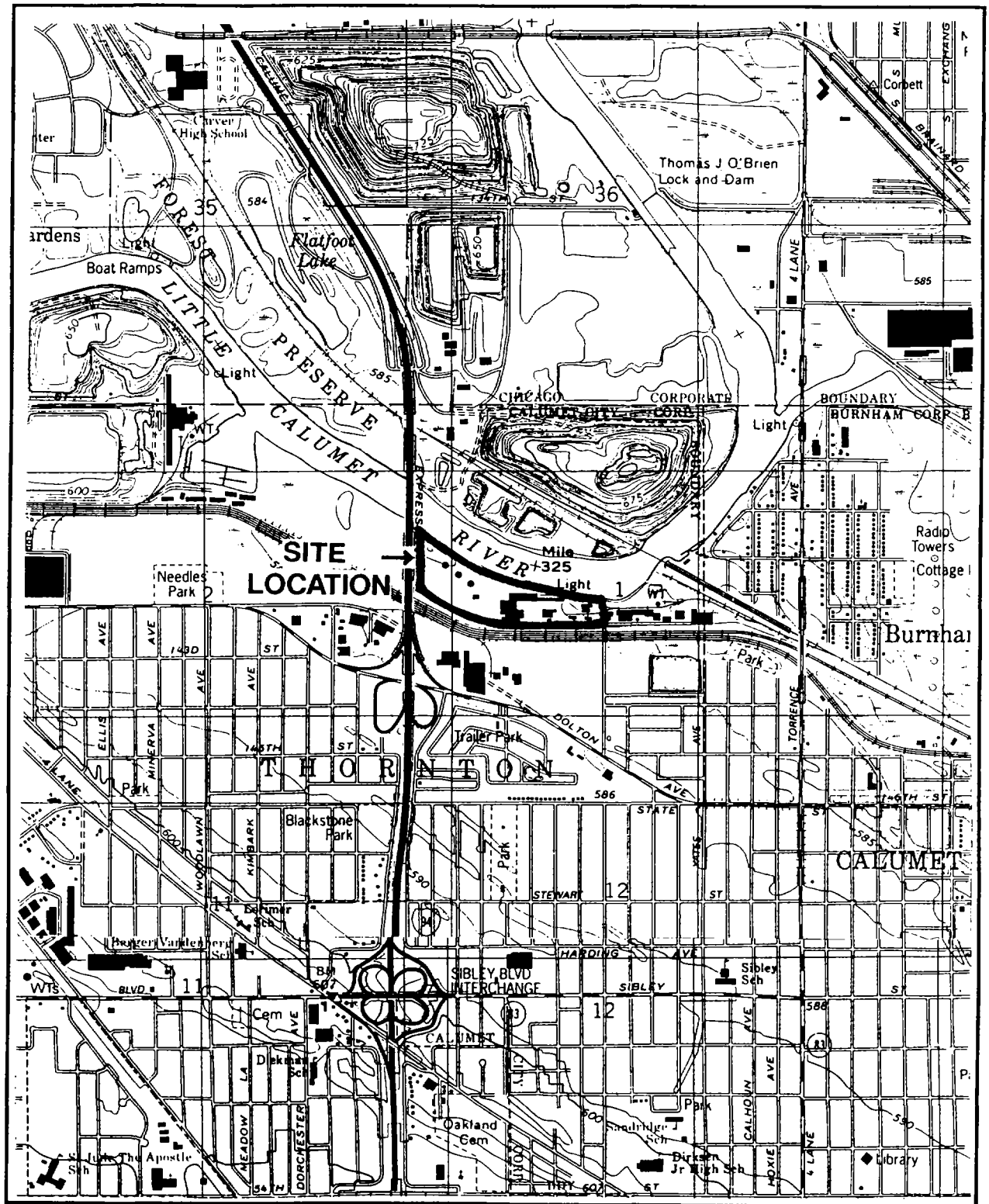
This section includes information obtained during the ESI and from reports of previous site activities.

2.2 Site Description

The Cosden site is an inactive chemical and plastic manufacturing facility located at 142nd Street and Paxton Avenue in Calumet City, Cook County, Illinois, in Township 36 North, Range 14 East, Section 1 [U.S. Geological Survey (1980)]. The site occupies approximately 38 acres in an industrial and residential area (Figure 2-1). The site is bordered on the west by the Calumet Expressway (I-94), on the north by the Little Calumet River, on the south by the B&O Railroad tracks, and on the east by the Ashland Chemical facility (Figure 2-2). CID Landfill is located north of the Little Calumet River. Industrial property and vacant land are located south of the B&O Railroad, and vacant land is located west of I-94. Fina Oil and Chemical Co., owner of the Cosden site, owns portions of the vacant land located south and west of the site.

The site is inactive and has been since it was shut down in 1990. The site owner performed dismantling activities from 1990 to 1992; machinery was removed for scrap or salvage, waste and product storage tanks were emptied, and hazardous wastes and products were removed from the site. Buildings, plastic pellet storage silos, tanks, and other permanent structures remain onsite. The site perimeter is fenced, except for the northern site boundary east of the barge platform on the Little Calumet River.

Site runoff flows to the Little Calumet River, the ditch along the southern site boundary, and the sanitary sewer. The site storm sewer system collects runoff through manholes located throughout the site, and a culvert discharges the runoff to the Little Calumet River. A ditch at the northwestern portion of the site, near the styrene tank berms, discharges to the Little Calumet River though another culvert. The ditch along the southern site boundary collects runoff from a low-lying portion of the site. No outlet from this ditch has been identified. Sanitary sewer manholes are located on the southeastern portion of the site and on Paxton Avenue. The sanitary sewer discharges to the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC).



Source: USGS Topo. Quads., 1980
Lake Calumet, Calumet City; IL–IN

SCALE (IN MILES)
0 1/2 1

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Figure 2–1
Site Location Map

Cosden Oil and Chemical Co.
Calumet City, Illinois

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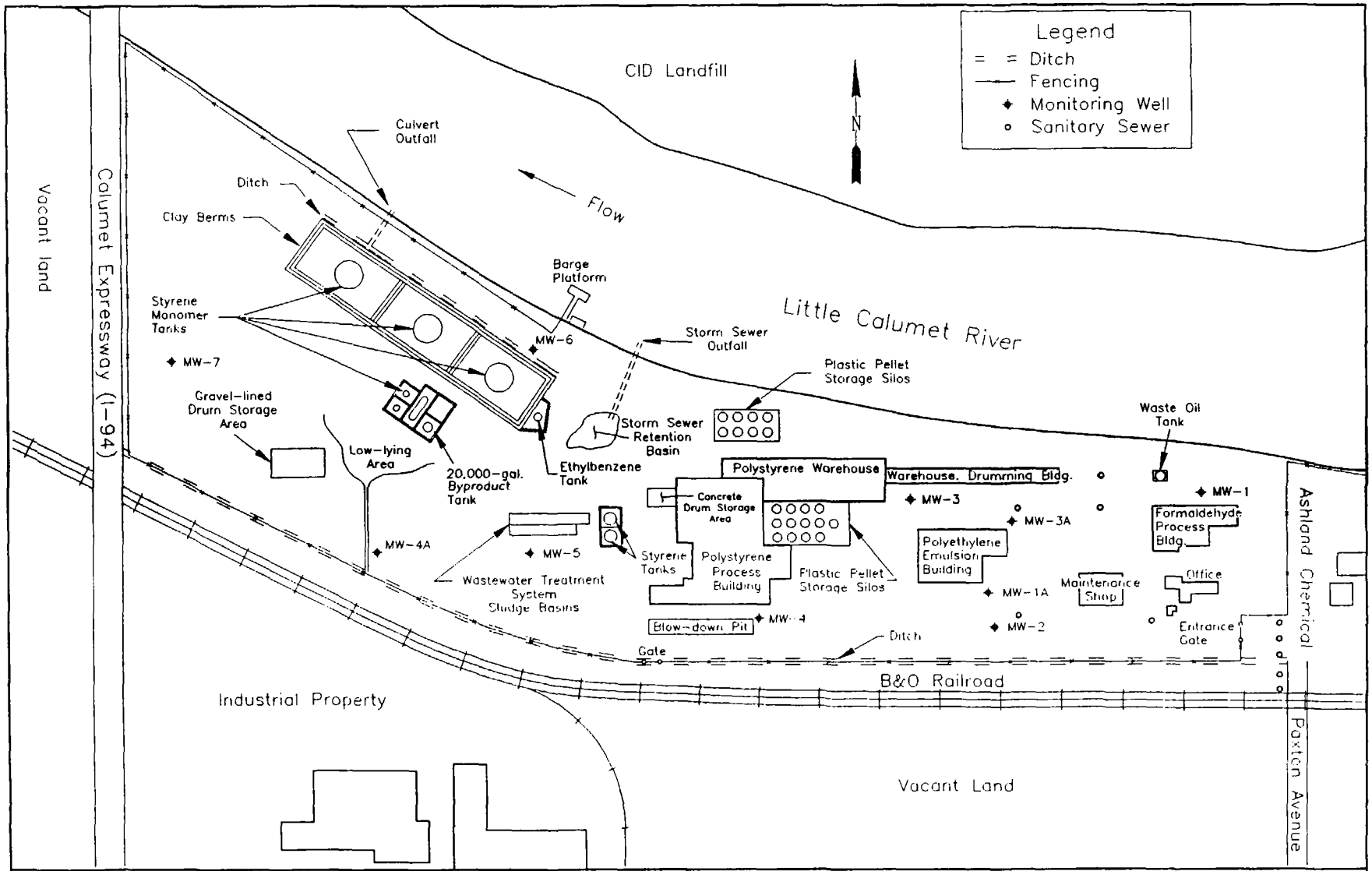

BVWS, 1994
(Modified from USGS, 1980; ENSR, 1990)

Figure 2-2
Site Layout

Not To Scale

Cosden Oil & Chemical Co.
Calumet City, Illinois

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Appendix A includes a 4-mile radius map of the site and a 15-mile downstream surface water route map.

2.3 Site History

2.3.1 Operational History

From 1949 until 1990, the Cosden facility manufactured a variety of products, including formaldehyde, aqua ammonia, hexamethylenetetramine (hexamine), polyethylene emulsion, and polystyrene plastic. From 1949 until 1963, Spencer Chemical Company owned the facility. In 1963, Gulf Oil Corporation (Gulf) purchased the facility. Gulf sold the facility to Cosden in 1968. Cosden continued manufacturing chemicals until 1970. In 1970, Cosden reduced its chemical manufacturing, producing only polyethylene emulsion, and expanded the facility to include polystyrene plastic manufacturing. Rohm and Haas Corporation purchased process information from Cosden and manufactured polyethylene emulsion within a portion of the Cosden facility from 1977 to 1989. In 1986, Cosden changed its name to Fina Oil and Chemical Co. (Fina). Fina continued to manufacture polystyrene plastic until 1990. Fina ceased all manufacturing operations at the facility in 1990 and completed dismantling of the facility in 1992. During dismantling, machinery was removed for scrap or salvage, waste and product storage tanks were emptied, and hazardous wastes and products were removed from the site (USEPA 1992).

Several steel above-ground storage tanks were used to store products and wastes from about 1978 until 1992. Three 850,000-gallon tanks and one 690,000-gallon tank stored styrene monomer, and one 80,000-gallon tank stored ethylbenzene in areas surrounded by clay berms at the northwestern portion of the site. Two additional steel styrene monomer tanks (approximately 20,000 gallons each) are located west of the polystyrene process building on concrete containment structures. A 20,000-gallon tank stored a byproduct waste consisting of styrene and ethylbenzene in a bermed area south of the 850,000-gallon styrene tanks. A 10,000-gallon tank with concrete containment stored waste oil near the Little Calumet River at the eastern portion of the site (USEPA 1992).

The blow-down pit, the wastewater treatment system, and two drum storage areas were used to manage other wastes generated onsite. Process blow-down, containing ethylbenzene and styrene from the polystyrene suspension process, was contained in the concrete (formerly earthen) blow-down pit. The wastewater treatment system, which treated process wastewater from the facility, consisted of an

equalizing basin, water clarifier, and two concrete sludge basins. Treated effluent from the wastewater treatment system was discharged to the sanitary sewer (MWRDGC). The blow-down pit and the concrete sludge basins used in water treatment were earthen before 1980. Two drum storage areas were used to store the following drummed wastes: acrylonitrile waste, process blowdown, and used sand bed filters containing ethylbenzene and styrene.

Facility records indicate that all wastes generated onsite were sent offsite for treatment, disposal, or recycling; no onsite disposal allegedly occurred. Before 1980, acrylonitrile waste, process blowdown, and used sand bed filters were stored in drums on a gravel-lined drum storage pad at the southwestern site corner for periods of up to two years. After 1981, the facility did not generate acrylonitrile waste or process blowdown and discontinued use of the gravel-lined pad. From 1980 to 1992, the facility stored drummed wastes on a bermed concrete pad located on the northwest side of the polystyrene process building. The concrete pad was used to store drums of used sand bed filters and wastes generated during dismantling of the facility. Wastes were stored on the concrete pad for less than 90 days before removal from the site. Sludges from the blow-down pit and wastewater treatment sludge basins were taken offsite for landfilling.

Two documented releases to the air pathway have been attributed to the site. The facililty released styrene monomer vapor during a 1986 incident when reactors overheated [Illinois Environmental Protection Agency (IEPA) 1986]. A fire that took place in 1989 may have caused the release of an estimated 200 to 300 pounds of styrene vapor (Illinois Emergency Services & Disaster Agency 1989). No record of fines or other penalties was found in connection with either incident.

2.3.2 Summary of Onsite Environmental Work

A consultant hired by the facility conducted investigations of potential contaminants at the site between 1987 and 1990. These investigations included soil vapor monitoring and sampling of soil, groundwater, and surface water.

Soil vapor monitoring was conducted at 48 onsite locations. Elevated levels of styrene and ethylbenzene were detected in or near the drum storage areas, wastewater treatment system, by-product storage tank, and blow-down pit. The monitoring results were qualitative; no numerical levels were reported.

Three rounds of soil sampling were conducted. The first round of soil samples was collected in June 1989 at six locations in and near the blow-down pit. First round

analyses found toluene, ethylbenzene, xylene, and styrene at concentrations ranging from 100 to 47,000 parts per billion (ppb) (ENSR 1990a).

The facility's consultant recommended soil removal from the former earthen blow-down pit based on first round soil samples. The facility removed approximately one thousand cubic yards of soil, to a depth of 4 feet, from this area located just south of the polyethylene process building. The removed soil was reportedly disposed of at CID Landfill, but no manifest of the removal is available. The excavated area was backfilled with clean fill. A report by the facility's consultant stated that trace amounts of chemicals remained beneath the clean fill following the removal. The report did not identify chemicals, concentrations, or other information to support this statement (USEPA 1992).

The second round of soil sampling took place in February 1990 near each of ten sanitary sewer manholes. Four of these manholes were located on the eastern portion of the site, and six were located offsite on the western side of Paxton Avenue. Second round analyses indicated the presence of volatile organics ranging from 3 to 1600 ppb and semivolatile organics ranging from 11,000 to 48,000 ppb (ENSR 1990d). Fina representatives stated that sanitary sewer backup from Ashland Chemical is the likely cause of semivolatile onsite contamination. Fina has contacted Ashland Chemical, located immediately east of Paxton Avenue, to resolve this issue.

The third round of soil sampling took place in March and April 1990, at 16 soil boring locations throughout the site. Split spoon samples collected at depths of one to eight feet revealed levels of ethylbenzene, acetone, and styrene at concentrations ranging from 0.097 to 8.5 parts per million (ppm) in three boring locations (ENSR 1990b).

Sampling of the onsite shallow drift aquifer found ethylbenzene in MW-4 at 30 ppb and formaldehyde in MW-3, -4, -5, -6, and -7 at concentrations ranging from 0.33 to 0.439 ppb. The blank for the groundwater sampling equipment was found to contain formaldehyde at 0.055 ppb. Water level elevations taken during the groundwater sampling in 1990 indicated that the flow direction of the shallow aquifer was northeasterly, toward the Little Calumet River (ENSR 1990c).

Analyses of surface water samples collected in the Little Calumet River at two locations adjacent to the site showed no concentrations of hazardous substances above detection limits (ENSR 1990c).

2.4 Applicability of Other Statutes

A subcontractor for the USEPA completed a Resource Conservation and Recovery Act (RCRA) preliminary assessment/visual site inspection (PA/VSI) report for the site in December 1992 (USEPA 1992). The PA/VSI report recommended the following:

- Conducting RCRA closure of the gravel-lined drum storage pad and blow-down pit area, providing documentation of prior remediation of blow-down pit.
- Protecting the concrete drum storage pad, wastewater treatment system, and blow-down pit area from a 100-year flood.
- Conducting soil and groundwater sampling near the wastewater treatment system and 20,000-gallon by-product tank, and performing remediation, if sampling shows it is necessary.
- Performing remediation near styrene and ethylbenzene product storage tanks.

Fina representatives stated that they had received a copy of the PA/VSI report, excluding the report's recommendations. To date, no enforcement of the PA/VSI recommendations has occurred.

RCRA files list the site as a full-quantity generator based on RCRA Part A information. The site has no RCRA permits (USEPA 1994).

3.0 Site Inspection Activities and Analytical Results

3.1 Introduction

This section outlines procedures used and observations made during the ESI conducted at the Cosden site. Sampling activities were conducted in accordance with the quality assurance project plan (QAPjP).

ESI samples were analyzed for organic and inorganic substances contained on the USEPA Target Compound List (TCL) and Target Analyte List (TAL) by USEPA Contract Laboratory Program (CLP) participant laboratories. Appendix B presents the TCL and TAL. Appendix C summarizes analytical data generated by ESI sampling. Appendix D contains photographs of the site and sample locations.

3.2 Site Reconnaissance

On April 15, 1993, a reconnaissance of the site was conducted. This visit included a visual site inspection to determine site status and facility activities, health and safety concerns, and potential sampling locations.

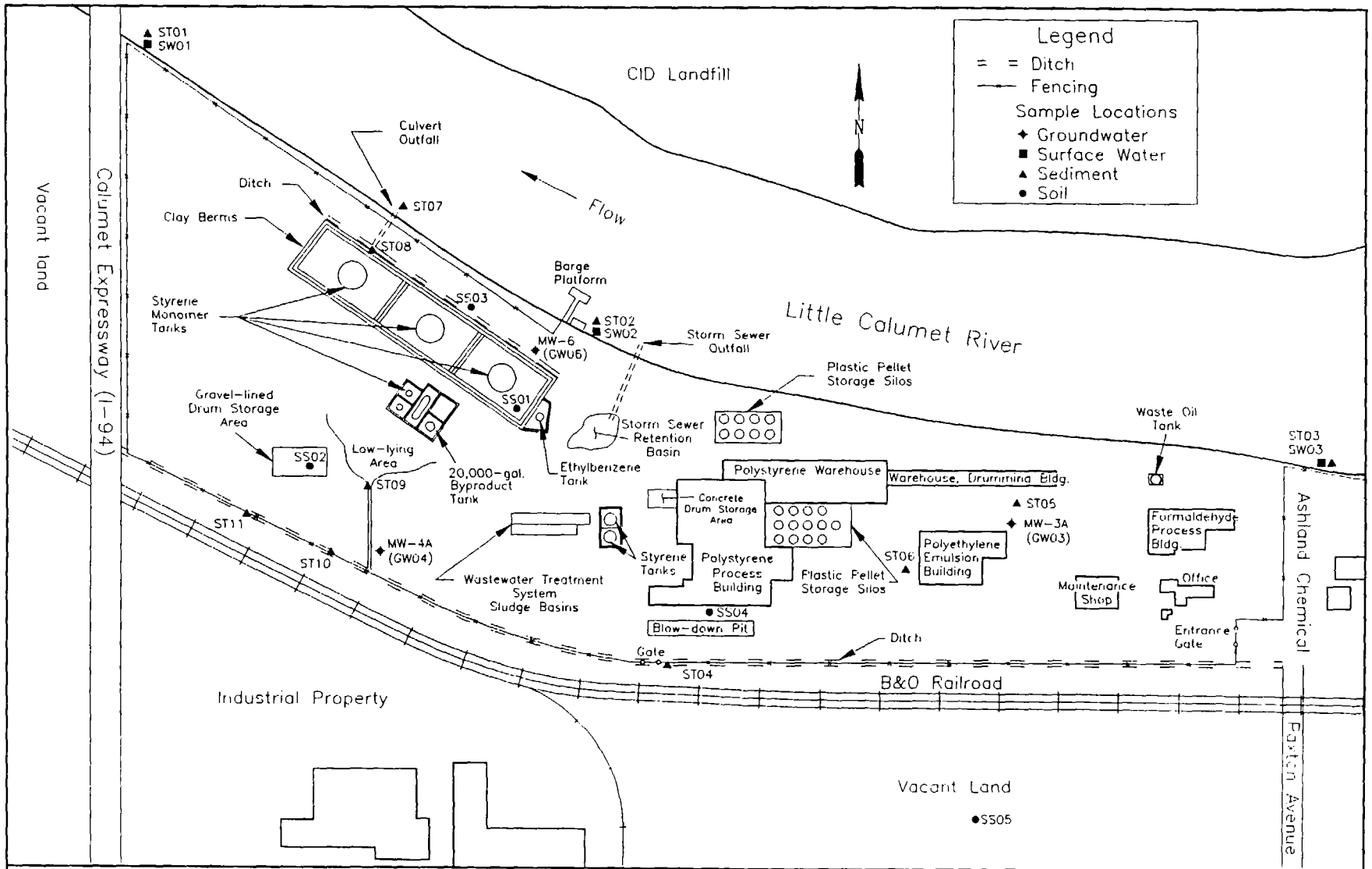
Representatives of Fina, the owner of the site, were interviewed. A site walk-through was conducted, and potential sampling locations were identified.

3.3 Site Representative Interview

The site reconnaissance and interview were conducted on April 15, 1993. Mr. Jim Mahon, environmental coordinator for Fina, and Mr. John Spice, former engineering manager for the site, accompanied the reconnaissance team on the tour of the site and answered questions concerning site operations and history. The reconnaissance team observed manufacturing buildings, waste and product storage, site drainage, and monitoring wells.

3.4 Sampling Activities

The ESI field team collected groundwater, surface water, sediment, and soil samples on July 28 and 29, 1993. Split samples were collected for the site owner; the field team filled containers provided by the owner's consultant, who was present during sampling. Figure 3-1 shows sample locations; Table 3-1 summarizes sample descriptions and locations.



BVWS, 1994 (Modified from USGS, 1980; ENSR, 1990)	Figure 3-1 Sample Location Map
Not To Scale	Cosden Oil & Chemical Co. Calumet City, Illinois

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Table 3-1 Sample Summary			
Sample	Depth*	Appearance	Location
GW03	10.6'	Light brown, turbid	MW-3A, near the northeastern corner of the polyethylene emulsion building
GW04	11.5'	Brown, turbid	MW-4A, near the southern site boundary at the southwestern portion of the site
GW06	13.1'	Brown, turbid	Background sample; from MW-6, near the clay berms at the northwestern portion of the site, south and west of the barge platform
SW01	0 to 6"	Clear	In the Little Calumet River, just west (downstream) of the site, near the southern bank; same location as ST01
SW02	0 to 6"	Clear	In the Little Calumet River, adjacent to the site, just east of the barge platform; same location as ST02
SW03	0 to 6"	Clear	Background sample; in the Little Calumet River, near the southern bank, approximately 100 feet east (upstream) of the site, same location as ST03
ST01	0 to 6"	Gray clay, stiff, saturated	In the Little Calumet River, just west (downstream) of the site, near the southern bank, same location as SW01
ST02	0 to 6"	Gray clay, stiff, saturated	In the Little Calumet River, adjacent to the site, just east of the barge platform; same location as SW02
ST03	0 to 6"	Silty sand with some gravel, saturated	Background sample; in the Little Calumet River, near the southern bank, approximately 100 feet east (upstream) of the site, same location as SW03
ST04	2 to 6"	Sandy silt, damp	In the ditch south of the southwestern corner of the polyethylene process building, about 50 feet east of the gate in the fence, outside the fence

*Groundwater sample depth measured from top of well riser to bottom of sample interval.

Table 3-1 Sample Summary (continued)			
Sample	Depth	Appearance	Location
ST05	2 to 6"	Brown silty clay with some sand and gravel, dry	Near the storm sewer manhole north of the northeast corner of the polyethylene emulsion building
ST06	2 to 6"	Brown silty clay with some sand and gravel, dry	Near the storm sewer manhole west of the polyethylene emulsion building
ST07	6 to 12"	Silty sand, some gravel, saturated	In the Little Calumet River, at the outfall of the culvert which drains the ditch near the western styrene tank berms
ST08	6 to 12"	Silty sand with some gravel, dry	At the inlet to the culvert which drains the ditch near the western styrene tank berms
ST09	6 to 12"	Brown silty topsoil with roots, dry	In the low-lying area approximately 60 feet north of MW-4A
ST10	6 to 12"	Gray silty clay, wet	In the ditch along the southern fenceline which drains the low-lying area north of MW-4A
ST11	6 to 12"	Gray silty clay, moist	In the ditch along the southern fenceline, about 75 feet west of ST10
SS01	6 to 12"	Dark brown sand with organic matter, damp	Within the bermed area surrounding the three 850,000-gallon styrene tanks, near the furthest east tank
SS02	6 to 12"	Light brown sandy topsoil with some styrene pellets	Approximately 100 feet northwest of MW-4A, in the likely location of the gravel-lined drum storage area
SS03	6 to 12"	Gray/brown clayey sand, dry	North of the bermed area surrounding the three 850,000-gallon styrene tanks, beneath above-ground product piping
SS04	6 to 12"	Brown sandy soil, dry	Just south of the polystyrene process building, in the location of the former earthen blow-down pit
SS05	6 to 12"	Dark brown topsoil	Background sample; south of the B&O railroad, in the wooded area south of the site

Sample activities were conducted in accordance with procedures set forth in the QAPjP. Sample jars were sealed, labeled, packaged, and transported to USEPA CLP participant laboratories. Table 3-2 presents laboratory information according to media sampled and analyses performed.

Reusable sampling and personal protective equipment (PPE) were decontaminated before transport offsite. Disposable sampling and PPE items were discarded in accordance with procedures outlined in the ESI project work plan and the QAPjP.

Table 3-2
Laboratory Information

Media	Analyses	Laboratory
Soil and Surface Water	Organic	Industrial Environmental Analysis, Inc. Cary, North Carolina
	Inorganic	Chemtech Consulting Group Englewood, New Jersey
Groundwater and Sediment	Organic	IT Analytical Services - Cerritos Cerritos, California
	Inorganic	ITMO - St. Louis Laboratory Earth City, Missouri

3.4.1 Surface Water and Sediment Sampling

Three surface water samples and 11 sediment samples were collected during the ESI sampling. These samples were collected to determine whether the site is releasing significant amounts of hazardous substances to the Little Calumet River and nearby wetlands.

Three surface water samples (SW01,2,3) and four sediment samples (ST01,2,3,7) were collected from the Little Calumet River below the sediment/water interface. SW01 and ST01 were collected just west (downstream) of the site, near the southern river bank. SW02 and ST02 were collected adjacent to the site, just east of the barge platform. ST07 was collected at the culvert outfall which drains runoff from the ditch along the western styrene tank berms. The background surface water and sediment samples (SW03 and ST03) were collected approximately 100 feet east (upstream) of the site, near the southern river bank.

Seven sediment samples (ST04,5,6,8,9,10,11) were collected from runoff routes which drain the site. ST04, ST10, and ST11 were collected in the ditch along the

southern site fenceline which collects runoff from a low-lying onsite area. ST09 was collected in this low-lying area, approximately 60 feet north of MW-4A. ST05 and ST06 were collected near storm sewer manholes located north and west of the polyethylene emulsion building, respectively. The storm sewer system discharges to the Little Calumet River. ST08 was collected at the the culvert inlet which drains runoff from the ditch along the western styrene tank berms. This culvert discharges to the Little Calumet River.

3.4.2 Soil Sampling

Five soil samples were collected from depths of less than two feet during the ESI sampling. SS01 was collected within the bermed area surrounding the three 850,000-gallon styrene tanks at the northwestern portion of the site, near the farthest east tank. SS02 was collected approximately 100 feet northwest of MW-4A, in the likely location of the gravel-lined drum storage area. Sample SS03 was collected north of the bermed area surrounding the three 850,000-gallon styrene tanks, beneath above-ground product piping. SS04 was collected just south of the polystyrene process building, in the location of the former earthen blow-down pit. SS05, the background soil sample, was collected in the wooded area south of the site.

3.4.3 Groundwater Sampling

Three groundwater samples (GW03,4,6) were collected from onsite monitoring wells MW-3A, MW-4A, and MW-6, respectively, to assess the groundwater to surface water migration pathway. The facility's consultant installed the wells in the shallow glacial drift aquifer during previous investigations of potential contaminants. Appendix E contains boring logs for MW-3A and MW-4A; no boring log was available for MW-6.

Relative groundwater elevations were established for the three wells sampled during the ESI. Water levels were measured in the three sampled wells using a water level detector. A survey during previous site investigations by the facility established the relative elevations of the top of the casing of each well, assuming an elevation of 100.00 feet at the top of the fire hydrant bolt located east of the maintenance shop. These elevations were used to determine the following relative water elevations in the three sampled wells.

Monitoring Well	Relative Groundwater Elevation (in feet)
MW-3A	93.28
MW-4A	93.98
MW-6	95.20

These elevations indicate that groundwater in the glacial drift had a southeasterly gradient (away from the river) during the ESI sampling. This is inconsistent with the northeasterly gradient (toward the river) found during sampling by the facility's consultant in 1990.

3.5 Analytical Results

Appendix C presents analytical data for surface water, sediment, soil, and groundwater samples collected during the ESI.

3.6 Key Samples

"Key samples" are those samples that contain substances at concentrations sufficiently above background concentrations to document an observed release. Evaluation of ESI analytical data found 10 sediment key samples and four soil key samples, containing the following compounds and analytes:

- Sediment: 7 semivolatile organic compounds, 2 pesticides, and 12 inorganic analytes.
- Soil: 3 volatile organic compounds, 1 polychlorinated biphenyl (PCB), and 14 inorganic analytes.

No key samples resulted from ESI surface water and groundwater analytical data.

Table 3-3 identifies ESI key samples and associated background concentrations.

Table 3-3
Key Sample Summary

Sediment

Substance	Sample Number (concentrations in ug/kg)										
	ST01	ST02	ST03 Background	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11
Phenol			380 U		1000 J						
Fluorene	950		380 UJ								
Phenanthrene	4500		380 UJ								
Anthracene	860		380 UJ								
Fluoranthene	2700		380 UJ								
Benzo(a)anthracene	960		380 UJ								
bis(2-ethylhexyl) phthalate			380 UJB	6700 J							
4,4'-DDD			3.8 U								210
4,4'-DDT			3.8 UJ								310 J
	(concentrations in mg/kg)										
Aluminum	9090	8180	1790				5920	43100	5700		
Antimony			6.9 UJN						17.9 JN	36.5 JN	
Barium	72.5		22.8 B					124	90.0	78.9	70.7
Beryllium	1.5	0.34 B	0.23 U						0.037 B		
Cadmium			0.66 U		1.2	1.2					1.1 B
Chromium			7.5	67.0	24.2	56.3		74.9	134	38.6	
Cobalt	8.0 B	11.8 B	2.2 B				7.2 B	6.6 B	11.8		
Iron		18400	5880				19800		74800		
Nickel	17.7	26.1	5.9 B				17.9		28.2		
Potassium	1440	1460	1030 U								
Thallium	0.34 JBNW	0.38 JBN	0.23 UN								
Vanadium	14.6	17.2	4.5 JB					61.1	73.7	28.2	

Table 3-3 Key Sample Summary (Continued)					
Soil					
Substance	Sample Number (concentrations in ug/kg)				
	SS01	SS02	SS03	SS04	SS05 Background
Chloromethane	120				15 UJ
Acetone	1200 J				15 UJ
Styrene	820				15 UJ
Aroclor-1260			600 P		51 UJ
(concentrations in mg/kg)					
Aluminum		21.8			10.0 U
Barium			209	216	66.5
Cadmium	66.4			14.5	0.83 U
Calcium			148000 J		4400 J
Chromium	182	78.6		455	14.2
Copper	2440 JE				33.0 UJE
Iron				51700	16800
Lead	1240				47.5
Magnesium			96000 J		1980 J
Manganese	829	4130			255
Nickel	135			116	15.4
Silver		2.2	6.5		1.7 U
Vanadium		58.4			18.4
Zinc	212000 JE				461 JE

Reporting Qualifiers

U Compound analyzed for, but not detected. The associated numerical value is the sample quantitation limit.

P Pesticide Aroclor target analyte where greater than 25% difference exists between the two GC columns for detected concentrations. The lower of the two values is reported and flagged with a "P."

J Estimated value.

B Reported value is less than the contract required detection limit, but greater than or equal to the instrument detection limit.

E Estimated because of interference.

N Spiked sample recovery not within control limits.

4.0 Characterization of Sources

4.1 Introduction

Analysis of ESI samples and review of file information identified the following sources at the Cosden site: contaminated soil, above-ground storage tanks, the blow-down pit, wastewater treatment system, and drum storage areas.

4.2 Contaminated Soil

4.2.1 Description

Analyses of ESI soil and sediment samples indicate that approximately 10 acres of soil contain an observed release. This area is defined by four ESI key surface soil samples (SS01,2,3,4) and four onsite key sediment samples (ST05,6,8,9) that document the observed release. These four sediment samples were included to define the area of contaminated soil because they were collected in onsite runoff routes which were dry during sampling.

4.2.2 Waste Characteristics

ESI analytical results indicate the area of affected soil contains releases of 3 volatile organic compounds, 1 semivolatile organic compound, 1 PCB, and 16 inorganic analytes in concentrations ranging from 1.2 to 212,000 parts per million (ppm). Table 3-3 lists substances detected in key samples and their associated concentrations.

4.3 Above-Ground Storage Tanks

4.3.1 Description

Several steel above-ground storage tanks were used to store products and wastes from about 1978 until 1992. Three 850,000-gallon tanks and one 690,000-gallon tank stored styrene monomer, and one 80,000-gallon tank stored ethylbenzene in areas surrounded by clay berms at the northwestern portion of the site. Two additional steel styrene monomer tanks (approximately 20,000 gallons each) are located west of the polystyrene process building on concrete containment structures. A 20,000-gallon tank stored a byproduct waste consisting of styrene and ethylbenzene in a bermed area south of the 850,000-gallon styrene tanks. A 10,000-gallon tank with concrete containment stored waste oil near the Little Calumet River at the eastern portion of the site.

4.3.2 Waste Characteristics

The contents of the styrene monomer and ethylbenzene tanks are assumed to have been pure products. The byproduct waste stored in the 20,000-gallon tank consisted of 95 percent styrene monomer and 5 percent ethylbenzene. Waste oil was used for machinery maintenance and was classified as non-hazardous. Styrene (820 ppb) and acetone (1,200 ppb) were detected in ESI soil sample SS01 collected within the bermed area surrounding the 850,000-gallon styrene monomer tanks. Tanks were emptied during dismantling activities completed in 1992 (USEPA 1992).

4.4 Blow-Down Pit

4.4.1 Description

The blow-down pit, adjacent to the exterior southern wall of the polystyrene process building, was used to contain process blow-down from the polystyrene suspension process from about 1970 to 1981. The pit was earthen until 1980, when a 22,500-cubic-foot concrete pit, constructed just south of the earthen pit, replaced it.

In 1989, the site owner removed approximately 1,000 cubic yards of soil, to a depth of 4 feet, from the earthen pit location. The removal took place in response to soil vapor monitoring and soil sampling by the facility's consultant, which found ethylbenzene and styrene at concentrations up to 47 ppm in the former earthen pit location (USEPA 1992). The excavated soil was shipped to a landfill, and the excavated area was backfilled with fill material from offsite. The soil removal was initiated by the site owner, and no manifests or other documentation was found concerning the removal. No documented releases from the concrete pit have occurred, and the concrete was in good condition during ESI field activities.

4.4.2 Waste Characteristics

Process blow-down consisted of suspension water containing detergent, liquid styrene monomer, butyldiene rubber, ethylbenzene, and polystyrene plastic. Process blow-down was released from polystyrene process vats when the polymerization rate of the polystyrene suspension process was too high, causing pressure-release plates in the vats to open. Process blow-down accumulated in the blow-down pit located south of the polyethylene process building and was periodically removed and shipped to a local landfill (USEPA 1992). No manifests or waste characterization data for the process blow-down were found.

4.5 Wastewater Treatment System

4.5.1 Description

The wastewater treatment system, located west of the polystyrene process building, treated process wastewater generated by the facility from about 1970 to 1989. The system consisted of an equalizing basin to adjust pH, a clarifier to remove solids, and two sludge basins to further remove suspended solids. Treated effluent was discharged to the sanitary sewer. All system components were concrete; however, sludge basins were earthen until 1980, when they were replaced by two concrete basins. After 1989, the concrete sludge basins were used to collect runoff or spills from the concrete drum storage area. Wastewater treatment sludges were shipped offsite to an incinerator.

In 1980, sludge and soil were excavated from the earthen sludge basins, and disposed of in an offsite landfill. Sand and gravel fill was placed over the excavated area. No manifest of soil removed or records of closure of the earthen sludge basins were found. Between 1987 and 1990, the facility's consultant conducted onsite soil vapor monitoring and soil sampling. Soil vapor monitoring revealed high levels of ethylbenzene and styrene near the wastewater treatment system, but no specific numerical levels were given. Soil sampling approximately 100 feet northwest of the wastewater treatment system found ethylbenzene at 2.5 ppm and styrene at 8.5 ppm. The concrete basins appeared to be in good condition during the ESI field activities (USEPA 1992).

4.5.2 Waste Characteristics

In 1980, samples of excavated sludge and soil from the earthen sludge basins detected the following metals (with associated concentrations): chromium (0.83 ppm), copper (0.1 ppm), lead (3.97 ppm), nickel (0.1 ppm), and zinc (12.24 ppm) (Ana-Qual 1980). The facility typically generated about 29,940 pounds of wastewater treatment sludge annually, which was shipped offsite for incineration. During dismantling of the facility, liquid removed from the wastewater treatment system was found to contain freon, a RCRA hazardous waste. About 65,550 gallons of the freon-containing waste were shipped offsite for incineration (USEPA 1992).

4.6 Drum Storage Areas

4.6.1 Description

A 30,000-square-foot gravel-lined drum storage area, located at the southwestern site corner, was used to store drummed wastes until 1981. Drummed wastes stored on this area consisted of used sand bed filters from the polystyrene suspension process, acrylonitrile waste, and process blow-down. Up to 1,000 drums of waste were stored in this area for up to two years.

A 1,900-square-foot concrete drum storage area, located west of the polystyrene process building, was used to store drummed wastes from 1980 until 1992. Drums of used sand bed filters were routinely stored in this area for periods of less than 90 days. During dismantling activities, transformers and capacitors that formerly contained PCB oil were stored in the area. Release controls include a 6-inch concrete berm around the perimeter of the area and a sump that drains to a concrete basin (USEPA 1992). The concrete appeared to be in good condition during ESI field activities.

4.6.2 Waste Characteristics

Used sand bed filters contained unknown amounts of ethylbenzene and styrene and were shipped offsite for incineration. Transformers and capacitors reportedly contained non-hazardous amounts (less than 50 ppm) of PCBs and were shipped offsite for recycling or disposal. Soil vapor monitoring conducted near both areas in 1987 revealed high levels of ethylbenzene and styrene. Soil samples collected near both drum storage areas in 1989 did not detect hazardous substances (USEPA 1992).

5.0 Discussion of Migration Pathways

5.1 Introduction

This section provides information concerning the effects of the Cosden site on the four migration pathways: groundwater, surface water, air, and soil.

5.2 Groundwater

Three wells (MW-3A,-4A,-6) were sampled during the ESI. No detectable levels of organic compounds were found, and no key samples resulted from ESI groundwater sampling data.

Static water level elevations in MW-3A, -4A, and -6, measured during ESI field activities, indicated that the gradient of the shallow aquifer was southeasterly, away from the Little Calumet River. This gradient was inconsistent with the 1990 gradient, which was northeasterly. The relatively high water level of the Little Calumet River, caused by heavy rainfall in the spring and summer of 1993, may have caused the flow reversal of the shallow glacial drift aquifer.

Glacial drift, consisting of low-permeability lacustrine silts and clays with some sand and gravel lenses, extends from land surface to depths of approximately 40 to 80 feet below land surface. The water table is approximately 5 feet below land surface. The glacial drift is not used to supply drinking water to area residents. Silurian dolomite bedrock lies beneath the glacial drift and is approximately 400 feet thick. The Silurian dolomite aquifer is productive; however, it has only industrial and minimal drinking water uses near the site. Beneath the Silurian dolomite is the approximately 400-foot-thick Ordovician Maquoketa Shale Group. The relatively impermeable Maquoketa lies above sandstone aquifers, which are used for industrial supply near the site (ENSR 1990a) [Ecology and Environment (E&E) 1991]; [Illinois State Water Survey (ISWS) 1993]. Site-specific geology was limited to onsite monitoring well logs which provided information to about 10 feet below land surface; local and regional geological information were available to characterize deeper geology.

The site poses little threat to drinking water supplies. Nearly all of the population within 4 miles of the site are supplied by treated water from Lake Michigan. However, the potential exists for hazardous substances to migrate from the site to groundwater in the glacial drift. Within 4 miles of the site, no glacial drift wells and few Silurian dolomite wells supply drinking water (ISWS 1993, State of

Indiana 1989). The Silurian dolomite drinking water wells consist of hand-pump wells in public parks and a few private wells. No sandstone wells within 4 miles of the site supply drinking water. The Silurian dolomite and sandstone aquifers are unlikely to be affected by the site because of low-permeability clay and shale layers between hazardous substances and the aquifers. Table 5-1 summarizes the approximate drinking water population within 4 miles of the site. Average household populations were used to approximate population served by private wells (U.S. Dept. of Commerce 1990).

Table 5-1
Private Well Users Within 4 Miles of the Site

Radial Distance from Site (in miles)	Approximate Population Supplied by Private Wells
[redacted]	0
Non-responsive [redacted]	0
[redacted]	5
[redacted]	15
[redacted]	316
[redacted]	13
Total Population	349

5.3 Surface Water

The Little Calumet River, which forms the northern site boundary, is the probable point of entry of potential contaminants into the surface water pathway. Approximately 5 miles downstream, the Little Calumet River flows into the Calumet Sag Channel, which completes the 15-mile target distance limit [U.S. Geological Survey (USGS) 1980]. The Little Calumet River and Calumet Sag Channel are recreational fisheries and are classified as riverine open water wetlands. The ditch along the southern site fenceline is a documented wetlands [United States Department of the Interior (USDI) 1984]. No drinking water intakes are present in the surface water pathway within the target distance limit (IEPA 1983).

Onsite hazardous substances may enter the Little Calumet River by runoff, flooding, or discharge from the glacial drift aquifer. Two culverts discharge site runoff to the Little Calumet River. A portion of the site is in the 100-year floodplain [Federal Emergency Management Agency (FEMA) 1980].

ESI key samples suggest that hazardous substances detected onsite may be migrating to the Little Calumet River. Hazardous substances were detected onsite at concentrations significantly above background in soil and dry sediment key samples (SS02,3,4,5 and ST05,6,8,9). Hazardous substances were detected at concentrations significantly above background in sediment key samples ST01, ST02, and ST07 collected in the Little Calumet River at locations adjacent to the site. Seven metals were found both onsite and in the Little Calumet River at concentrations significantly above background in key samples: aluminum, barium, beryllium, cobalt, iron, nickel, and vanadium.

An eroded gully indicates that site runoff enters the ditch at the southern site fenceline. This ditch is classified as a palustrine emergent, semi-permanently flooded, excavated wetland, and consists of approximately 0.2 acres. Five inorganic analytes (antimony, barium, cadmium, chromium and vanadium) were detected at concentrations significantly above background levels in three sediment key samples (ST04,10,11) collected from the ditch. These analytes were present at concentrations significantly above background in onsite soil and dry sediment key samples.

5.4 Air

Direct release of significant amounts of hazardous vapors to the air pathway from the facility is unlikely; the facility is inactive and hazardous wastes and products

were removed from the site during dismantling activities. However, hazardous substances present in surficial soils may migrate offsite by particulate migration. During ESI field activities, no air sampling was conducted. Air monitoring with a flame ionization detector during sampling showed no readings above background.

Particulate migration of hazardous substances from the site may affect sensitive environments. Sensitive environments located within 4 miles of the site include state-designated wildlife communities and threatened and endangered species. The Dolton Avenue Prairie is located just south of the site and contains two wildlife communities. The Beaubien Woods Forest Preserve is located about 1 mile northwest of the site and contains two threatened plant species. The O'Brien Lock Heron Colony is located about 1 mile northeast of the site and contains an endangered bird. The Powderhorn Lake and Prairie is a natural area located about 2 miles west of the site. Powderhorn Lake provides a habitat for a threatened fish, and the natural area provides a habitat for threatened and endangered plants and animals. The Sand Ridge Nature Preserve and the Thornton Fractional North High School Prairie are less than 3 miles southwest of the site and contain nine unique state-designated wildlife communities and four state-designated threatened plant species (Illinois Department of Conservation 1993).

5.5 Soil

ESI sampling results indicate that three volatile organics, one PCB, and 14 inorganic analytes are present in onsite soils. Hazardous substances present in onsite soils are not likely to adversely affect human health or the environment. No workers or other persons are routinely onsite, and the nearest residences are located about 1,000 feet south of the site in Calumet City. The site perimeter is fenced, except for the northern site boundary east of the barge platform on the Little Calumet River. Within 1 mile of the site, the estimated population is 21,595 persons. This estimate was based on apportionment of surrounding municipalities (E&E 1991). No sensitive environments are located onsite (Illinois Department of Conservation 1993).

6.0 References

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Appendix A – Site 4-mile radius map & 15-mile surface water route map

Document is available at the EPA Region 5 Records Center.

Specify Type of Document(s) / Comments:

BVWS
N
Site Name: Cosden Oil and Chemical Company
Site ILD: 091 766 410
USGS TOPOGRAPHIC MAPS
Name: Blue Island Date: 1978
Name: Lake Calumet Date: 1991
Name: Harvey Date: 1978
Name: Calumet City Date: 199
Name: Whiting Date: 1980
Name: Highland Date: 1991
LEGEND
Site 4 Mile Radius Map
Map Scale
1 ½ 0
Miles
Name: CHI00149.DWG
Date: 07/08/94
SITE
LAKE CALUMET
WOLF LAKE
Lake George
Powder Horn Lake
Flatfoot Lake
Lake Cottage Grove
Lake Victory
Green Lake
Wampum Lake
Pullman
West Pullman
Kensington
South Deering
Hegewisch
Burnham
RIVERDALE
DOLTON
HARVEY
Phoenix
SOUTH HOLLAND
CALUMET CITY
HAMMOND
WHITING
Robertsdale
East Hazel Crest
Thornton Junction
Altgeld Gardens
T H O R N T O N
N O R T H
WOLF LAKE PARK
W M W POWERS CONSERVATION AREA
COOK COUNTY FOREST PRESERVE
LITTLE CALUMET RIVER
GRAND CALUMET RIVER
ILLINOIS INDIANA
COOK CO LAKE CO
SEWAGE DISPOSAL
Oil Refinery
Thomas J O'Brien Lock and Dam
Turning Basin No 5
Turning Basin No 3
HOLY CROSS CEMETERY
WENTWORTH WOODS
SIBLEY BLVD INTERCHANGE
159TH STREET INTERCHANGE
CALUMET-KINGERY INTERCHANGE
TORRENCE AVE INTERCHANGE
TRI-STATE TOLLWAY
CCFP

BVWS
N
Site Name: Cosden Oil and Chemical Company
Site ILD: 091 766 410
USGS TOPOGRAPHIC MAPS
Name: Palos Park
Date: 1980
Name: Blue Island
Date: 1973
Name: Lake Calumet
Date: 1991
LEGEND
15 Mile Downstream Map
Map Scale
Miles
Name: CM000350.DWG
Date: 07/08/94
COSDEN OIL AND CHEMICAL COMPANY
LAKE MICHIGAN
LAKE CALUMET
CHICAGO
OAK LAWN
EVERGREEN PARK
CALUMET PARK
BLUE ISLAND
RIVERDALE
DOLTON
THORNTON
HARVEY
MIDLOTHIAN
ROBBINS
Crestwood
Palos Park
Palos Heights
Merrionette Park
Hickory Hills
Palos Hills
CHICAGO RIDGE
WORTH
STICKNEY
BRIDGEVIEW
HOMETOWN
FOREST PRESERVE
ORLAND
BREMEN
Calumet Harbor
WOLF LAKE
NORTH

Appendix A

Cosden Oil and Chemical Co.

Site 4-Mile Radius Map

and

15-Mile Surface Water Route Map

Appendix B

Cosden Oil and Chemical Co.

Target Compound List and Target Analyte List

Target Compound List

Volatiles

Chloromethane
Bromomethane
Vinyl Chloride
Chloroethane
Methylene Chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (total)
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
Carbon Tetrachloride
Bromodichloromethane
1,2-Dichloropropane
Cis-1,3-Dichloropropene
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
trans-1,3-Dichloropropane
Bromoform
4-Methyl-2-pentanone
2-Hexanone
Tetrachloroethene
Toluene
1,1,2,2-Tetrachloroethane
Chlorobenzene
Ethyl benzene
Styrene
Xylenes (total)

Source: Target Compound List for water and soil with low or medium levels of volatile and semivolatile organic contaminants, as shown in the Quality Assurance Project Plan for Region V Superfund Site Assessment Program, BVWST, September 27, 1991.

Target Compound List (Continued)

Semivolatiles

Phenol
bis(2-Chloroethyl) ether
2-Chlorophenol
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene
2-Methylphenol
2,2-oxybis-(1-Chloropropane)*
4-Methylphenol
N-Nitroso-di-n-dipropylamine
Hexachloroethane
Nitrobenzene
Isophorone
2-Nitrophenol
2,4-Dimethylphenol
bis(2-Chloroethoxy) methane
2,4-Dichlorophenol
1,2,4-Trichlorobenzene
Naphthalene
4-Chloroaniline
Hexachlorobutadiene
4-Chloro-3-methylhenol
2-Methylnaphthalene
Hexachlorocyclopentadiene
2,4,6-Trichlorophenol
2,4,5-Trichlorophenol
2-Chloronephthalene
2-Nitroaniline
Dimethylphthalate
Acenaphthylene
2,6-Dinitrotoluene
3-Nitroaniline
Acenaphthene
2,4-Dinitrophenol
4-Nitrophenol
Dibenzofuran
2,4-Dinitrotoluene
Diethylphthalate
4-Chlorphenyl-phenyl ether
Fluorene
4-Nitroaniline
4,6-Dinitro-2-methylphenol
N-Nitrosodiphenylamine
4-Bromophenyl-phenyl ether
Hexachlorobenzene
Pentachlorophenol
Phenanthrenel
Anthracene
Carbazole
Di-n-butylphthalate
Fluoranthene
Pyrene
Butyl benzyl phthalate
3,3-Dichlorbenzidine
Benzo(a)anthracene
Chrysene
bis(2-Ethylhexyl)phthalate
Di-n-Octyphthalate
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Indeno(1,2,3-cd)pyrene
Dibenzo(a,h)anthracene
Benzo(g,h,i)perylene

*Previously known by the name of bis(2-chlorousipropyl) ether.

Source: Target Compound List for water and soil with low or medium levels of volatile and semivolatile organic contaminants, as shown in the Quality Assurance Project Plan for Region V Superfund Site Assessment Program, BVWST, September 27, 1991.

Target Compound List (Continued)

Pesticide/PCB

alpha-BHC	4,4-DDT
beta-BHC	Methoxychlor
delta-BHC	Endrin ketone
gamma-BHC (Lindane)	Endrin aldehyde
Heptachlor	alpha-chlordane
Aldrin	gamma-chlordane
Heptachlor epoxide	Toxaphene
Endosulfan I	Aroclor-1016
Dieldrin	Aroclor-1221
4,4-DDE	Aroclor-1232
Endrin	Aroclor-1242
Endosulfan II	Aroclor-1248
4,4-DDD	Aroclor-1254
Endosulfan sulfate	Aroclor-1260

Source: Target Compound List for water and soil containing less than high concentrations of pesticides/aroclors, as shown in the Quality Assurance Project Plan for Region V Superfund Site Assessment Program, BVWST, September 27, 1991.

Target Analyte List

Aluminum	Magnesium
Antimony	Manganese
Arsenic	Mercury
Barium	Nickel
Beryllium	Potassium
Cadmium	Selenium
Calcium	Silver
Chromium	Sodium
Cobalt	Thallium
Copper	Vanadium
Iron	Zinc
Lead	Cyanide

Source: Target Analyte List in the Quality Assurance Project Plan for Region V Superfund Site Assessment Program, BVWST, September 27, 1991.

Appendix C

Cosden Oil and Chemical Co.

Analytical Results

Appendix C

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- Inorganic Analysis C-20

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- Inorganic Analysis C-29

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- Inorganic Analysis C-35

Data Reporting Qualifiers
Definitions for Organic Chemical Data Qualifiers

R - Indicates that the data are unusable. The compound may or may not be present.

U - Indicates compound was analyzed for but not detected. The associated numerical value is the sample quantitation limit.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

N - Indicates presumptive evidence of a compound. This flag is only used for TICs where the identification is based on a mass spectral library search. It is applied to all TIC results. For generic characterization of a TIC, the N code is not used.

P - This flag is used for a pesticide Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported and flagged with a "P".

C - This flag applies to results where identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination. This flag must be used for a TIC as well as for a positively identified TCL compound

E - This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for the specific analysis. This flag will not apply to pesticide/PCBs analyzed by GC/MS methods. If one or more compounds have a response greater than full scale, the sample or extract must be diluted and re-analyzed according to the specifications.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor.

A - This flag indicates that a TIC is a suspected aldol-condensation product.

X - Required GC/MS confirmation, but did not confirm.

Z- Determined to be false positive by the pesticide data interpretation specialist.

Data Reporting Qualifiers
Definitions for Inorganic Chemical Data Qualifiers

R - Indicates that the data are unusable. The compound may or may not be present.

U - Indicates compound was analyzed for but not detected. The associated numerical value is the sample quantititaion limit.

J - Indicates an estimated value.

B - Indicates that the reported value is less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).

E - The reported value is estimated because of the presence of interference.

M - Duplicate injection precision criteria not met.

N - Spiked sample recovery not within control limits.

S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.

* - Duplicate analysis was not within control limits.

+ - Correlation coefficient for the MSA was less than 0.995.

Volatile Organic Analysis for Surface Water Samples Cosden Oil & Chemical Co.			
Volatile Compound	Sample Location and Number Concentrations in ug/l		
	SW01	SW02	SW03 Background
Chloromethane	10 U	10 U	11
Bromomethane	10 U	10 U	10 U
Vinyl Chloride	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U
Methylene Chloride	10 U	10 U	10 U
Acetone	10 U	10 U	10 U
Carbon Disulfide	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 U	10 U
1,2-Dichloroethene (total)	10 U	10 U	10 U
Chloroform	10 U	3 J	10 U
1,2-Dichloroethane	10 UJ	9 J	10 UJ
2-Butanone	10 U	10 U	10 U
1,1,1-Trichloroethane	10 U	10 U	10 U
Carbon Tetrachloride	10 U	10 U	10 U
Bromodichloromethane	10 U	10 U	10 U
1,2-Dichloropropane	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U
Trichloroethene	10 UJ	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U
Benzene	10 UJ	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U
4-Methyl-2-Pentanone	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U
Toluene	10 UJ	10 U	10 U
Chlorobenzene	10 UJ	10 U	10 U
Ethylbenzene	10 U	10 U	10 U
Styrene	10 U	10 U	10 U
Xylene (total)	10 U	10 U	10 U
Total Number of TICS *	0	0	0

* Number, not concentrations, of tentatively identified compounds (TICs).

sw-volat

Semivolatile Organic Analysis for Surface Water Samples
Cosden Oil & Chemical Co.

Semivolatile Compound	Sample Location Concentrations in ug/l		
	SW01	SW02	SW03 Background
Phenol	10 U	10 U	10 U
bis(2-Chloroethyl)Ether	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropan	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	10 U
n-Nitroso-Di-n-Propylamine	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U
2-Nitrophenol	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U
bis(2-Chloroethoxy)Methane	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U
4-Chloro-3-Methylphenol	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U
2,4,6-Trichlorophenol	10 U	10 U	10 U
2,4,5-Trichlorophenol	25 U	25 U	25 U
2-Chloronaphthalene	10 U	10 U	10 U
2-Nitroaniline	25 U	25 U	25 U
Dimethyl Phthalate	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U
3-Nitroaniline	25 U	25 U	25 U
Acenaphthene	10 U	10 U	10 U
2,4-Dinitrophenol	25 UJ	25 UJ	25 UJ
4-Nitrophenol	25 U	25 U	25 U
Dibenzofuran	10 U	10 U	10 U
2,4-Dinitrotoluene	10 U	10 U	10 U
Diethylphthalate	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U
Fluorene	10 UJ	10 UJ	10 UJ
4-Nitroaniline	25 U	25 U	25 U
4,6-Dinitro-2-Methylphenol	25 U	25 U	25 U
n-Nitrosodiphenylamine	10 U	10 U	10 U
4-Bromophenyl-phenylether	10 U	10 U	10 U

Semivolatile Organic Analysis for Surface Water Samples Cosden Oil & Chemical Co.			
Semivolatile Compound	Sample Location Concentrations in ug/l		
	SW01	SW02	SW03 Background
Hexachlorobenzene	10 U	10 U	10 U
Pentachlorophenol	25 U	25 U	25 U
Phenanthrene	10 U	10 U	10 U
Anthracene	10 U	10 U	10 U
Carbazole	10 U	10 U	10 U
di-n-Butylphthalate	10 UB	10 UB	10 UB
Fluoranthene	10 U	10 U	10 U
Pyrene	10 U	10 U	10 U
Butylbenzylphthalate	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U
Benzo(a)Anthracene	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U
bis(2-Ethylhexyl)Phthalate	10 U	2 J	2 J
di-n-Octyl Phthalate	10 U	10 U	10 U
Benzo(b)Fluoranthene	10 U	10 U	10 U
Benzo(k)Fluoranthene	10 U	10 U	10 U
Benzo(a)Pyrene	10 U	10 U	10 U
Indeno(1,2,3-cd)Pyrene	10 U	10 U	10 U
Dibenzo(a,h)Anthracene	10 U	10 U	10 U
Benzo(g,h,i)Perylene	10 U	10 U	10 U
Total Number of TICs *	1	0	1

* Number, not concentration, of tentatively identified compounds (TICs)

sw-semiv

Semivolatile Organic Analysis for Surface Water Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/kg		
Compound Name	Retention Time	Estimated Concentration
Sample SW01		
Unknown Amide	30.94	7 JB
Sample SW03		
Unknown Amide	30.95	4 JB

ticswsv

Pesticide/PCB Analysis for Surface Water Samples Cosden Oil & Chemical Co.			
Pesticide/ PCB	Sample Locations and Number Concentrations in ug/L		
	SW01	SW02	SW03 Background
Alpha-BHC	0.050 U	0.050 U	0.050 U
Beta-BHC	0.050 U	0.050 U	0.050 U
Delta-BHC	0.050 U	0.050 U	0.050 U
Gamma-BHC (Lindane)	0.050 UJ	0.050 U	0.050 U
Heptachlor	0.050 U	0.050 U	0.050 U
Aldrin	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.050 U	0.050 U	0.050 U
Endosulfan I	0.050 U	0.050 U	0.050 U
Dieldrin	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10 U	0.10 U	0.10 U
Endrin	0.10 UJ	0.10 U	0.10 U
Endosulfan II	0.10 U	0.10 U	0.10 U
4,4'-DDD	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10 UJ	0.10 U	0.10 U
Methoxychlor	0.50 U	0.50 U	0.50 U
Endrin Ketone	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10 U	0.10 U	0.10 U
Alpha-Chlordane	0.050 U	0.050 U	0.050 U
Gamma-Chlordane	0.050 U	0.050 U	0.050 U
Toxaphene	5.0 U	5.0 U	5.0 U
Aroclor-1016	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0 U	1.0 U	1.0 U

swpest

Inorganic Analysis for Surface Water Samples
Cosden Oil & Chemical Co.

Metals and Cyanide	Sample Locations and Number Concentrations in ug/L		
	SW01	SW02	SW03 Background
Aluminum	180 B	176 B	703
Antimony	36.0 U	36.0 U	36.0 U
Arsenic	4.0 UJW	4.0 UJW	4.1 JBW
Barium	25.9 B	26.8 B	47.5 B
Beryllium	2.0 U	2.0 U	2.4 B
Cadmium	3.0 U	3.0 U	3.0 U
Calcium	38300	39200	43600
Chromium	6.0 U	6.0 U	6.4 B
Cobalt	8.0 U	8.0 U	8.0 U
Copper	16.6 B	20.3 B	35.0
Iron	456	475	1990
Lead	15.8 JN*	12.7 JN*	23.5 JNS*
Magnesium	14400	15100	16700
Manganese	26.9	26.9	92.9
Mercury	0.20 U	0.20 U	0.20 U
Nickel	66.8 J*	126 J*	112 J*
Potassium	2900 B	2350 B	2050 B
Selenium	3.6 JBW	2.0 UJW	2.0 U
Silver	6.0 UJN	6.0 UJN	6.0 UJN
Sodium	19200	19200	20400
Thallium	3.0 UJW	3.0 UJW	3.0 U
Vanadium	12.0 U	12.0 U	12.0 U
Zinc	1160 JE	1360 JE	1230 JE
Cyanide	10.0 U	10.0 U	10.0 U

swmetals

Volatile Organic Analysis for Sediment Samples
Cosden Oil & Chemical Co.

Volatile Compound	Sample Locations and Number / Concentration in ug/kg										
	ST01	ST02	ST03 Background	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11
Chloromethane	13 UJ	13 UJ	12 UJ	13 UJ	10 UJ	11 UJ	12 UJ	12 UJ	11 UJ	19 UJ	15 UJ
Bromomethane	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Vinyl Chloride	13 UJ	13 UJ	12 UJ	13 UJ	10 UJ	11 UJ	12 UJ	12 UJ	11 UJ	19 UJ	15 UJ
Chloroethane	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Methylene Chloride	13 UJB	13 UJB	12 UJB	13 UJB	10 UJB	10 UJB	12 UJB	12 UJB	11 UJB	19 UJB	15 UJB
Acetone	13 UJ	22 J	12 UJ	13 UJ	10 UJ	11 UJ	12 UJ	12 UJ	11 UJ	19 UJ	15 UJ
Carbon Disulfide	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
1,1-Dichloroethene	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
1,1-Dichloroethane	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
1,2-Dichloroethene (total)	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Chloroform	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
1,2-Dichloroethane	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
2-Butanone	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
1,1,1-Trichloroethane	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Carbon Tetrachloride	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Bromodichloromethane	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
1,2-Dichloropropane	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
cis-1,3-Dichloropropene	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Trichloroethene	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Dibromochloromethane	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
1,1,2-Trichloroethane	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Benzene	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
trans-1,3-Dichloropropene	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Bromoform	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
4-Methyl-2-Pentanone	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
2-Hexanone	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Tetrachloroethene	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
1,1,2,2-Tetrachloroethane	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Toluene	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Chlorobenzene	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Ethylbenzene	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Styrene	13 U	13 U	12 U	13 U	10 U	3 J	12 U	12 U	11 U	5 J	15 U
Xylene (total)	13 U	13 U	12 U	13 U	10 U	11 U	12 U	12 U	11 U	19 U	15 U
Total Number of TICS *	0	0	0	0	0	0	0	0	0	0	0

* Number, not concentrations, of tentatively identified compounds (TICs).

sed-vol

Semivolatile Organic Analysis for Sediment Samples
Cosden Oil & Chemical Co.

Semivolatile Compound	Sample Location / Concentrations in ug/kg										
	ST01	ST02	ST03 Background	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11
Phenol	840 UJ	420 U	380 U	130000 RU	1000 J	150 J	400 U	380 U	3700 U	3100 U	490 U
bis(2-Chloroethyl)Ether	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2-Chlorophenol	840 U	420 U	380 U	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
1,3-Dichlorobenzene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
1,4-Dichlorobenzene	840 UJ	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
1,2-Dichlorobenzene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2-Methylphenol	840 U	420 U	380 U	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2,2'-oxybis(1-Chloropropane)	840 U	420 U	380 UJ	130000 RU	1700 UJ	710 U	400 UJ	380 U	3700 U	3100 UJ	490 UJ
4-Methylphenol	840 U	110 J	380 U	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
n-Nitroso-Di-n-Propylamine	840 UJ	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Hexachloroethane	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Nitrobenzene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Isophorone	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2-Nitrophenol	840 U	420 U	380 U	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2,4-Dimethylphenol	840 U	420 U	380 U	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
bis(2-Chloroethoxy)Methane	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2,4-Dichlorophenol	840 U	420 U	380 U	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
1,2,4-Trichlorobenzene	840 UJ	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Naphthalene	440 J	420 U	380 UJ	130000 RU	1700 U	710 U	44 J	380 U	3700 U	3100 U	490 U
4-Chloroaniline	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Hexachlorobutadiene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
4-Chloro-3-Methylphenol	840 U	420 U	380 U	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2-Methylnaphthalene	360 J	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	25 J
Hexachlorocyclopentadiene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2,4,6-Trichlorophenol	840 U	420 U	380 U	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2,4,5-Trichlorophenol	2000 U	1000 U	930 U	330000 RU	4200 U	1700 U	960 U	930 U	9000 U	7500 U	1200 U
2-Chloronaphthalene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2-Nitroaniline	2000 U	1000 U	930 UJ	330000 RU	4200 U	1700 U	960 U	930 U	9000 U	7500 U	1200 U
Dimethyl Phthalate	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Acenaphthylene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
2,6-Dinitrotoluene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
3-Nitroaniline	2000 U	1000 U	930 UJ	330000 RU	4200 U	1700 U	960 U	930 U	9000 U	7500 U	1200 U
Acenaphthene	840 UJ	26 J	380 UJ	130000 RU	1700 U	710 U	33 J	380 U	3700 U	3100 U	490 U
2,4-Dinitrophenol	2000 U	1000 U	930 U	330000 RUJ	4200 U	1700 U	960 U	930 U	9000 U	7500 U	1200 U
4-Nitrophenol	2000 U	1000 U	930 U	330000 RU	4200 U	1700 U	960 U	930 U	9000 U	7500 U	1200 U

Semivolatile Organic Analysis for Sediment Samples
Cosden Oil & Chemical Co.

Semivolatile Compound	Sample Location / Concentrations in ug/kg										
	ST01	ST02	ST03 Background	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11
Dibenzofuran	450 J	24 J	380 UJ	130000 RU	1700 U	710 U	39 U	380 U	3700 U	3100 U	490 U
2,4-Dinitrotoluene	840 UJ	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Diethylphthalate	840 U	420 UJB	380 UJ	130000 RU	1700 U	710 U	400 UJB	380 UJB	3700 U	3100 U	490 U
4-Chlorophenyl-phenylether	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Fluorene	950	25 J	380 UJ	130000 RU	1700 U	710 U	42 J	380 U	3700 U	3100 U	490 U
4-Nitroaniline	2000 U	1000 UJ	930 UJ	330000 RU	4200 U	1700 U	960 U	930 U	9000 U	7500 U	1200 U
4,6-Dinitro-2-Methylphenol	2000 U	1000 U	930 U	330000 RU	4200 U	1700 U	960 U	930 U	9000 U	7500 U	1200 U
n-Nitrosodiphenylamine	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
4-Bromophenyl-phenylether	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Hexachlorobenzene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Pentachlorophenol	2000 RU	1000 U	930 U	330000 RU	4200 U	1700 U	960 U	930 U	9000 U	7500 U	1200 U
Phenanthrene	4500	73 J	380 UJ	130000 RU	190 J	710 U	260 J	96 J	260 J	340 J	200 J
Anthracene	860	420 U	380 UJ	130000 RU	1700 U	710 U	43 J	380 U	3700 U	3100 U	220 J
Carbazole	530 J	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
di-n-Butylphthalate	840 UJB	420 UJB	380 UJB	130000 RU	1700 U	710 U	400 UJB	380 U	3700 U	3100 U	490 UJB
Fluoranthene	2700	54 J	380 UJ	130000 RU	270 J	710 U	240 J	210 J	380 J	350 J	490 U
Pyrene	2200 J	81 J	380 UJ	130000 RU	340 J	710 U	400	380 U	310 J	3100 U	490 U
Butylbenzylphthalate	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	20 J	380 U	3700 U	3100 U	490 U
3,3'-Dichlorobenzidine	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Benzo(a)Anthracene	960	26 J	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Chrysene	560 J	420 U	380 UJ	130000 RU	1700 U	710 U	100 J	170 J	260 J	3100 U	490 U
bis(2-Ethylhexyl)Phthalate	840 U	420 UJB	380 UJB	6700 J	1700 U	550 JB	400 UJB	500 B	3700 UJB	3100 UJB	490 U
di-n-Octyl Phthalate	840 UJ	420 U	380 UJ	130000 RU	1700 UJ	710 UJ	400 UJ	380 UJ	3700 U	3100 UJ	490 UJ
Benzo(b)Fluoranthene	690 J	26 J	380 UJ	130000 RU	1700 U	710 U	90 J	190 J	410 J	3100 U	200 J
Benzo(k)Fluoranthene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	43 J	380 U	3700 U	3100 U	490 U
Benzo(a)Pyrene	57 J	420 U	380 UJ	130000 RU	120 J	710 U	49 J	67 J	3700 U	3100 U	490 U
Indeno(1,2,3-cd)Pyrene	130 J	420 U	380 UJ	130000 RU	1700 U	54 J	400 U	40 J	3700 U	3100 U	490 U
Dibenzo(a,h)Anthracene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	20 J	3700 U	3100 U	490 U
Benzo(g,h,i)Perylene	840 U	420 U	380 UJ	130000 RU	1700 U	710 U	400 U	380 U	3700 U	3100 U	490 U
Total Number of TICs *	20	19	4	16	20	20	19	20	20	20	20

sedim-sv

* Number, not concentrations, of tentatively identified compounds

Semivolatile Organic Analysis for Sediment Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/kg			
Compound Name	Retention Time	Estimated Concentration	
Sample ST01			
Unknown Hydrocarbon	5.55	340	J
Unknown Hydrocarbon	5.92	340	J
Unknown Hydrocarbon	7.22	590	J
Unknown Hydrocarbon	8.70	630	J
Unknown Hydrocarbon	8.97	510	J
Unknown Hydrocarbon	9.82	380	J
Unknown Hydrocarbon	11.60	930	J
Unknown Hydrocarbon	12.38	1000	J
Unknown Hydrocarbon	12.90	1000	J
Unknown Hydrocarbon	14.13	800	J
Unknown Hydrocarbon	15.33	1400	J
Unknown	16.02	460	J
Unknown Hydrocarbon	17.48	420	J
Unknown Hydrocarbon	18.43	460	J
Unknown Hydrocarbon	19.23	510	J
Unknown	20.33	380	J
Unknown Hydrocarbon	20.63	460	J
Hexanedioic Acid Derivative	21.20	680	J
Unknown Hydrocarbon	22.42	340	J
Unknown Hydrocarbon	22.97	340	J
Sample ST02			
Ethylmethyl Benzene Isomer	4.27	230	J
Unknown Hydrocarbon	10.28	170	J
Unknown Hydrocarbon	11.67	170	J
Unknown Hydrocarbon	12.43	190	J
Unknown	12.60	490	J
Unknown Hydrocarbon	12.97	210	J
Unknown Hydrocarbon	14.18	190	J
Unknown Hydrocarbon	15.37	430	J
Unknown	15.95	300	J
Unknown Hydrocarbon	17.53	260	J
Unknown Hydrocarbon	18.47	210	J
Unknown Hydrocarbon	19.28	210	J
Unknown Hydrocarbon	20.68	190	J
Unknown	21.63	530	J
Unknown	22.18	1000	J
Unknown	22.27	1500	J
Unknown	22.37	450	J
Unknown	22.90	170	J
Unknown Hydrocarbon	23.02	210	J

Semivolatile Organic Analysis for Sediment Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/kg			
Compound Name	Retention Time	Estimated Concentration	
Sample ST03			
Unknown Hydrocarbon	15.32	140	J
Benzene Dicarboxylic Acid De	17.07	150	J
Unknown Hydrocarbon	17.87	120	J
Unknown Hydrocarbon	24.32	77	J
Sample ST04			
Unknown Cycloalkene	6.38	1500000	J
Unknown Alkylbenzene	7.07	110000	J
Benzene, Propyl-	7.70	71000	JN
Benzaldehyde	7.88	33000	JN
Ethanone, 1-Phenyl-	9.97	53000	JN
Cyclobutanediyl Benzene Isom	20.17	36000	J
Cyclobutanediyl Benzene Isom	20.83	100000	J
Unknown Benzene	27.60	190000	J
Unknown Benzene	28.40	370000	J
Unknown Benzene	28.50	610000	J
Unknown Benzene	28.63	210000	J
Unknown Hydrocarbon	28.85	48000	J
Unknown Benzene	29.45	81000	J
Unknown Hydrocarbon	29.75	74000	J
Unknown Hydrocarbon	30.82	43000	J
Unknown Hydrocarbon	32.07	28000	J
Sample ST05			
Unknown	3.68	5600	J
Ethyl Methyl Benzene	4.23	2500	J
Unknown	4.75	1600	J
Methyl Ethyl Benzene Isomer	4.88	1100	J
Unknown	6.72	630	J
Unknown Hydrocarbon	14.15	430	J
Unknown	15.28	1400	J
Unknown	15.90	3000	J
Unknown Hydrocarbon	17.48	2300	J
Unknown	18.17	870	J
Unknown Hydrocarbon	18.43	1800	J
Unknown	18.57	610	J
Unknown Hydrocarbon	20.23	690	J
Unknown	21.60	520	J
Unknown Hydrocarbon	22.07	1400	J
Unknown	22.15	6900	J
Unknown	22.23	10000	J

Semivolatile Organic Analysis for Sediment Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/kg			
Compound Name	Retention Time	Estimated Concentration	
Sample ST05 (Continued)			
Unknown	22.33	3600	J
Unknown Hydrocarbon	22.60	690	J
Unknown	22.87	960	J
Sample ST06			
Unknown	3.63	1800	J
Unknown Hydrocarbon	11.25	1200	J
Unknown Hydrocarbon	12.38	2000	J
Unknown Hydrocarbon	12.90	1700	J
Trimethyl Naphthalene Isomer	13.53	1300	J
Unknown Hydrocarbon	14.13	2900	J
Unknown Hydrocarbon	14.67	2700	J
Unknown Hydrocarbon	15.32	5400	J
Cyclobutanediyl Benzene Isom	15.88	3300	J
Unknown Hydrocarbon	16.47	1600	J
Unknown Hydrocarbon	17.47	3300	J
Unknown Hydrocarbon	18.42	2900	J
Unknown Hydrocarbon	19.23	2200	J
Unknown	20.75	1700	J
Unknown	21.20	2500	J
Unknown	21.58	3300	J
Unknown	22.13	5700	J
Unknown	22.23	6500	J
Unknown	22.32	2800	J
Unknown	22.85	1300	J
Sample ST07			
Unknown Hydrocarbon	5.57	560	J
Unknown Hydrocarbon	5.93	420	J
Unknown Hydrocarbon	7.23	740	J
Unknown Hydrocarbon	8.97	500	J
Unknown Hydrocarbon	10.23	760	J
Unknown Hydrocarbon	11.62	820	J
Unknown Hydrocarbon	12.40	780	J
Unknown Hydrocarbon	12.92	720	J
Unknown Hydrocarbon	15.33	1300	J
Unknown Hydrocarbon	15.45	140	J
Unknown Hydrocarbon	17.48	380	J
Unknown Hydrocarbon	17.90	120	J
Unknown Hydrocarbon	18.43	400	J
Phenanthrene Derivative	18.82	160	J
Unknown Hydrocarbon	19.25	400	J

Semivolatile Organic Analysis for Sediment Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/kg			
Compound Name	Retention Time	Estimated Concentration	
Sample ST07 (Continued)			
Unknown Hydrocarbon	20.65	260	J
Unknown Hydrocarbon	21.27	260	J
Unknown Hydrocarbon	22.42	180	J
Unknown Hydrocarbon	23.50	140	J
Sample ST08			
Unknown	3.65	97	J
Unknown	4.90	140	J
Unknown	6.65	210	J
Unknown Hydrocarbon	10.20	170	J
Unknown	10.32	210	J
Unknown Hydrocarbon	11.58	270	J
Unknown Hydrocarbon	12.35	350	J
Unknown Hydrocarbon	12.88	330	J
Unknown Hydrocarbon	14.10	250	J
Unknown	14.78	210	J
Unknown Hydrocarbon	15.28	910	J
Unknown	15.87	1800	J
Unknown Hydrocarbon	17.45	990	J
Unknown Hydrocarbon	18.40	910	J
Unknown Hydrocarbon	21.18	540	J
Unknown	21.58	2600	J
Unknown	22.13	2700	J
Unknown	22.22	4500	J
Unknown	22.30	1400	J
Unknown	22.83	620	J
Sample ST09			
Unknown	3.70	18000	J
Ethyl Methyl Benzene Isomer	4.25	2200	J
Unknown	4.77	1700	J
Ethyl Methyl Benzene Isomer	4.90	1100	J
Unknown	6.73	750	J
Unknown Hydrocarbon	15.32	1900	J
Unknown	15.58	1100	J
Unknown	15.90	2600	J
Unknown Hydrocarbon	17.48	2800	J
Unknown Hydrocarbon	17.90	940	J
Unknown Hydrocarbon	18.10	750	J
Unknown	18.18	750	J
Unknown Hydrocarbon	18.43	2200	J
Unknown Hydrocarbon	19.25	1300	J

Semivolatile Organic Analysis for Sediment Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/kg			
Compound Name	Retention Time	Estimated Concentration	
Sample ST09 (Continued)			
Unknown	21.22	1100	J
Unknown	22.15	7100	J
Unknown	22.23	11000	J
Unknown	22.33	3700	J
Unknown	22.87	1500	J
Unknown	23.10	1700	J
Sample ST10			
Unknown	3.68	47000	J
Benzene, (1-Methylethyl)-	4.23	6400	JN
Propyl Benzene	4.75	4600	J
1-Phenyl Ethanone	6.68	3300	JN
Methyl Substituted Phenol	12.95	1600	J
Benzene Derivative	14.82	2200	J
Unknown Hydrocarbon	15.30	3600	J
Unknown	15.90	6300	J
Unknown Hydrocarbon	17.48	4400	J
Unknown	17.90	3800	J
Unknown Hydrocarbon	18.08	3600	J
Unknown Hydrocarbon	18.43	3800	J
Unknown Hydrocarbon	19.53	2800	J
Unknown	21.60	11000	J
Unknown	22.15	17000	J
Unknown	22.23	24000	J
Unknown	22.33	11000	J
Unknown Hydrocarbon	24.03	7700	J
Unknown Hydrocarbon	25.48	3500	J
Unknown Hydrocarbon	27.15	4900	J
Sample ST11			
Unknown	3.68	170	J
Unknown Methyl Alkene Group	17.77	98	J
Unknown	18.73	1300	J
Dimethyl Alekene Group	18.93	1300	J
Unknown	19.28	290	J
Unknown	19.55	370	J
Unknown	19.82	240	J
Unknown	20.48	440	J
Unknown Hydrocarbon	20.82	730	J
Unknown	21.03	290	J
Unknown Hydrocarbon	21.15	370	J
Unknown	21.32	200	J

Semivolatile Organic Analysis for Sediment Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/kg			
Compound Name	Retention Time	Estimated Concentration	
Sample ST11 (Continued)			
Unknown Hydrocarbon	22.12	240	J
Unknown	22.18	240	J
Unknown Hydrocarbon	23.00	370	J
Unknown Hydrocarbon	24.05	2400	J
Unknown	25.13	660	J
Unknown	25.72	660	J
Unknown	27.22	2400	J
Unknown	28.22	320	J

tic-sedsv

Pesticide/PCB Analysis for Sediment Samples
Cosden Oil and Chemical Co.

Pesticide/ PCB	Sample Location and Number / Concentrations in ug/kg										
	ST01	ST02	ST03 Background	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11
Alpha-BHC	4.3 UJ	2.2 U	2.0 U	110 U	7.1 U	46 U	2.0 U	7.9 U	7.6 U	13 U	50 U
Beta-BHC	4.3 UJ	2.2 U	2.0 U	110 U	7.1 U	46 U	2.0 U	7.9 U	7.6 U	13 U	50 U
Delta-BHC	4.3 UJ	2.2 U	2.0 U	110 U	7.1 U	46 U	2.0 U	7.9 U	7.6 U	13 U	50 U
Gamma-BHC (Lind.)	4.3 UJ	2.2 U	2.0 U	110 U	7.1 U	46 U	2.0 U	7.9 U	7.6 U	13 U	50 U
Heptachlor	4.3 UJ	2.2 U	2.0 U	110 U	7.1 U	46 U	2.0 U	7.9 U	7.6 U	13 U	50 U
Aldrin	4.3 UJ	2.2 U	2.0 U	110 U	7.1 U	46 U	2.0 U	7.9 U	7.6 U	13 U	50 U
Heptachlor Epoxide	4.3 UJ	2.2 U	2.0 U	110 U	7.1 U	46 U	2.0 U	7.9 U	7.6 U	13 U	50 U
Endosulfan I	4.3 UJ	2.2 U	2.0 U	110 U	7.1 U	46 U	2.0 U	7.9 U	7.6 U	13 U	50 U
Dieldrin	8.4 UJ	4.2 U	3.8 U	220 U	14 U	89 U	4.0 U	15 U	15 U	25 U	97 U
4,4'-DDE	8.4 UJ	4.2 U	3.8 U	220 U	14 U	89 U	4.0 U	8.2 U	15 U	25 U	32 U
Endrin	8.4 UJ	4.2 U	3.8 U	220 U	14 U	89 U	4.0 UJ	15 UJ	15 U	25 U	97 UJ
Endosulfan II	8.4 UJ	4.2 U	3.8 U	220 U	14 U	89 U	4.0 U	15 U	15 U	25 U	97 U
4,4'-DDD	8.4 UJ	4.2 U	3.8 U	220 U	14 U	89 U	4.0 U	9.2 J	15 U	25 U	210
Endosulfan Sulfate	8.4 UJ	4.2 U	3.8 U	220 U	14 U	89 U	4.0 U	15 U	15 U	25 U	97 U
4,4'-DDT	8.4 UJ	4.2 UJ	3.8 UJ	220 UJ	14 UJ	89 UJ	4.0 U	18 J	15 UJ	25 UJ	310 J
Methoxychlor	43 UJ	22 U	20 U	1100 U	71 U	460 U	20 U	79 U	76 U	130 U	500 U
Endrin Ketone	8.4 UJ	4.2 U	3.8 U	220 U	14 U	89 U	4.0 U	15 U	15 U	25 U	97 U
Endrin Aldehyde	8.4 UJ	4.2 U	3.8 U	220 U	14 U	89 U	4.0 U	15 U	15 U	25 U	97 U
Alpha-Chlordane	4.3 UJ	2.2 U	2.0 U	110 U	7.1 U	46 U	2.0 U	7.9 U	7.6 U	13 U	50 U
Gamma-Chlordane	4.3 UJ	2.2 U	2.0 U	110 U	7.1 U	46 U	2.0 U	7.9 U	7.6 U	13 U	50 U
Toxaphene	430 UJ	220 U	200 U	11000 U	710 U	4600 U	200 U	790 U	760 U	1300 U	5000 U
Aroclor-1016	84 UJ	42 U	38 U	2200 U	140 U	890 U	40 U	150 U	150 U	250 U	970 U
Aroclor-1221	170 UJ	86 U	78 U	4400 U	280 U	1800 U	81 U	310 U	300 U	510 U	2000 U
Aroclor-1232	84 UJ	42 U	38 U	2200 U	140 U	890 U	40 U	150 U	150 U	250 U	970 U
Aroclor-1242	84 UJ	25 JP	38 U	2200 U	140 U	890 U	40 U	150 U	150 U	250 U	970 U
Aroclor-1248	84 UJ	42 U	38 U	2200 U	140 U	3700 U	40 U	150 U	150 U	250 U	970 U
Aroclor-1254	84 UJ	42 U	38 U	2200 U	140 U	890 U	40 U	150 U	150 U	250 U	970 U
Aroclor-1260	84 UJ	42 U	38 U	2200 U	140 U	890 U	40 U	150 U	150 U	250 U	970 U

sedpest

Inorganic Analysis for Sediment Samples
Cosden Oil & Chemical Co.

Metals and Cyanide	Sample Location Concentrations in mg/kg										
	ST01	ST02	ST03 Background	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11
Aluminum	9090	8180	1790	1210	1210	1550	5920	43100	5700	2550	1870
Antimony	7.8 UJN	7.8 UJN	6.9 UJN	7.5 UJN	13.4 JN	6.1 UJN	7.3 UJN	7.3 JBN	17.9 JN	36.5 JN	9.9 UJN
Arsenic	6.8	6.8	3.7	1.4 B	1.2 B	2.2 S	6.9 S	1.4 JBW	2.6 S	2.8 JBW	2.5 BS
Barium	72.5	43.0 B	22.8 B	12.7 B	18.9 B	16.5 B	34.1 B	124	90.0	78.9	70.7
Beryllium	1.5	0.34 B	0.23 U	0.25 U	0.21 U	0.21 U	0.25 U	0.23 U	0.37 B	0.39 U	0.34 U
Cadmium	0.74 U	0.75 U	0.66 U	0.71 U	1.2	1.2	0.69 U	0.65 U	0.66 U	1.1 U	1.1 B
Calcium	86400 J*	64200 J*	62600 J*	8900 J*	155000 J*	105000 J*	38900 J*	76300 J*	114000 J*	199000 J*	263000 J*
Chromium	14.9 *	16.0 *	7.5 *	67.0 *	24.2 *	56.3 *	14.3 *	74.9 *	134 *	38.6 *	20.2 *
Cobalt	8.0 B	11.8 B	2.2 B	2.4 B	1.1 B	2.4 B	7.2 B	6.6 B	11.8	4.8 B	2.7 B
Copper	18.8 U	21.4 U	4.9 UB	7.7 U	9.2 U	14.4 U	32.9 U	20.8 U	43.1 U	15.3 U	11.9 U
Iron	12900 *	18400 *	5880 *	4110 *	8070 *	8740 *	19800 *	17400 *	74800 *	9460 *	6670 *
Lead	89.3 J*	13.9 J*	12.1 J*	27.5 J*	32.2 J*	24.9 J*	46.0 J*	29.7 J*	48.2 J*	48.0 J*	67.8 J*
Magnesium	32900 J	28300 J*	32900 J*	9390 J*	88300 J*	60300 J*	18300 J*	16000 J*	34000 J*	26800 J*	12300 J*
Manganese	913 J*	399 J*	251 J*	163 J*	958 J*	243 J*	552 J*	2850 J*	5510 J*	1840 J*	633 J*
Mercury	0.07 U	0.07 U	0.06 U	0.06 U	0.05 U	0.05 U	0.06 U	0.06 U	0.06 B	0.10 U	0.08 U
Nickel	17.7	26.1	5.9 B	3.9 B	4.8 B	6.6 B	17.9	11.9	28.2	10.1 B	5.8 B
Potassium	1440	1460	1030 U	1120 U	918 U	905 U	1090 U	1030 U	1030 U	1690 U	1480 U
Selenium	1.3 RUN	0.27 RUNW	2.3 RUN	0.25 RUN	0.21 RUNW	0.21 RUNW	0.25 RUNW	0.23 RUNW	0.23 RUNW	0.39 RUNW	0.34 RUNW
Silver	0.90 U	0.91 U	0.80 U	0.87 U	0.71 U	0.70 U	0.84 U	0.80 U	0.80 U	1.3 U	1.1 U
Sodium	1090 UB	207 UB	180 UJB	90.1 UB	189 UB	136 UB	174 UB	110 UB	295 UB	313 UB	295 UB
Thallium	0.34 JBNW	0.38 JBN	0.23 UN	0.25 UJNW	0.21 UJNW	0.21 UJN	0.25 UJN	0.23 UJN	0.23 UJN	0.39 UJN	0.34 UJN
Vanadium	14.6	17.2	4.5 JB	6.2 JB	12.1	5.1 JB	13.0	61.1	73.7	28.2	9.5 B
Zinc	62.4 JE	55.7 JE	39.2 JE	73.4 JE	93.0 JE	270 JE	120 JE	72.6 JE	198 JE	152 JE	402 JE
Cyanide	0.15 B	0.09 U	0.45 B	0.09 U	0.18 B	0.07 U	0.60 B	0.08 U	0.08 U	0.12 U	0.12 U

sedmetal

Volatile Organic Analysis for Soil Samples Cosden Oil & Chemical Co.					
	Sample Locations and Number / Concentration in ug/kg				
Volatile Compound	SS01	SS02	SS03	SS04	SS05 Background
Chloromethane	120	11 U	10 U	10 UJ	15 UJ
Bromomethane	92 U	11 U	10 U	10 UJ	15 UJ
Vinyl Chloride	92 U	11 U	10 U	10 UJ	15 UJ
Chloroethane	92 U	11 U	10 U	10 UJ	15 UJ
Methylene Chloride	92 U	11 U	10 U	10 UJ	15 UJ
Acetone	1200 J	11 UJ	10 UJ	10 UJ	15 UJ
Carbon Disulfide	92 U	11 U	10 U	10 UJ	15 UJ
1,1-Dichloroethene	92 U	11 U	10 U	10 UJ	15 UJ
1,1-Dichloroethane	92 U	11 U	10 U	10 UJ	15 UJ
1,2-Dichloroethene (total)	92 U	11 U	10 U	10 UJ	15 UJ
Chloroform	92 U	11 U	10 U	10 UJ	15 UJ
1,2-Dichloroethane	92 U	11 U	10 U	10 UJ	15 UJ
2-Butanone	92 U	11 U	10 U	10 UJ	15 UJ
1,1,1-Trichloroethane	92 U	11 U	10 U	10 UJ	15 UJ
Carbon Tetrachloride	92 UJ	11 UJ	10 UJ	10 UJ	15 UJ
Bromodichloromethane	92 U	11 U	10 U	10 UJ	15 UJ
1,2-Dichloropropane	92 U	11 U	10 U	10 UJ	15 UJ
cis-1,3-Dichloropropene	92 U	11 U	10 U	10 UJ	15 UJ
Trichloroethene	92 U	11 U	10 U	10 UJ	15 UJ
Dibromochloromethane	92 U	11 U	10 U	10 UJ	15 UJ
1,1,2-Trichloroethane	92 U	11 U	10 U	10 UJ	15 UJ
Benzene	92 U	11 U	10 U	10 UJ	15 UJ
trans-1,3-Dichloropropene	92 UJ	11 UJ	10 UJ	10 UJ	15 UJ
Bromoform	92 U	11 U	10 U	10 UJ	15 UJ
4-Methyl-2-Pentanone	92 U	11 U	10 U	10 UJ	15 UJ
2-Hexanone	92 U	11 U	10 U	10 UJ	15 UJ
Tetrachloroethene	92 U	11 U	10 U	2 J	4 J
1,1,2,2-Tetrachloroethane	92 U	11 U	10 U	10 UJ	15 UJ
Toluene	92 U	11 U	10 U	10 UJ	15 UJ
Chlorobenzene	92 U	11 U	10 U	10 UJ	15 UJ
Ethylbenzene	92 U	11 U	10 U	14 J	15 UJ
Styrene	820	11 U	2 J	10 UJ	15 UJ
Xylene (total)	92 U	11 U	10 U	10 UJ	15 UJ
Total Number of TICS *	2	1	0	2	1

* Number, not concentrations, of tentatively identified compounds (TICs) soil-vol

Volatile Organic Analysis for Soil Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/kg			
Compound Name	Retention Time	Estimated Concentration	
Sample SS01			
Unknown Hydrocarbon	2.990	210	J
Diazene, bis(1,1-dimethyleth	13.280	97	JN
Sample SS02			
Cyclotetrasiloxane, octameth	21.370	7	JNY
Sample SS04			
Methane, trichlorofluoro-	4.230	18	JN
Cyclotetrasiloxane, octameth	21.390	9	JNY
Sample SS05			
Cyclotetrasiloxane, octameth	21.390	16	JNY

tic-vsl

Semivolatile Organic Analysis for Soil Samples
Cosden Oil & Chemical Co.

Semivolatile Compound	Sample Location / Concentrations in ug/kg				
	SS01	SS02	SS03	SS04	SS05 Background
Phenol	30000 RU	11000 U	350 U	10000 RU	500 U
bis(2-Chloroethyl)Ether	30000 U	11000 U	350 U	10000 RU	500 U
2-Chlorophenol	30000 RU	11000 U	350 U	10000 RU	500 U
1,3-Dichlorobenzene	30000 U	11000 U	350 U	10000 RU	500 U
1,4-Dichlorobenzene	30000 RU	11000 U	350 U	10000 RU	500 U
1,2-Dichlorobenzene	30000 U	11000 U	350 U	10000 RU	500 U
2-Methylphenol	30000 U	11000 U	350 U	10000 RU	500 U
2,2'-oxybis(1-Chloropropane)	30000 U	11000 U	350 U	10000 RU	500 U
4-Methylphenol	30000 U	11000 U	350 U	10000 RU	500 U
n-Nitroso-Di-n-Propylamine	30000 RU	11000 U	350 U	10000 RU	500 U
Hexachloroethane	30000 U	11000 U	350 U	10000 RU	500 U
Nitrobenzene	30000 U	11000 U	350 U	10000 RU	500 U
Isophorone	30000 U	11000 U	350 U	10000 RU	500 U
2-Nitrophenol	30000 U	11000 U	350 U	10000 RU	500 U
2,4-Dimethylphenol	30000 U	11000 U	350 U	10000 RU	500 U
bis(2-Chloroethoxy)Methane	30000 U	11000 U	350 U	10000 RU	500 U
2,4-Dichlorophenol	30000 U	11000 U	350 U	10000 RU	500 U
1,2,4-Trichlorobenzene	30000 RU	11000 U	350 U	10000 RU	500 U
Naphthalene	30000 U	11000 U	350 U	10000 RU	500 U
4-Chloroaniline	30000 U	11000 U	350 U	10000 RU	500 U
Hexachlorobutadiene	30000 U	11000 UJ	350 U	10000 RU	500 U
4-Chloro-3-Methylphenol	30000 RU	11000 U	350 U	10000 RU	500 U
2-Methylnaphthalene	30000 U	11000 U	350 U	10000 RU	500 U
Hexachlorocyclopentadiene	30000 U	11000 U	350 U	10000 RU	500 U
2,4,6-Trichlorophenol	30000 U	11000 U	350 U	10000 RU	500 U
2,4,5-Trichlorophenol	73000 U	26000 U	840 U	26000 RU	1200 U
2-Chloronaphthalene	30000 U	11000 U	350 U	10000 RU	500 U
2-Nitroaniline	73000 U	26000 U	840 U	26000 RU	1200 U
Dimethyl Phthalate	30000 U	11000 U	350 U	10000 RU	500 U
Acenaphthylene	30000 U	11000 U	350 U	10000 RU	500 U
2,6-Dinitrotoluene	30000 U	11000 U	350 U	10000 RU	500 U
3-Nitroaniline	73000 U	26000 U	840 U	26000 RU	1200 U
Acenaphthene	30000 RU	11000 U	350 U	10000 RU	500 U
2,4-Dinitrophenol	73000 UJ	26000 U	840 UJ	26000 RU	1200 UJ
4-Nitrophenol	73000 RU	26000 U	840 U	26000 RU	1200 U
Dibenzofuran	30000 U	11000 U	350 U	10000 RU	500 U
2,4-Dinitrotoluene	30000 RU	11000 U	350 U	10000 RU	500 U
Diethylphthalate	30000 U	11000 U	350 U	10000 RU	500 U
4-Chlorophenyl-phenylether	30000 U	11000 U	350 U	10000 RU	500 U
Fluorene	30000 UJ	11000 U	350 UJ	10000 RU	500 UJ
4-Nitroaniline	73000 U	26000 U	840 U	26000 RU	1200 U
4,6-Dinitro-2-Methylphenol	73000 U	26000 U	840 U	26000 RU	1200 U
n-Nitrosodiphenylamine	30000 U	11000 U	350 U	10000 RU	500 U
4-Bromophenyl-phenylether	30000 U	11000 U	350 U	10000 RU	500 U
Hexachlorobenzene	30000 U	11000 U	350 U	10000 RU	500 U
Pentachlorophenol	73000 RU	26000 U	840 U	26000 RU	1200 U
Phenanthrene	30000 U	11000 U	73 J	10000 RU	69 J
Anthracene	30000 U	11000 UJ	350 UJ	10000 RUJ	500 U
Carbazole	30000 U	11000 UJ	350 UJ	10000 RUJ	500 U
di-n-Butylphthalate	30000 U	11000 UJ	350 UJ	10000 RUJ	500 U

Semivolatile Organic Analysis for Soil Samples
Cosden Oil & Chemical Co.

Semivolatile Compound	Sample Location / Concentrations in ug/kg				
	SS01	SS02	SS03	SS04	SS05 Background
Fluoranthene	30000 U	11000 UJ	120 J	10000 RUJ	72 J
Pyrene	30000 RU	11000 UJ	120 J	10000 RUJ	76 J
Butylbenzylphthalate	30000 U	11000 UJ	280 J	10000 RUJ	500 U
3,3'-Dichlorobenzidine	30000 U	11000 UJ	350 UJ	10000 RUJ	500 U
Benzo(a)Anthracene	30000 U	11000 UJ	50 J	10000 RUJ	500 U
Chrysene	30000 UJ	11000 UJ	66 J	10000 RUJ	51 J
bis(2-Ethylhexyl)Phthalate	30000 UJ	11000 UJ	350 UJ	1700 RJ	500 U
di-n-Octyl Phthalate	30000 U	11000 UJ	350 UJ	10000 RUJ	500 U
Benzo(b)Fluoranthene	30000 U	11000 UJ	150 J	10000 RUJ	53 J
Benzo(k)Fluoranthene	30000 U	11000 UJ	150 J	10000 RUJ	500 U
Benzo(a)Pyrene	30000 U	11000 UJ	52 J	10000 RUJ	500 U
Indeno(1,2,3-cd)Pyrene	30000 U	11000 U	350 U	10000 RU	500 U
Dibenzo(a,h)Anthracene	30000 U	11000 U	350 U	10000 RU	500 U
Benzo(g,h,i)Perylene	30000 U	11000 U	350 U	10000 RU	500 U
Total Number of TICs	5	20	20	20	20

Semivolatile Organic Analysis for Soil Samples
Tentatively Identified Compounds
Cosden Oil & Chemical Co.
Concentrations in ug/kg

Compound Name	Retention Time	Estimated Concentration	
Sample SS01			
Styrene	7.740	800000	JN
Unknown Aromatic	20.350	6800	J
Unknown Aromatic	21.770	10000	J
Unknown Aromatic	25.680	9500	J
Unknown	29.160	6400	J
Sample SS02			
Unknown Hydrocarbon	21.820	12000	J
Unknown Hydrocarbon	22.850	14000	J
Unknown	23.690	10000	J
Unknown Hydrocarbon	23.840	14000	J
Unknown	24.020	14000	J
Unknown	24.210	12000	J
Unknown	24.390	12000	J
Unknown Cyclic Alkane	24.700	5400	J
Unknown Hydrocarbon	26.010	10000	J
Unknown Cyclic Alkane	26.550	12000	J
Unknown Hydrocarbon	26.860	13000	J
Unknown	27.420	21000	J
Unknown Hydrocarbon	27.670	16000	J
Unknown	28.310	21000	J
Unknown	28.400	28000	J
Unknown	28.470	12000	J
Unknown	28.530	12000	J
Unknown	29.220	13000	J
Unknown Aromatic	29.490	14000	J
Unknown	30.020	10000	J
Sample SS03			
Unknown	26.860	810	J
Unknown	27.470	580	J
Chlorinated Unknown	28.080	720	J
Unknown Aromatic	28.710	710	J
Unknown	29.000	1200	J
Unknown	29.100	1500	J
Unknown	29.180	560	J
Unknown	29.220	850	J
Unknown	29.610	610	J
Unknown	29.780	590	J
Unknown	30.260	760	J
Unknown	30.490	750	J
Unknown	31.610	790	J
Unknown	31.930	710	J

Semivolatile Organic Analysis for Soil Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/kg			
Compound Name	Retention Time	Estimated Concentration	
Unknown	32.480	560	J
Unknown	33.120	700	J
Unknown	33.610	830	J
Unknown	33.850	770	J
Unknown	34.480	780	J
Unknown	34.940	580	J
Sample SS04			
Unknown	25.750	14000	RJ
Unknown Aromatic	26.720	11000	RJ
Unknown	27.130	10000	RJ
Unknown	27.900	12000	RJ
Unknown	28.140	14000	RJ
Unknown	28.810	20000	RJ
Unknown	28.920	23000	RJ
Unknown	29.030	12000	RJ
Unknown	29.210	12000	RJ
Unknown	29.760	18000	RJ
Unknown	30.040	17000	RJ
Unknown	30.400	16000	RJ
Unknown	30.790	18000	RJ
Unknown	31.160	15000	RJ
Unknown	31.350	16000	RJ
Unknown	31.600	14000	RJ
Unknown	32.250	12000	RJ
Unknown	32.760	12000	RJ
Unknown	33.200	13000	RJ
Unknown	33.440	13000	RJ
Sample SS05			
Unknown	8.190	700	JB
Tricyclo[8,2,2,24,7]hexadeca	21.120	240	JN
Unknown Phthalate	22.230	250	JB
Hexadecanoic Acid	23.040	390	JNX
Unknown	26.250	240	J
Unknown	26.580	210	J
Technical chlorophenothane	27.290	210	JN
Unknown	27.460	270	J
Unknown Hydrocarbon	27.980	310	J
Unknown	28.050	450	J
Unknown	28.320	190	J
Unknown	28.780	240	J
Unknown	28.960	940	J
Unknown	29.060	1300	J

Semivolatile Organic Analysis for Soil Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/kg		
Compound Name	Retention Time	Estimated Concentration
Unknown	29.130	420 J
Unknown	29.180	590 J
Unknown hydrocarbon	29.580	200 J
Unknown	29.930	400 J
Unknown	30.920	520 J
Unknown hydrocarbon	33.890	350 J

tic-svsw

Pesticide/PCB Analysis for Soil Samples Cosden Oil and Chemical Co.					
	Sample Location and Number / Concentrations in ug/kg				
Pesticide/ PCB	SS01	SS02	SS03	SS04	SS05 Background
Alpha-BHC	3.1 RUJ	18 U	1.8 U	17 U	2.6 UJ
Beta-BHC	3.1 RUJ	18 U	1.8 U	17 U	2.6 UJ
Delta-BHC	3.1 RUJ	18 U	1.8 U	17 U	2.6 UJ
Gamma-BHC (Lind.)	3.1 RUJ	18 U	1.8 U	17 U	2.6 UJ
Heptachlor	3.1 RUJ	18 U	1.8 U	17 U	2.6 UJ
Aldrin	3.1 RUJ	18 U	1.8 U	17 U	2.6 UJ
Heptachlor Epoxide	3.1 RUJ	18 U	1.8 U	17 U	2.6 UJ
Endosulfan I	3.1 RUJ	18 U	1.8 U	17 U	2.6 UJ
Dieldrin	6.1 RUJ	35 U	3.4 U	34 U	5.1 UJ
4,4'-DDE	6.1 RUJ	35 U	3.4 U	34 U	95
Endrin	6.1 RUJ	35 U	3.4 U	34 U	5.1 UJ
Endosulfan II	6.1 RUJ	35 U	3.4 U	34 U	5.1 UJ
4,4'-DDD	6.1 RUJ	35 U	3.4 U	34 U	26
Endosulfan Sulfate	6.1 RUJ	35 U	3.4 U	34 U	2.0 JPZ
4,4'-DDT	6.1 RUJ	35 U	3.4 U	34 U	39
Methoxychlor	8.0 RJP	180 PZ	0.92 JPZ	3100 PZ	3.6 JPZ
Endrin Ketone	6.1 RUJ	35 U	7.6 Z	34 U	5.1 UJ
Endrin Aldehyde	6.1 RUJ	35 U	3.4 U	34 U	5.1 UJ
Alpha-Chlordane	3.1 RUJ	18 U	1.8 U	17 U	2.6 UJ
Gamma-Chlordane	3.1 RUJ	18 U	1.8 U	17 U	2.6 UJ
Toxaphene	310 RUJ	1800 U	180 U	1700 U	260 UJ
Aroclor-1016	61 RUJ	350 U	34 U	340 U	51 UJ
Aroclor-1221	120 RUJ	700 U	70 U	690 U	100 UJ
Aroclor-1232	61 RUJ	350 U	34 U	340 U	51 UJ
Aroclor-1242	61 RUJ	350 U	34 U	340 U	51 UJ
Aroclor-1248	61 RUJ	390 XP	34 U	340 U	51 UJ
Aroclor-1254	61 RUJ	350 U	34 U	340 U	51 UJ
Aroclor-1260	61 RUJ	350 U	600 P	17000 XP	51 UJ

soilpest

Inorganic Analysis for Soil Samples
Cosden Oil & Chemical Co.

Metals and Cyanide	Sample Locations Concentrations in mg/kg				
	SS01	SS02	SS03	SS04	SS05 Background
Aluminum	7100	5670	3860	6430	6810
Antimony	14.4 U	21.8	7.7	7.8 U	10.0 U
Arsenic	12.3 JN+	2.6 JSN	2.7 JSN	8.3 JN	8.1 JN
Barium	67.5 B	101	209	216	66.5
Beryllium	1.1 JB	0.81 JB	0.43 UJ	0.62 JB	1.4 J
Cadmium	66.4	0.63 U	0.64 U	14.5	0.83 U
Calcium	7940 J	98400 J	148000 J	74400 J	4400 J
Chromium	182	78.6	30.6	455	14.2
Cobalt	10.5 B	4.3 B	3.7 B	8.9 B	7.0 B
Copper	2440 JE	44.5 JE	33.1 UJE	140 JE	33.0 UJE
Iron	125000	22900	15500	51700	16800
Lead	1240	81.7 S	68.0 S	109	47.5
Magnesium	1920 JB	20200 J	96000 J	46700 J	1980 J
Manganese	829	4130	516	753	255
Mercury	0.20 U	0.11 U	0.11 U	0.11 U	0.14 U
Nickel	135	9.6	11.3	116	15.4
Potassium	413 B	659 B	809 B	808 B	864 B
Selenium	0.80 UJN	4.2 UJN	4.3 UJN	4.3 UJN	0.55 UJN
Silver	2.4 U	2.2	6.5	1.3 U	1.7 U
Sodium	662 UB	212 UB	246 UB	298 UB	186 UB
Thallium	1.2 UJW	0.63 U	0.64 U	0.65 U	0.83 UJW
Vanadium	4.8 U	58.4	12.0	13.3	18.4
Zinc	212000 JE	1160 JE	542 JE	2570 JE	461 JE
Cyanide	2.0 U	1.1 U	1.1 U	1.1 U	1.4 U

soilmet

Volatile Organic Analysis for Groundwater Samples Cosden Oil & Chemical Co.			
Volatile Compound	Sample Locations Concentrations in mg/kg		
	GW03 MW-3A	GW04 MW-4A	GW06 MW-6
Chloromethane	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U
Vinyl Chloride	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U
Methylene Chloride	10 UJB	10 UJB	10 UJB
Acetone	37 UJ	35 UJB	34 UJB
Carbon Disulfide	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 U	10 U
1,2-Dichloroethene (total)	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U
1,2-Dichloroethane	10 UJ	10 UJ	10 UJ
2-Butanone	10 UJ	10 UJ	10 UJ
1,1,1-Trichloroethane	10 U	10 U	10 U
Carbon Tetrachloride	10 U	10 U	10 U
Bromodichloromethane	10 U	10 U	10 U
1,2-Dichloropropane	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U
Benzene	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U
4-Methyl-2-Pentanone	10 U	10 U	10 U
2-Hexanone	10 UJ	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U
Toluene	10 U	10 U	10 U
Chlorobenzene	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U
Styrene	10 U	10 U	10 U
Xylene (total)	10 U	10 U	10 U
Total Number of TICS *	0	0	0

* Number, not concentrations, of tentatively identified compounds (TICs).

gw-volat

Semivolatile Organic Analysis for Groundwater Samples
Cosden Oil & Chemical Co.

Semivolatile Compound	Sample Location Concentrations in ug/l		
	GW03 MW-3A	GW04 MW-4A	GW06 MW-6
Phenol	10 U	10 UJ	10 U
bis(2-Chloroethyl)Ether	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropan	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	10 U
n-Nitroso-Di-n-Propylamine	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U
2-Nitrophenol	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U
bis(2-Chloroethoxy)Methane	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 UJ	10 UJ
4-Chloro-3-Methylphenol	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U
2,4,6-Trichlorophenol	10 U	10 U	10 U
2,4,5-Trichlorophenol	25 U	25 U	25 U
2-Chloronaphthalene	10 U	10 U	10 U
2-Nitroaniline	25 U	25 U	25 U
Dimethyl Phthalate	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U
3-Nitroaniline	25 U	25 U	25 U
Acenaphthene	10 U	10 U	10 U
2,4-Dinitrophenol	25 UJ	25 U	25 U
4-Nitrophenol	25 U	25 UJ	25 UJ
Dibenzofuran	10 U	10 U	10 U
2,4-Dinitrotoluene	10 U	10 U	10 U
Diethylphthalate	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U
4-Nitroaniline	25 U	25 U	25 U
4,6-Dinitro-2-Methylphenol	25 U	25 U	25 U
n-Nitrosodiphenylamine	10 U	10 U	10 U
4-Bromophenyl-phenylether	10 U	10 U	10 U

Semivolatile Organic Analysis for Groundwater Samples Cosden Oil & Chemical Co.			
Semivolatile Compound	Sample Location Concentrations in ug/l		
	GW03 MW-3A	GW04 MW-4A	GW06 MW-6
Hexachlorobenzene	10 U	10 UJ	10 UJ
Pentachlorophenol	25 U	25 U	25 U
Phenanthrene	10 U	10 U	10 U
Anthracene	10 U	10 U	10 U
Carbazole	10 U	10 U	10 U
di-n-Butylphthalate	10 UJB	10 U	10 U
Fluoranthene	10 U	10 U	10 U
Pyrene	10 U	10 U	10 U
Butylbenzylphthalate	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U
Benzo(a)Anthracene	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U
bis(2-Ethylhexyl)Phthalate	10 U	33 UJB	33 UJB
di-n-Octyl Phthalate	10 U	10 U	10 U
Benzo(b)Fluoranthene	10 U	10 U	10 U
Benzo(k)Fluoranthene	10 U	10 U	10 U
Benzo(a)Pyrene	10 U	10 U	10 U
Indeno(1,2,3-cd)Pyrene	10 U	10 U	10 U
Dibenzo(a,h)Anthracene	10 U	10 U	10 U
Benzo(g,h,i)Perylene	10 U	10 U	10 U
Total Number of TICs *	0	3	0

* Number, not concentration, of tentatively identified compounds (TICs)

gw-semiv

Semivolatile Organic Analysis for Groundwater Samples Tentatively Identified Compounds Cosden Oil & Chemical Co. Concentrations in ug/L			
Compound Name	Retention Time	Estimated Concentration	
Sample GW04			
Unknown Hydrocarbon	13.07	4	J
Unknown	13.18	3	J
Sulfur, Mol. (S8)	19.10	28	JN

tic-svgw

Pesticide/PCB Analysis for Groundwater Samples Cosden Oil & Chemical Co.			
Pesticide/ PCB	Sample Locations and Number Concentrations in ug/L		
	GW03 MW-3A	GW04 MW-4A	GW06 MW-6
Alpha-BHC	0.050 UJ	0.050 UJ	0.050 UJ
Beta-BHC	0.050 UJ	0.050 UJ	0.050 UJ
Delta-BHC	0.050 UJ	0.050 UJ	0.050 UJ
Gamma-BHC (Lindane)	0.050 UJ	0.050 UJ	0.050 UJ
Heptachlor	0.050 UJ	0.050 UJ	0.050 UJ
Aldrin	0.050 UJ	0.050 UJ	0.050 UJ
Heptachlor Epoxide	0.050 UJ	0.050 UJ	0.050 UJ
Endosulfan I	0.050 UJ	0.050 UJ	0.050 UJ
Dieldrin	0.10 UJ	0.10 UJ	0.10 UJ
4,4'-DDE	0.10 UJ	0.10 UJ	0.10 UJ
Endrin	0.10 UJ	0.10 UJ	0.10 UJ
Endosulfan II	0.10 UJ	0.10 UJ	0.10 UJ
4,4'-DDD	0.10 UJ	0.10 UJ	0.10 UJ
Endosulfan Sulfate	0.10 UJ	0.10 UJ	0.10 UJ
4,4'-DDT	0.10 UJ	0.10 UJ	0.10 UJ
Methoxychlor	0.50 UJ	0.50 UJ	0.50 UJ
Endrin Ketone	0.10 UJ	0.10 UJ	0.10 UJ
Endrin Aldehyde	0.10 UJ	0.10 UJ	0.10 UJ
Alpha-Chlordane	0.050 UJ	0.050 UJ	0.050 UJ
Gamma-Chlordane	0.050 UJ	0.050 UJ	0.050 UJ
Toxaphene	5.0 UJ	5.0 UJ	5.0 UJ
Aroclor-1016	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1221	2.0 UJ	2.0 UJ	2.0 UJ
Aroclor-1232	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1242	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1248	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1254	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1260	1.0 UJ	1.0 UJ	1.0 UJ

gwpest

Inorganic Analysis for Groundwater Samples
Cosden Oil & Chemical Co.

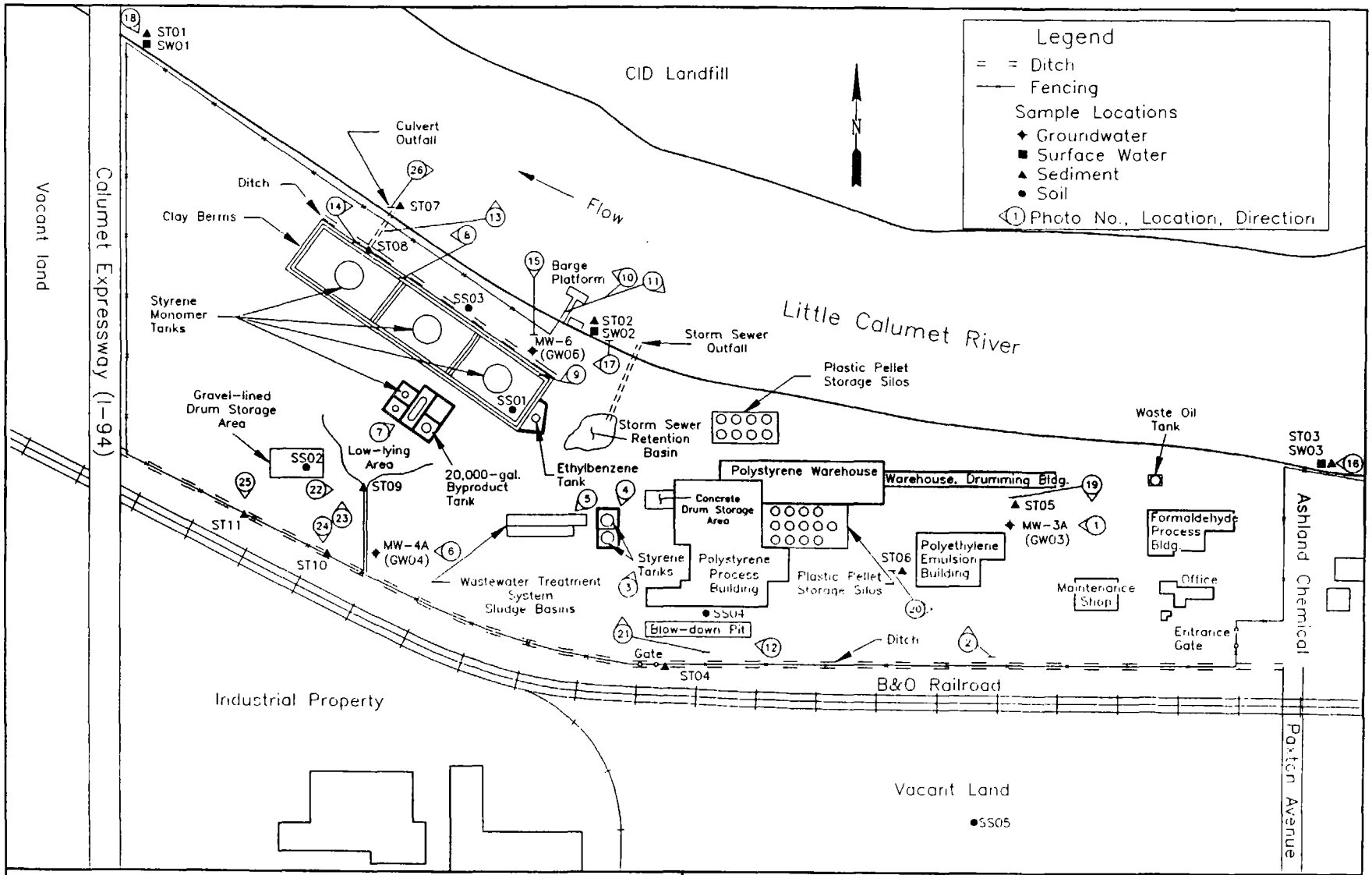
Metals and Cyanide	Sample Locations Concentrations in ug/l		
	GW03 MW-3A	GW04 MW-4A	GW06 MW-6
Aluminum	55.1 UB	53.8 U	53.8 U
Antimony	29.4 U	29.4 U	29.4 U
Arsenic	4.6 B	3.4 JBW	12.4 S
Barium	69.2 JB	100 JB	45.0 JB
Beryllium	1.0 U	1.0 U	1.0 U
Cadmium	2.8 U	2.8 U	2.8 U
Calcium	111000 J	210000 J	191000 J
Chromium	3.7 U	3.7 U	3.7 U
Cobalt	4.5 U	4.5 U	4.5 U
Copper	5.0 UB	3.6 U	4.9 U
Iron	50.4 UB	2040 J	4610 J
Lead	1.0 U	1.6 B	1.0 B
Magnesium	5330 J	75800 J	31500 J
Manganese	256	652	922
Mercury	0.10 U	0.10 U	0.10 U
Nickel	13.2 U	13.2 U	13.2 U
Potassium	22700	4390 U	4390 U
Selenium	10.0 UJN	1.0 UJN	1.0 UJN
Silver	3.4 U	3.4 U	3.4 U
Sodium	25900 J	77300 J	10400 J
Thallium	1.0 U	1.0 U	1.0 UJW
Vanadium	6.0 B	4.7 U	4.7 U
Zinc	7.9 UJB	6.0 UJB	12.8 UJB
Cyanide	0.75 U	0.75 U	0.75 U

gwmetals

Appendix D

Cosden Oil and Chemical Co.

Site Photographs



BVWS, 1994 (Modified from USGS, 1980; ENSR, 1990)	Figure D-1 Photo Locations
Not To Scale	Cosden Oil & Chemical Co. Calumet City, Illinois

CHI00151
MAM 7/21/94

Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 1

Direction of Photo: West

Description: View from the eastern portion of the site. The polystyrene warehouse is on the right, pellet silos are in the background, and the polyethylene emulsion building is on the left. MW-3A, the location of groundwater sample GW03, is in the foreground.

Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 2

Direction of Photo: North

Description: Polyethlene emulsion building; MW-1A is in the foreground.

Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 3

Direction of Photo: Northeast

Description: View from the western side of the polyethylene process building; the concrete drum storage area is in the foreground, and pellet silos are in the background.

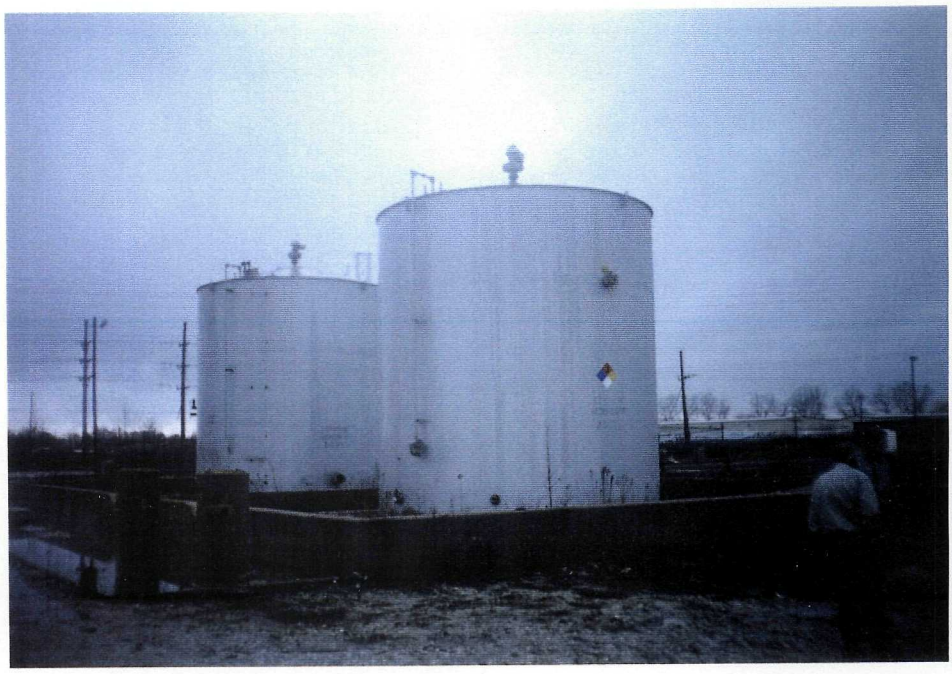
Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 4

Direction of Photo: Southwest

Description: Two styrene monomer tanks located west of the polyethylene process building.



Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 5

Direction of Photo: Southwest

Description: Location of former earthen wastewater treatment sludge basins; concrete structures formerly supported piping.

Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 6

Direction of Photo: West

Description: MW-4A, the location of groundwater sample GW04, is in the foreground. Drainage from the low-lying onsite area is flowing behind MW-4A to the ditch at the southern site boundary. Calumet Expressway (I-94) is in the background.

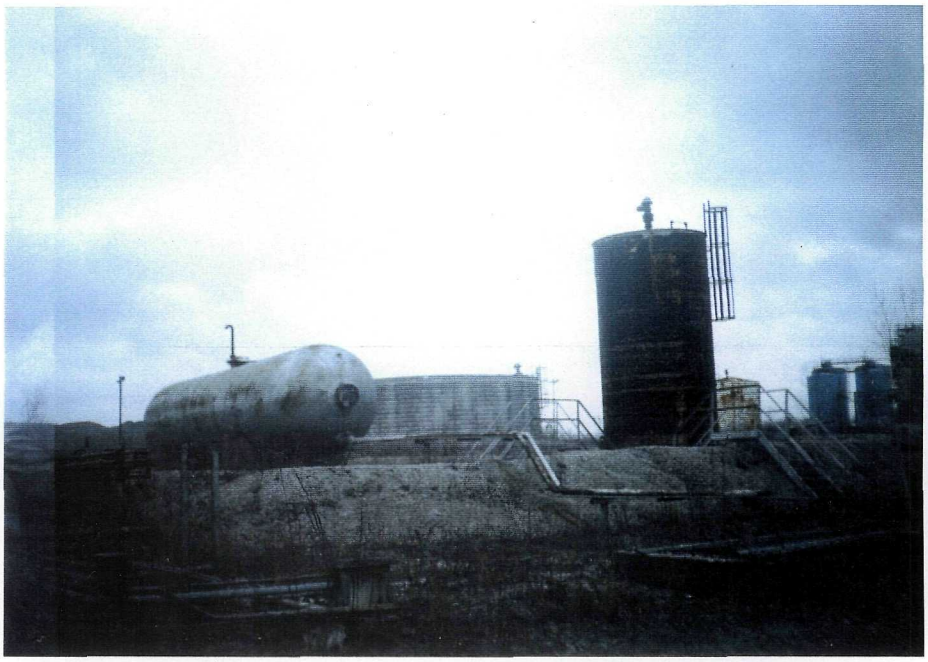
Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 7

Direction of Photo: Northeast

Description: The 20,000-gallon rusted ethylbenzene/styrene byproduct tank at the northwestern portion of the site to the right of center in the photo. A horizontal mineral oil tank is on the left.



Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 8

Direction of Photo: West

Description: The furthest west 850,000-gallon styrene monomer tank located at the northwestern portion of the site. The manway is open, and bermed area is retaining water.

Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 9

Direction of Photo: Southwest

Description: The furthest east 850,000-gallon styrene monomer tank located at the northwestern portion of the site, with standing water within the bermed area. Soil sample SS01 was collected from this location.

Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 10

Direction of Photo: Northwest

Description: Downstream view of the Little Calumet River from the barge platform. The Calumet Expressway bridge is in the background.

Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 11

Direction of Photo: Southeast

Description: Upstream view of the Little Calumet River from the barge platform. Pellet silos are at the right.

Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 12

Direction of Photo: Northwest

Description: The blow-down pit area located just south of the polyethylene process building. The concrete pit contains standing water. MW-4 is at the right.

Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 13

Direction of Photo: North

Description: The culvert outfall which drains the ditch along the berms at the northwestern portion of the site. Sediment sample ST07 was collected in the Little Calumet River near the outfall.

Date: 4/15/93

Photo Taken By: M.A. Mastronardi

Photo Number: 14

Direction of Photo: East

Description: The culvert inlet which drains the ditch along the berms at the northwestern portion of the site. Sediment sample ST08 was collected near the culvert inlet.

Date: 7/28/93

Time: 1230

Photo Taken By: M.A. Mastronardi

Photo Number: 15

Direction of Photo: South

Description: MW-6, located north of styrene monomer piping at the northwestern portion of the site, near styrene monomer tanks; Groundwater sample GW06 was collected from this well.

Date: 7/28/93

Time: 1800

Photo Taken By: M.A. Mastronardi

Photo Number: 16

Direction of Photo: West

Description: Background surface water (SW03) and sediment (ST03) sample location in the Little Calumet River, approximately 100 feet east of the site.

Date: 7/28/93

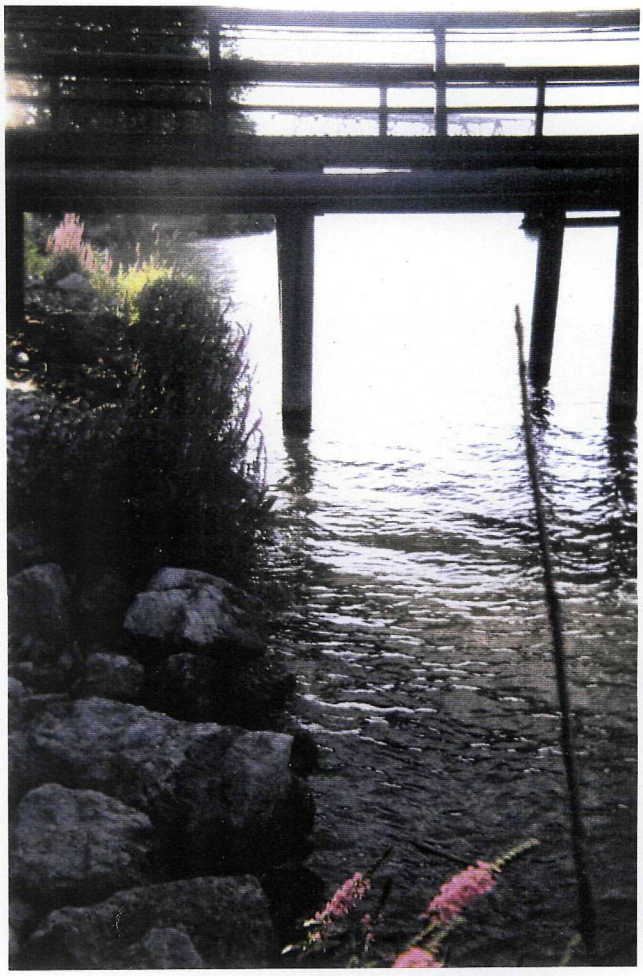
Time: 1845

Photo Taken By: M.A. Mastronardi

Photo Number: 17

Direction of Photo: West

Description: Surface water (SW02) and sediment (ST02) sample location, collected just east of the barge platform which is visible in the background.



Date: 7/29/93

Time: 0925

Photo Taken By: M.A. Mastronardi

Photo Number: 18

Direction of Photo: Southeast

Description: Surface water (SW01) and sediment (ST01) sample location, collected just west of the site.

Date: 7/29/93

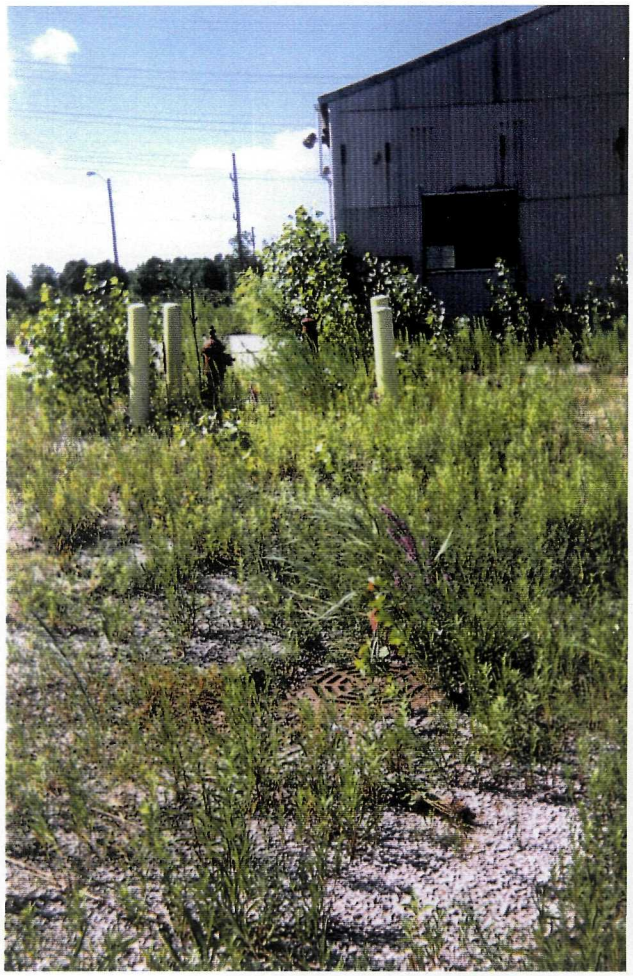
Time: 1000

Photo Taken By: M.A. Mastronardi

Photo Number: 19

Direction of Photo: South

Description: Storm sewer manhole located north of the northeast corner of the polyethylene emulsion building. Sediment sample ST05 was collected near this manhole.



Date: 7/29/93

Time: 1000

Photo Taken By: M.A. Mastronardi

Photo Number: 20

Direction of Photo: East

Description: Storm sewer manhole, partially covered by a steel plate, located west of the polyethylene emulsion building. Sediment sample ST06 was collected near this manhole.

Date: 7/29/93

Time: 1007

Photo Taken By: M.A. Mastronardi

Photo Number: 21

Direction of Photo: North

Description: Location of soil sample SS04, near tape flagging south of the polyethylene process building, within the former earthen blow-down pit location.

Date: 7/29/93

Time: 1025

Photo Taken By: M.A. Mastronardi

Photo Number: 22

Direction of Photo: East

Description: Location of sediment sample ST09, in the low-lying area north of MW-4A.

Date: 7/29/93

Time: 1030

Photo Taken By: M.A. Mastronardi

Photo Number: 23

Direction of Photo: North

Description: Photo taken just north and west of MW-4 near sample locations SS02 and ST09.

Date: 7/29/93

Time: 1040

Photo Taken By: M.A. Mastronardi

Photo Number: 24

Direction of Photo: South

Description: Location of sediment sample ST10, collected in the ditch near the southern site fenceline at the southwestern portion of the site.

Date: 7/29/93

Time: 1050

Photo Taken By: M.A. Mastronardi

Photo Number: 25

Direction of Photo: South

Description: Location of sediment sample ST11, collected in the ditch near the southern site fenceline about 75 feet west of ST10.

Date: 7/29/93

Time: 1200

Photo Taken By: M.A. Mastronardi

Photo Number: 26

Direction of Photo: East

Description: Location of sediment sample ST07, collected at the outfall of the culvert which drains the ditch at the northwestern portion of the site.

Appendix E

Cosden Oil and Chemical Co.

Monitoring Well Boring Logs

LOG OF BORING

MW-4A
Page 1 of 1

CLIENT : FINA OIL AND CHEMICAL
PROJECT NAME : FINA
PROJECT LOCATION : CALUMET CITY, ILLINOIS

PROJECT NUMBER : 9500-058-340

LOGGED BY : T.DAPPAS
APPROVED BY : G.SMITH
DRILLED BY : FOX DRILLING, INC.

GROUND ELEV. : 96.60
T.O.C. ELEV. : 98.68

DATE STARTED : 3-27-90 TOTAL DEPTH : 10.0 ft
DATE COMPLETED : 3-27-90 METHOD : HSA

WELL I.D. : 2.0 SCREEN LENGTH : 5.0
CASING LENGTH : 6.0 SLOT SIZE : 0.10
TYPE : 304 Stainless Steel TYPE : 304 Stainless Steel

DEPTH (feet)	LENGTH	RECOVERY	SAMPLE NUMBER	SAMPLE TYPE	N-VALUE	OVA	DESCRIPTION
							CLAY (CL) - silty, little sand, fine grained, soft, gray
			S-1	s.s.	12	0	
							SAND (SP) - fine grained, gray
			S-2	s.s.	7	0	
5							
			S-3	s.s.	14	0	
							CLAY (CL) - silty, trace sand, gray
10							END OF BORING @ 10.0

GRAPHIC LOG | WELL COMPLETION | WATER (3-28-90) | DEPTH (feet)

LOG OF BORING

MW-3A
Page 1 of 1

CLIENT : FINA OIL AND CHEMICAL
PROJECT NAME : FINA OIL AND CHEMICAL
PROJECT LOCATION : CALUMET CITY, ILLINOIS

PROJECT NUMBER : 9500-058-330

LOGGED BY : T. DAPPAS
APPROVED BY : G.SMITH
DRILLED BY : FOX DRILLING, INC.

GROUND ELEV. : 96.26
T.O.C. ELEV. : 97.98

DATE STARTED : 3-26-90 TOTAL DEPTH : 10.0 ft
DATE COMPLETED : 3-26-90 METHOD : HSA

WELL I.D. : 2.0 SCREEN LENGTH : 5.0
CASING LENGTH : 5.5 SLOT SIZE : 0.01
TYPE : 304 Stainless Steel TYPE : 304 Stainless Steel

DEPTH (feet)	LENGTH	RECOVERY	SAMPLE NUMBER	SAMPLE TYPE	N-VALUE	OVA	DESCRIPTION
							Gravel (GW) - crushed limestone, gray
							FILL - gravel, brick fragments, little silt
			S-2	s.s	13	0	
							SAND (SP) - fine to medium grained, gray
			S-3	s.s.	11	0	
5							
							CLAY (OH) - organic, highly plastic, gray
10							
							END OF BORING @ 10.0 FEET

GRAPHIC LOG | WELL COMPLETION | WATER 3-27-90 | DEPTH (feet)