



EXPANDED SITE INSPECTION

Milwaukee Solvay Coke and Gas Company

**Milwaukee, Milwaukee County, Wisconsin
U.S. EPA ID: WIN 000508215**

REF. 37

Prepared by:

**WISCONSIN DEPARTMENT OF NATURAL RESOURCES
Remediation & Redevelopment Program
Southeast Region Headquarters**

July 10, 2006

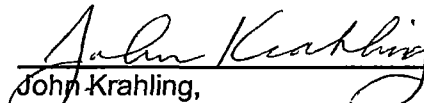
Expanded Site Inspection

~~Milwaukee~~ Solvay Coke and Gas Company *LJ Ripley 02/26/2007*
Milwaukee, Wisconsin

U.S. EPA ID: WI^N 000508215 *LJ Ripley 02/26/2007*
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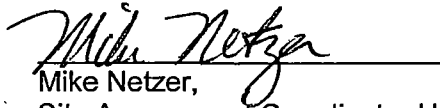
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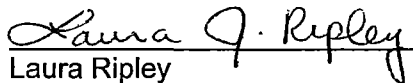
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TABLE OF CONTENTS

	<u>Section</u>	<u>Page</u>
1.0	INTRODUCTION	1
2.0	GENERAL SITE INFORMATION	2
	2.1 Site Location	2
	2.2 Site Background and History	2
3.0	WASTE CHARACTERISTICS/SOURCES	6
	3.1 Waste Samples	6
	3.2 Soil Samples	11
	3.3 Sediment Samples	17
4.0	MIGRATION PATHWAYS	27
	4.1 Soil Exposure Pathway	27
	4.2 Groundwater Pathway	28
	4.3 Surface Water Pathway	29
5.0	SUMMARY AND CONCLUSIONS	33
6.0	REFERENCES	36

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Site Location Map	3
2	Site Features/Areas of Interest Map	5
3	Soil/Waste Sample Location Map	8
4	Sediment Sample Location Map	19
5	Potential Contaminant Sources in Source Water Area	30
6.	Drainage Pattern of Milwaukee Source Water Area	32

LIST OF TABLES

TABLE 1	CONCENTRATION RANGES AND SCREENING LEVEL EXCEEDANCES FOR ANALYTES DETECTED IN WASTE SOURCE SAMPLES	9
TABLE 2	CONCENTRATION RANGES AND SCREENING LEVEL EXCEEDANCES FOR SOIL SAMPLES	12
TABLE 3	SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES IN SELECTED SOIL SAMPLES AT THE FORMER TANK PIT AND TANK # 14	14
TABLE 4	SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES FOR SOIL SAMPLES AT TANK NO. 13	16
TABLE 5	SEDIMENT CORE SUMMARY	18
TABLE 6	SUMMARY OF CONCENTRATION RANGES AND SCREENING LEVEL EXCEEDANCES FOR SEDIMENT SAMPLES	20
TABLE 7	SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES IN SEDIMENT CORE SOL – KK-01	22
TABLE 8	SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES IN SEDIMENT CORE SOL – KK-02	23
TABLE 9	SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES IN SEDIMENT CORE SOL – KK-03	24
TABLE 10	SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES IN SEDIMENT CORE SOL – KK-04	25

APPENDICES

Glossary of Terms	Appendix A
Summary Tables of Sediment Analytical Results	Appendix B
Summary Tables of Soil and Waste Analytical Results	Appendix C
Photo Documentation Log	Appendix D

1.0 INTRODUCTION

Under authority of the Comprehensive Environmental Response Compensation Liability Act of 1980 (CERCLA), and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Wisconsin Department of Natural Resources (WDNR) was tasked by the United States Environmental Protection Agency (U.S. EPA) to conduct an Expanded Site Inspection (ESI) at the Milwaukee Solvay Coke and Gas Company, (Solvay Coke), as part of the FY '05 Cooperative Agreement. The ESI was performed under the U.S. EPA site investigation protocol. Sediment samples were collected from the Kinnickinnic River on May 19, 2004. Waste source sampling was conducted during the week of September 25th, 2005.

The purpose of the ESI was to collect additional information concerning conditions at the Solvay Coke site sufficient to assess the threat posed to human health and the environment. The ESI also served to support site evaluation using the Hazard Ranking Systems (HRS) to determine site eligibility to the National Priorities List (NPL). The scope of the ESI generally includes reviewing previous information, sampling waste and environmental media to document critical hypotheses and assumptions not completely tested during the preliminary assessment or site inspection, and collecting any other missing data to evaluate and document HRS factors.

In 2003, U.S. EPA issued an Administrative Order on Consent to Water Street Holdings, LLC, Cliffs Mining Company and Wisconsin Wrecking, LLP requiring that a Removal Action be taken to address dilapidated buildings, asbestos containing materials, process wastes, and process system components. As a function of the removal work, the above ground storage tanks (ASTs) and associated wastes were removed and some soil disturbance had occurred. Confirmation soil samples were not collected subsequent to the AST removals to document that all hazardous substances posing a risk were removed during the removal action. A tank release of an estimated 73,500 gallons also occurred from Tank # 13 during the Removal Action. No remediation activity was conducted in response to this release; therefore, additional characterization of waste sources and impacts to on-site soil was necessary. The ESI, in addition to characterizing waste sources, also focused on targets suspected to be exposed to actual contamination. The primary pathway of concern is the surface water pathway. This pathway was evaluated based on the potential impacts to fisheries and sensitive targets by migration of hazardous substances from the site to surface water and sediments.

Two types of media were collected during the ESI for sampling and chemical analysis. Waste source samples were collected from two of the previously designated Areas of Interest on the site (**Area A** and **Area B**). See the site features map on Figure 2. The majority of the waste source samples were collected within Area B in the vicinity of the former coal storage yard. Soil samples were collected to evaluate background soil conditions and to determine if contaminated soil exists in the vicinity of the former tank pit and in the vicinity of the former location of tank # 13 and tank # 14. Most of the samples were collected using a Geoprobe device. A limited number of sediment samples were collected in a portion of Area D and downstream of the site to further characterize the extent of sediment contamination. Sediment core samples were collected using a vessel mounted Vibracore device.

This ESI report presents a summary of the findings of the additional sediment and waste sampling activities conducted at the site. Samples collected of the river sediment indicate the presence of organic and inorganic chemicals at elevated concentrations that exceed one or more of established health guidelines. The levels of contamination at certain areas of the site (including river sediment) were again found at concentrations that continue to pose potential threats to human health and the environment.

* A complete file of the references contained in this document is located at the Department of Natural Resources, Southeast Region Headquarters Office, at 2300 N. Dr. Martin Luther King Jr. Drive, Milwaukee, Wisconsin.

2.0 GENERAL SITE INFORMATION

2.1 Site Location

The Milwaukee Solvay Coke and Gas Company (Solvay Coke) site is located at 311 E. Greenfield Avenue in Milwaukee, Milwaukee County, Wisconsin, CERCLIS Identification Number WIN 000508215 (see Figure 1, Site Location Map). To reach the site in the Milwaukee area, take Interstate Highway I-43 and exit at the National Avenue/6th Street exit ramp. Proceed east to 1st Street. Turn south on 1st Street to Greenfield Avenue. Turn east on Greenfield Avenue to the Wisconsin Wrecking Company building at 311 E. Greenfield Avenue.

The Solvay Coke property is located in a portion of the NW quarter and SW quarter sections of Section 4, Township 6 North, Range 22 East, and the SW quarter section of Section 33, Township 7 North, Range 22 East (Ref. 2). Solvay Coke is located on the Milwaukee USGS quadrangle topographic map. A general Latitude/Longitude for the site is: 43 °00' 51" North, 87 °54' 25" West.

The site is approximately 46 acres in size (Ref. 8). The site lies adjacent to the Kinnickinnic River near the shore of Lake Michigan. Topography is generally flat. The area was originally marshland (Ref. 11). Land use in the immediate area is generally industrial/commercial with some limited residential (Ref. 3). Surface water drainage is to the Kinnickinnic River (east) and the Milwaukee Harbor (northeast). Aerial photos taken between 1937 and 2000 are included in the Site Assessment Report, Milwaukee Solvay Coke and Gas Site (Ref. 3) showing the site layout, potential source areas, and site features. Further description of the site location is provided in Reference 3, Section 2.1 of the Site Assessment Report, Milwaukee Solvay Coke and Gas Site, Milwaukee, Milwaukee County, Wisconsin, by Tetra Tech EM Inc.

2.2 Site Background and History

Beginning in the early 1800's through the mid 1900's, gas fuel was produced using coal and oil at more than 5000 manufactured gas plants across the U.S. Manufactured gas production declined after the 1950s when natural gas became more widely available. The Milwaukee Solvay Coke and Gas Company was one of the largest gas manufacturers, operating for most of the 1900's in the northern and western area of the site. The facility was founded in 1902 and supplied gas under contract to the Milwaukee Gas Light Company (Ref. 11). The facility later became one of the largest coking facilities in the Midwest. The coking operation burned coal at reduced oxygen levels to produce coke as a raw material for iron and steel making. Past uses at the facility and property included a coal storage facility, coking plant, coal gas production plant, furnace companies (iron and steel making), and two leather tanneries. Products produced at the Solvay Coke facility included: metallurgical coke, coal gas, coal tar, ammoniacal liquor, benzol (benzene), toluol (toluene), xylol (xylene), and pyridine (Ref. 8).

Contaminants at manufactured gas plants (MGPs) and coking operations include polycyclic aromatic hydrocarbons (PAHs), phenols, volatile organic compounds (VOCs) such as benzene and toluene, and cyanide. One of the leather tanneries is known to have used a chrome tanning process, therefore chromium is a likely contaminant. The buildings of the tanneries and furnace companies (southern and eastern portion of the site) were all removed by 1950. Most of the major

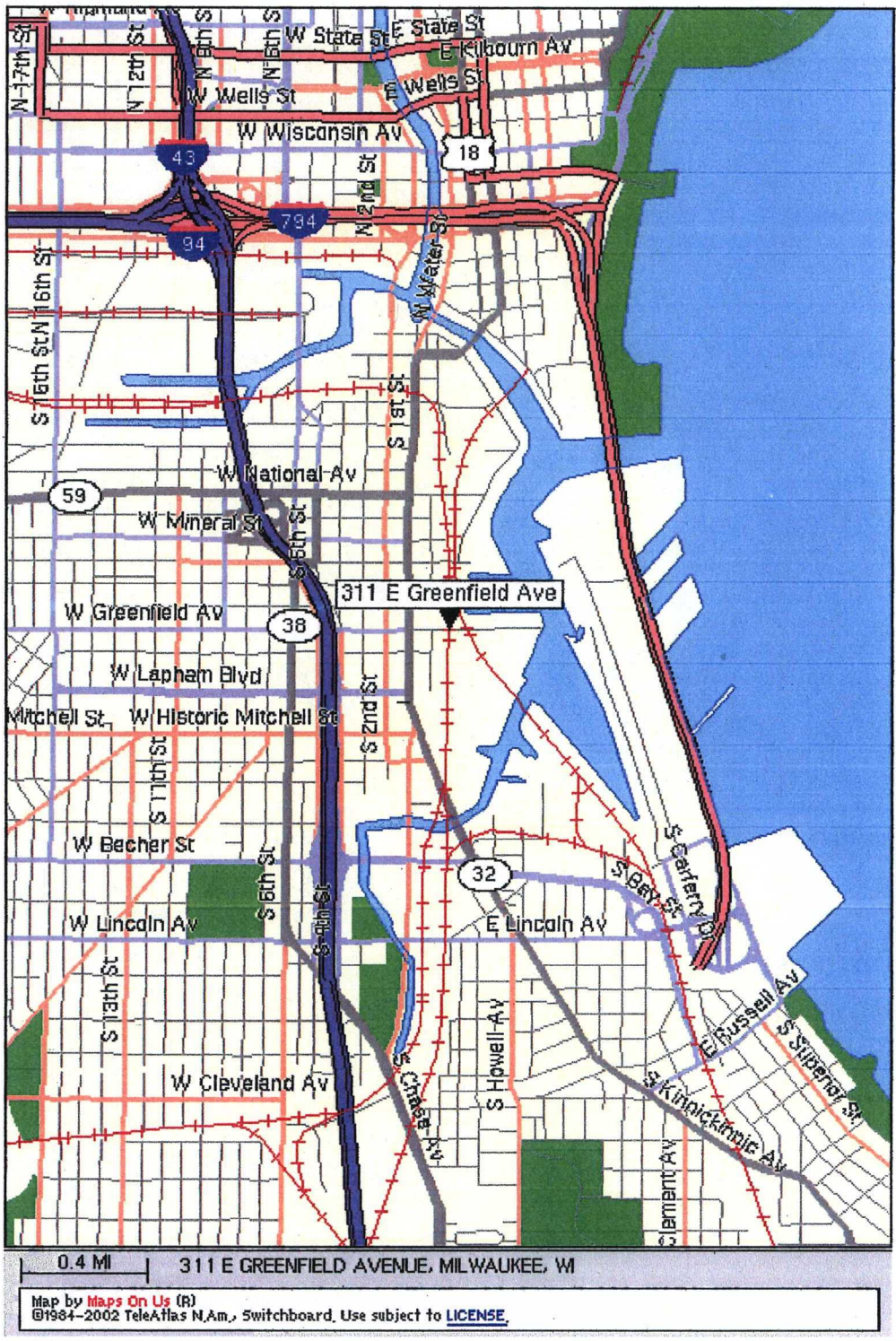


Figure 1 **Site Location Map**
Milwaukee Solvay Coke and Gas Company

coke and gas manufacturing buildings were razed during the U.S. EPA required removal action (2003-2004). All site manufacturing activities are inactive. The property is currently owned by Golden Marina Causeway, LLC.

(Ref. 3)

Further description of the site background and site history is available in Reference 11 and Reference 3. Reviews of several historic aerial photos are provided in Reference 3, Sections 2.1 and Section 2.2.

There were no previous on-site investigations on the upland portion of the Solvay Coke site prior to the Site Assessment in December, 2001. Some limited sediment sampling had been conducted near and adjacent to the site in the Kinnickinnic River. PAH contaminated sediments were found at concentrations between 80 and 1000 parts per million in sediment cores collected between the West Becher Street Bridge and the Wisconsin Wrecking Company Wharf (Ref. 10, Figure 1). In 1993, a Phase 1 Environmental Site Assessment was conducted of the property by the City of Milwaukee Health Department, Bureau of Consumer Protection and Environmental Health (Ref. 8). The Solvay Coke facility had also been cited by WDNR in the 1970s for excessive dust emissions. WDNR identified the Milwaukee Solvay Coke Co. as the largest industrial source of dust pollution in the Menomonee Valley (Ref. 8).

During the December, 2001 Site Assessment, 35 existing ASTs were identified on the site. The tanks were located in Areas of Interest (AOIs) identified as **Areas A** and **B** (Figure 2). Wastes were characterized by collecting and analyzing samples from five ASTs and from a pit in the location of a former AST. Although some tanks were dry, many contained waste materials, oils, sludges, and tars, and/or residual amounts of these materials and water. Wastes were found to contain VOCs, semi-volatile organic compounds (SVOCs), metals, cyanide, and other parameters, with SVOCs being the predominant contaminant. Elevated levels of contaminants in the soil were observed at depths of 0-2 feet. Surface soil samples contained elevated levels of metals and semi-volatile organic compounds (SVOCs) greater than three times the potential background soil concentrations indicating an apparent release to the soil exposure pathway. Although a specific investigation of the extent of groundwater contamination was not part of the scope of the site assessment, a limited assessment of shallow groundwater quality found impacts from metals (lead, arsenic, and cadmium); VOCs, (benzene); and SVOCs (benzo(a)pyrene). A potential release attributable to the site to the groundwater pathway was apparent.

The prior sediment sample data documented elevated levels of metals, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in river sediments adjacent to the Solvay Coke site. These sediment samples had concentrations of contaminants (most notably, SVOCs such as benzo(a)pyrene, VOCs such as acetone, benzene, toluene, and xylenes, metals, such as chromium, and cyanide) at levels three times or more above the potential background sediment core sample concentrations, indicating an apparent release to the surface water pathway.

Conclusions of the site assessment report were: there are potential completed pathways for soil exposure, surface water, and groundwater, with the surface water pathway currently having the greatest overall significance; the levels of contamination at certain areas of the site (both upland and in river sediment) pose potential threats to human health and the environment.; and, the on-site contamination and deteriorating ASTs posed threats of on-site exposure and off-site releases of hazardous substances.



LEGEND

- 1894 BUILDINGS AND STRUCTURES
- BUILDINGS AND STRUCTURES BEFORE 1910
- 1910 BUILDINGS AND STRUCTURES



NOT TO SCALE

MILWAUKEE SOLVAY COKE
AND GAS COMPANY
MILWAUKEE, WISCONSIN

FIGURE 2
SITE FEATURES

Tetra Tech EM Inc.

In 2003, US EPA issued an Administrative Order on Consent to Water Street Holdings, LLC, Cliffs Mining Company and Wrecking, L. L. C. The order required that a Removal Action be taken to address dilapidated buildings, asbestos containing materials, process wastes, and process system components. The majority of the removal work was completed by the end of 2004. Wastes removed during the removal action included: 403 tons of construction and demolition debris, 1432 tons of coal tar, 4823 tons of asbestos containing material, 52 tons of rubber tires and belts, and 5821 tons of recycled steel and other metals (Ref. 12).

3.0 WASTE CHARACTERISTICS/SOURCES

During the 2001 site assessment, the site was divided into four areas of interest (AOIs). These areas were based on historical uses of the site property. The AOI's included: (1) former coke and gas production area, **Area A**, (2) former coal storage yard, **Area B**, (3) southern tip of site property (location of former furnace companies and tanneries), **Area C**, and (4) Kinnickinnic River and riverbank bordering the east side of the property, **Area D**.

Sampling activities that were conducted during the Expanded Site Assessment (ESI) included **Area A** and **Area B**, and some additional sediment cores collected from the bed of the Kinnickinnic River (a portion of **Area D**). Sampling of river sediment was conducted on May 19, 2004. Soil and waste source sampling was conducted from September 26th to 28th, 2005. Samples collected during the Milwaukee Solvay Coke and Gas Company ESI were generally analyzed for the Target Compound List (TCL) organics, which included volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and the Target Analyte List (TAL) metals and cyanide. *Not all compounds were analyzed for in every sample, for example, volatile organic compounds (VOCs) were not analyzed for samples S01 through S10. Summary tables of the analytical results of the ESI are contained in Appendices B and C. Significant findings based on the data are summarized below in separate sections for waste sources and for soil/sediment. Under the Hazard Ranking System (HRS), results are considered significant if the concentrations are three times the background concentrations and above the Contract Required Detection Limit (CRDL) or Contract Required Quantitation Limit (CRQL); or five times the CRDL or CRQL (if the background concentration was reported as not detectable). Results are also considered significant if concentrations are J coded and are ten times or more above background analytical data. A photo documentation log of the sample locations is provided in Appendix D.

3.1 Waste Source Samples

Background

The site assessment previously identified 35 ASTs on the site located in Areas A and B. Samples had been collected and analyzed from specific ASTs (tanks 13, 14, 22, 25, and 32) and a former tank pit. Although some tanks were dry, many contained waste materials oils, sludges, and tars, and/or residual amounts of these materials and water. Additional samples had also been collected from site soil in Areas A and B. Results of the sampling were included in an Integrated Assessment (IA) report for the Milwaukee Solvay Coke and Gas Company, prepared by Wisconsin Department of Natural Resources (WDNR), dated August 30, 2002. The report was based on findings obtained

* only a portion of the soil and waste samples were analyzed for VOCs because they were not the primary compounds of interest, and most of the waste source samples that were proposed for collection were remote from the previous ASTs and building/operations areas that would have potentially released VOCs.

from the Milwaukee Solvay Coke and Gas Site, Milwaukee, Milwaukee County, Wisconsin, Site Assessment Report, prepared for U.S. EPA by Tetra Tech EM, Inc. and dated May 1, 2002. Data from the Removal Assessment documented hazardous substances in the AST tank contents and also releases to site soils (predominantly VOCs and SVOCs). Table 18 of Reference 3 summarizes the results for the SVOCs that were detected in AST and tank pit solid samples.

Three solid waste samples were collected during the 2001 site assessment from the ASTs and analyzed for SVOCs. Twenty-two SVOCs were detected in all three samples. Four additional SVOCs were detected in one or more samples. The following SVOCs had been detected in one or more samples at concentrations of one percent or more:

- 2-methylnaphthalene
- acenaphthylene
- anthracene
- benzo(a)anthracene
- chrysene
- fluoranthene
- dibenzofuran
- naphthalene
- phenanthrene
- pyrene

(Ref. 3)

Water samples were previously collected from tank #13 and the former tank pit location. A solid sample had also been collected from the former tank pit. The former tank pit location solid sample, in addition to other parameters, contained 14 SVOCs that exceeded one or more screening level concentrations. Four of these SVOCs included: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3 cd)pyrene which exceeded the U.S. EPA Emergency Response Guidelines for industrial soil. The water sample from the former tank pit contained concentrations of benzene and benzo(a)pyrene that exceeded the maximum contaminant level drinking water standards (Ref. 3). Analysis of the water sample collected from tank # 13 (in addition to other parameters) detected concentrations of more than eight SVOCs including benzo(a)pyrene.

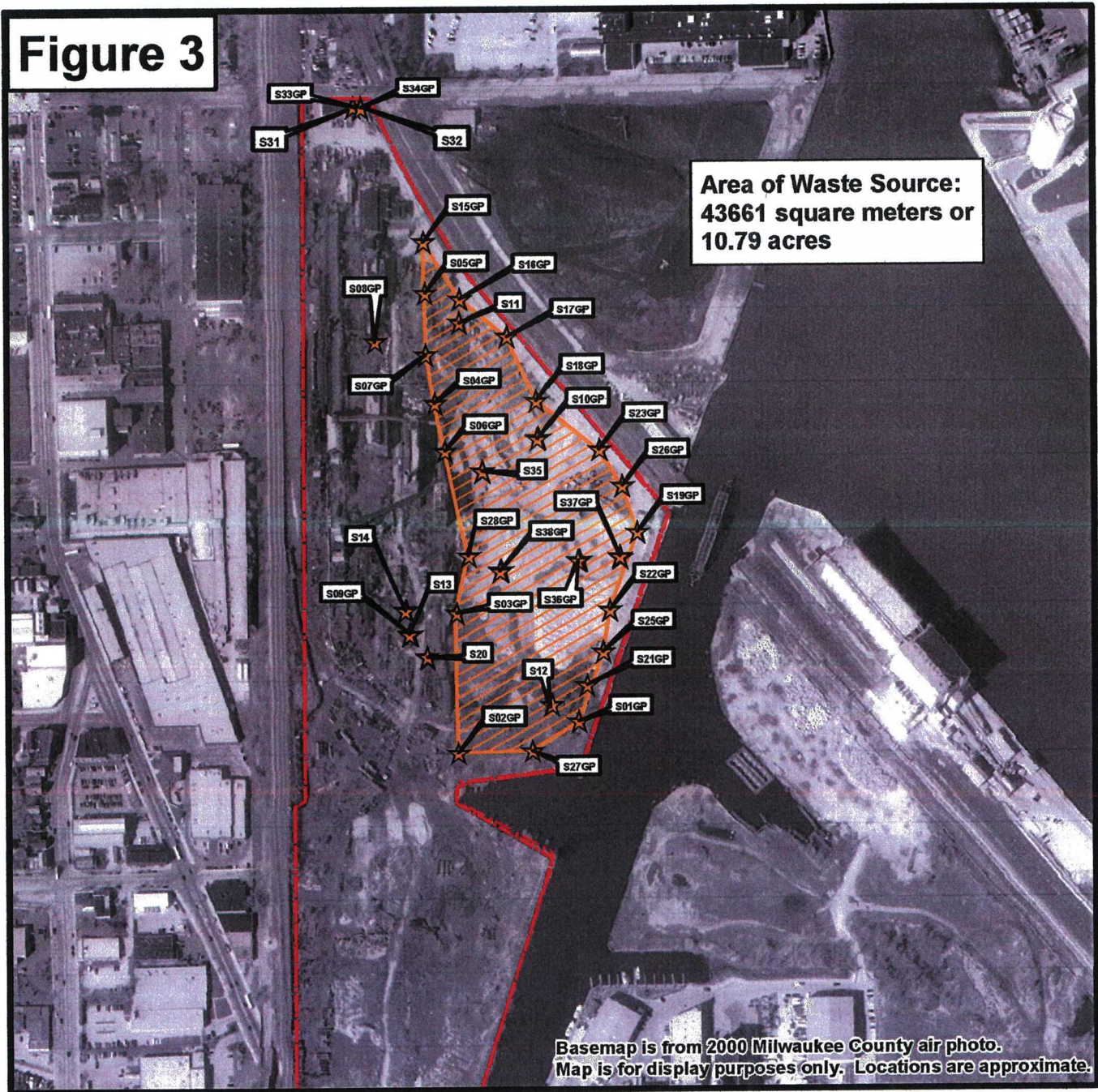
Since the time of the Removal Assessment sampling, the ASTs were removed and some soil disturbance had occurred. Confirmation soil samples were not collected subsequent to the AST removals to document that all hazardous substances posing a risk were removed. A tank release of 73,500 gallons at Tank # 13 also occurred during the removal action. No remediation activity occurred in response to the release, therefore, the ESI field activities included some limited soil sampling to determine if hazardous substances released from the tank had impacted soil.

ESI Waste Source Sampling

During the ESI field activities in September, 2005, additional characterization of waste sources and impacts to on-site soil was conducted. A total of 26 waste samples were collected from Area B (former coal storage yard). A Geoprobe device, supplied and operated by the U. S. EPA Technical Response Team, was used to collect all subsurface samples (represented Figure 3 with a GP suffix). Two of the 26 waste samples were collected from waste piles (samples S11 and S12), a covered waste pile, and coal pile, respectively. Refer to Figure 3 for the waste sample locations.

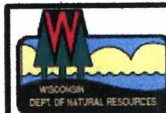
Milwaukee Solvay Coke & Gas Co. Soil / Waste Sample Location Map

Figure 3

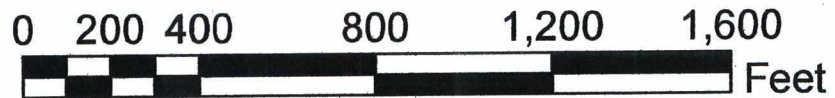


Legend

- ★ Sample Locations
-  Waste Source Area
-  Property Boundary Line



Map Prepared by Andrew Boettcher
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2300 N Dr. Martin Luther King Jr. Drive
Milwaukee, WI 53212-3128



The semivolatile organic compounds analysis for samples collected in the former coal yard identified concentrations of PAHs (in addition to metals and VOCs) with many that exceed U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Industrial and/or Residential soil (Table 1). In 25 of the 26 waste samples analyzed, concentrations of benzo(a)pyrene were detected above PRG screening levels. For comparison purposes, 15 of the 26 samples analyzed had concentrations of benzo(a)pyrene at levels greater than five times the Contract Required Quantitation Limit (CRQL) detected in the background soil sample.

TABLE 1
CONCENTRATION RANGES AND SCREENING LEVEL
EXCEEDANCES FOR ANALYTES DETECTED IN WASTE
SOURCE SAMPLES

Parameter	Concentration Range ^a	Screening Level ^b	Exceedance Frequency ^c
Inorganics			
Arsenic	1.1 U to 13.7 mg/kg	Residential PRG (0.39 mg/kg) Industrial PRG (2.7 mg/kg)	25 of 26
Cadmium	0.55 U to 4.3 mg/kg	Residential PRG (37 mg/kg) Industrial PRG (810 mg/kg)	None
Chromium	5.3 to 43.5 mg/kg	Residential PRG (30 mg/kg) Industrial PRG (64 mg/kg)	2 of 26
Copper	16.2 to 127 mg/kg	Residential PRG (2,900 mg/kg)	None
Cyanide	0.99 J to 29 mg/kg	Residential PRG (11 mg/kg) Industrial PRG (35 mg/kg)	2 of 26 (one)
Lead	9.5 to 784 mg/kg	Residential PRG (400 mg/kg) Industrial PRG (750 mg/kg)	3 of 26
Manganese	12.8 to 843 mg/kg	Residential PRG (1800 mg/kg)	None
Mercury	0.11 U to 1.4 mg/kg	Residential PRG (23 mg/kg) Industrial PRG (610 mg/kg)	None
Nickel	7 to 52.2 mg/kg	Residential PRG (1600 mg/kg)	None
Zinc	16.3 to 1230 J mg/kg	Residential PRG (23000 mg/kg)	None
Volatile Organic Compounds			
Benzene	13 U to 9 J µg/kg	Residential PRG (650 µg/kg) Industrial PRG (1,500 µg/kg)	None
Semivolatile Organic Compounds			
Acenaphthene	92 J to 19,000 J ug/kg	Residential PRG (3,700,000 µg/kg)	None
Acenaphthylene	97 J to 61,000 J ug/kg	NE	

Parameter	Concentration Range ^a	Screening Level ^b	Exceedance Frequency ^c
Anthracene	100 J to 100,000 J ug/kg	Residential PRG (22,000,000 ug/kg)	None
Benzo(a)anthracene	280 J to 190,000 J μg/kg	Residential PRG (620 μg/kg) Industrial PRG (2,900 μg/kg) Residential ERG (88,000 μg/kg)	21 of 26 (ten)
Benzo(a)pyrene	230 J to 120,000 J μg/kg	Residential PRG (62 μg/kg) Industrial PRG (290 μg/kg) Residential ERG (8,800 μg/kg) Industrial ERG (78,000 μg/kg)	25 of 26 (fourteen)
Benzo(b)fluoranthene	340 J to 140,000 J μg/kg	Residential PRG (620 μg/kg) Industrial PRG (2,900 μg/kg) Residential ERG (88,000 μg/kg)	22 of 26 (ten)
Benzo(k)fluoranthene	300 J to 92,000 J μg/kg	Residential PRG (6,200 μg/kg) Industrial PRG (29,000 μg/kg)	10 of 26 (six)
Benzo(g, h ,i)perylene	120 J to 59,000 J μg/kg	Residential PRG (24,000 μg/kg)	3 of 26 (three)
Chrysene	470 J to 200,000 J μg/kg	Residential PRG (62,000 μg/kg) Industrial PRG (290,000 μg/kg)	4 of 26 (four)
Dibenzo(a,h)anthracene	97 J to 25,000 J μg/kg	Residential PRG (62 μg/kg) Industrial PRG (290 μg/kg)	20 of 26 (seventeen)
Fluorene	120 J to 91,000 J μg/kg	Residential PRG (2,600,000 μg/kg)	None
Fluoranthene	430 J to 370,000 J μg/kg	Residential PRG (56,000 μg/kg)	6 of 26 (four)
Indeno(1,2,3-cd)pyrene	160 J to 74,000 J μg/kg	Residential PRG (620 μg/kg) Industrial PRG (2,900 μg/kg)	17 of 26 (eleven)
Naphthalene	89 J to 260,000 J μg/kg	Residential PRG (56,000 μg/kg) Industrial PRG (190,000 μg/kg)	2 of 26 (two)
Phenanthrene	460 to 430,000 J ug/kg	Residential PRG (56,000 μg/kg)	5 of 26 (five)
Pyrene	340 J to 290,000 J ug/kg	Residential PRG (2,300,000 ug/kg)	None

Notes:

^a Duplicate samples and sample dilutions were not used to determine concentration ranges.

^b When the concentration of a given analyte in a sample is equal to or greater than the analyte screening level (**SOIL**), the source documents define this as an exceedance of the screening level.

^c Values are based on the number of samples that exceed residential PRG screening levels. Each number presented in parentheses is the number of estimated results ("J"-flagged values) that exceeded the **SOIL** screening level.

µg/kg	=	Microgram per kilogram
ERG	=	Emergency response guideline
J	=	Value reported is the approximate concentration of the analyte
mg/kg	=	Milligram per kilogram
PRG	=	Preliminary remediation goal
U	=	Analyte was not present at a concentration greater than or equal to the reporting limit; value shown is the reporting limit
UJ	=	Analyte was not present at a concentration greater than or equal to the reporting limit; value shown is an estimate of the reporting limit
NE	=	Not established

3.2 Soil Samples

A total of nine soil samples were collected during the ESI. Samples included: S31 through S34, S08, S09, S13, S14, and S20. Because much of the site has some amount of fill or waste material overlying native soils, four soil samples were collected from the extreme northern corner of the site in an attempt to characterize potential background soil conditions. Shallow samples S31 and S32 were collected east of the office building, under or adjacent to asphalt pavement. Both samples contained detectable concentrations of many PAHs, with sample S31 having the highest concentrations. Sample S32 was also analyzed at a 3X dilution. Surface samples S31 and S32 were, therefore, discounted as representative background samples. Laboratory data for sub-surface sample S34 also contained detects for many PAH compounds. An oily sheen and petroleum odor were observed during advancement of both soil borings S33 and S34. Sample S33, collected at a depth interval of one to three feet, had very few detects of PAHs and at low concentrations. Sample S33, based on its proximity to the office building and separation from manufacturing operations, depth, and the low concentrations of contaminants associated with the site, is considered representative of background soil conditions. PAH concentrations for soil samples S08, S09, S13, S14, and S20, were compared to PAH concentrations detected in background sample S33. Refer to Figure 3 for the soil sample locations.

The semivolatile organic compound analysis of the soil samples identified concentrations of several PAHs (in addition to metals and VOCs) that exceed Federal Preliminary Remediation Goals for Industrial and/or Residential soil (Table 2). In seven of the nine total samples collected, concentrations of benzo(a)pyrene were detected above PRG screening levels. Laboratory data is contained in Appendix C.

These soil samples had concentrations of contaminants above three times the background soil concentrations or five times the CRQL:

Former Tank Pit (S08):	naphthalene, acenaphthylene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, ideno(1,2,3-cd)pyrene, dibenzo(ah)anthracene, and benzo(g,h,i)perylene
Tank No. 13 (S09):	phenanthrene, fluoranthene, pyrene, chrysene, and benzo(b)fluoranthene

TABLE 2

**CONCENTRATION RANGES AND SCREENING LEVEL
EXCEEDANCES FOR SOIL SAMPLES**

Parameter	Concentration Range ^a	Screening Level ^b	Exceedance Frequency ^c
Inorganics			
Arsenic	3.2 to 212 J mg/kg	Residential PRG (0.39 mg/kg) Industrial PRG (2.7 mg/kg)	8 of 8 (one)
Cadmium	0.55 J to 1.9 mg/kg	Residential PRG (37 mg/kg) Industrial PRG (810 mg/kg)	None
Chromium	6.2 to 566 J mg/kg	Residential PRG (30 mg/kg) Industrial PRG (64 mg/kg)	2 of 8 (one)
Copper	15.5 to 104 mg/kg	Residential PRG (2,900 mg/kg)	None
Cyanide	2.7 U to 28.8 J- mg/kg	Residential PRG (11 mg/kg) Industrial PRG (35 mg/kg)	3 of 8 (two)
Lead	20.8 to 1450 mg/kg	Residential PRG (400 mg/kg) Industrial PRG (750 mg/kg)	3 of 8 (one)
Manganese	71 to 806 mg/kg	Residential PRG (1800 mg/kg)	None
Mercury	0.11 U to 4.5 mg/kg	Residential PRG (23 mg/kg) Industrial PRG (610 mg/kg)	None
Nickel	8.0 to 32.6 mg/kg	Residential PRG (1600 mg/kg)	None
Zinc	47.3 to 380 J mg/kg	Residential PRG (23000 mg/kg)	None
Volatile Organic Compounds			
Benzene	11 U to 13 J µg/kg	Residential PRG (650 µg/kg) Industrial PRG (1,500 µg/kg)	None
Semivolatile Organic Compounds			
Acenaphthene	370 U to 8700 J ug/kg	Residential PRG (3,700,000 µg/kg)	None
Acenaphthylene	180 J to 55,000 J ug/kg	NE	
Anthracene	220 J to 94,000 J ug/kg	Residential PRG (22,000,000 ug/kg)	None
Benzo(a)anthracene	370 U to 210,000 J µg/kg	Residential PRG (620 µg/kg) Industrial PRG (2,900 µg/kg) Residential ERG (88,000 µg/kg)	8 of 9 (four)
Benzo(a)pyrene	370 U to 170,000 J µg/kg	Residential PRG (62 µg/kg) Industrial PRG (290 µg/kg) Residential ERG (8,800 µg/kg) Industrial ERG (78,000 µg/kg)	7 of 9 (three)
Benzo(b)fluoranthene	370 U to 220,000 J µg/kg	Residential PRG (620 µg/kg) Industrial PRG (2,900 µg/kg) Residential ERG (88,000 µg/kg)	7 of 9 (four)

Parameter	Concentration Range ^a	Screening Level ^b	Exceedance Frequency ^c
Benzo(k)fluoranthene	370 U to 120,000 J $\mu\text{g}/\text{kg}$	Residential PRG (6,200 $\mu\text{g}/\text{kg}$) Industrial PRG (29,000 $\mu\text{g}/\text{kg}$)	3 of 9 (two)
Benzo(g, h ,i)perylene	370 U to 100,000 J $\mu\text{g}/\text{kg}$	Residential PRG (24,000 $\mu\text{g}/\text{kg}$)	1 of 9 (one)
Chrysene	870 J to 220,000 J $\mu\text{g}/\text{kg}$	Residential PRG (62,000 $\mu\text{g}/\text{kg}$) Industrial PRG (290,000 $\mu\text{g}/\text{kg}$)	1 of 9 (one)
Dibenzo(a,h)anthracene	370 J to 43,000 J $\mu\text{g}/\text{kg}$	Residential PRG (62 $\mu\text{g}/\text{kg}$) Industrial PRG (290 $\mu\text{g}/\text{kg}$)	7 of 9 (five)
Fluorene	370 U to 28,000 J $\mu\text{g}/\text{kg}$	Residential PRG (2,600,000 $\mu\text{g}/\text{kg}$)	None
Fluoranthene	87 J to 360,000 J $\mu\text{g}/\text{kg}$	Residential PRG (56,000 $\mu\text{g}/\text{kg}$)	2 of 9 (two)
Indeno(1,2,3-cd)pyrene	370 U to 120,000 J $\mu\text{g}/\text{kg}$	Residential PRG (620 $\mu\text{g}/\text{kg}$) Industrial PRG (2,900 $\mu\text{g}/\text{kg}$)	8 of 9 (four)
Naphthalene	370 U to 28,000 J $\mu\text{g}/\text{kg}$	Residential PRG (56,000 $\mu\text{g}/\text{kg}$) Industrial PRG (190,000 $\mu\text{g}/\text{kg}$)	None
Phenanthrene	80 J to 190,000 J $\mu\text{g}/\text{kg}$	Residential PRG (56,000 $\mu\text{g}/\text{kg}$)	1 of 9 (one)
Pyrene	370 u to 330,000 J $\mu\text{g}/\text{kg}$	Residential PRG (2,300,000 $\mu\text{g}/\text{kg}$)	None

Notes:

^a Duplicate samples and sample dilutions were not used to determine concentration ranges.

^b When the concentration of a given analyte in a sample is equal to or greater than the analyte screening level, the source documents define this as an exceedance of the screening level.

^c Values are based on the number of samples that exceed residential PRG screening levels. Each number presented in parentheses is the number of estimated results ("J"-flagged values) that exceeded the screening level.

- $\mu\text{g}/\text{kg}$ = Microgram per kilogram
- ERG = Emergency response guideline
- J = Value reported is the approximate concentration of the analyte
- mg/kg = Milligram per kilogram
- PRG = Preliminary remediation goal
- U = Analyte was not present at a concentration greater than or equal to the reporting limit; value shown is the reporting limit
- UJ = Analyte was not present at a concentration greater than or equal to the reporting limit; value shown is an estimate of the reporting limit
- NE = Not established

Former Tank Pit

Inorganic parameters were not analyzed for sample S08 (former tank pit) because the sample container broke prior to shipment to the laboratory. Laboratory analysis of semivolatile organic compounds detected elevated concentrations of PAHs with many (including benzo(a)pyrene) that exceed Federal Preliminary Remediation Goals for Industrial and/or Residential soil (bold values in Table 3). Most of the PAHs detected in sample S08 had concentrations that also exceed background sample concentrations. Refer to Figure 3 for soil sample location S08.

Former AST Tank No. 14

Laboratory analysis of surface soil sample S20 detected many PAH compounds with several (including benzo(a)pyrene) that exceed Federal Preliminary Remediation Goals for residential soil. All of the PAHs detected in sample S20 (including benzo(a)pyrene) had concentrations that exceed background sample concentrations. Refer to Figure 3 for sample location S20.

TABLE 3

**SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES
IN SELECTED SOIL SAMPLES AT THE FORMER TANK PIT AND TANK # 14**

Analyte	Sample Identification	
	S08 (Tank Pit)	S20 (AST # 14)
Inorganics	Concentrations in mg/kg^{a,b}	
Arsenic	NA	212 J
Cadmium	NA	0.58 R
Chromium	NA	566 J
Copper	NA	87.2
Lead	NA	734 J
Mercury	NA	10.1
Nickel	NA	32.6
Zinc	NA	380 J

Semivolatiles	Concentrations in ug/kg ^{a,b}	
Anthracene	94000 J	2400
Benzo(a)anthracene	210,000 J	6600
Benzo(a)pyrene	170,000 J	7000
Benzo(g,h,i)perylene	100,000 J	8500 J
Benzo(b)fluoranthene	220,000 J	7700
Benzo(k)fluoranthene	120,000 J	6900
Chrysene	220,000 J	7500
Dibenzo(a,h)anthracene	43,000 J	1900
Fluoranthene	360,000 J	11,000
Indeno(1,2,3-cd)pyrene	120,000 J	6600
Naphthalene	2800 J	1500 J
Pyrene	330,000 J	8100
Phenanthrene	190,000 J	3200

Notes:

^a Duplicate sample and sample dilution data were not used.

^b The value in bold exceeds the U.S. Environmental Protection Agency Region 9 Preliminary Remediation Goals for Residential Soil (November 2000).

NA = Sample was not analyzed

J = The value reported is an approximate concentration of the analyte

U = Analyte was not present at or above the reporting limit; the value shown is an estimate of the reporting limit.

Former AST Tank No. 13

Two surface soil samples (S13 and S14) and one sub-surface soil sample (S09 from 2-5 feet) were collected on the perimeter of the former tank pad. Laboratory analysis of semivolatile organic compounds detected elevated concentrations of PAHs in sample S09 with many (including benzo(a)pyrene) that exceed Federal Preliminary Remediation Goals for Industrial and/or Residential soil (bold values in Table 4). Most of the PAHs detected in sample S09 (phenanthrene,

fluoranthene, pyrene, chrysene, and benzo(b)fluoranthene) had concentrations that exceed background sample concentrations. Soil samples S13 and S14 had fewer concentrations of PAHs that exceed Federal PRGs. Most of the PAHs detected in samples S09, S13, and S14 had concentrations that also exceed background sample concentrations. Refer to Figure 3 for soil sample locations.

TABLE 4
SUMMARY OF RESULTS FOR SELECTED METALS AND
SVOC ANALYTES
FOR SOIL SAMPLES AT TANK NO. 13

Analyte	Sample Identification		
	S09	S13	S14
Inorganics Concentrations in mg/kg^{a b}			
Arsenic	7.1	3.8	13
Cadmium	1.1 J+	0.64 J	1.9
Chromium	28.1	12.8	23.1
Copper	71.2	66.9	73.4
Lead	1450	187	903
Mercury	4.5	2.4	6.8
Nickel	16.4	12.5	19.9
Zinc	259 J	114 J	342 J
Semivolatiles Concentrations in ug/kg^{a b}			
Anthracene	94000 J	1500 J	12,000 U
Benzo(a)anthracene	210,000 J	4100	2800 J
Benzo(a)pyrene	170,000 J	3600	1200 U
Benzo(g,h,i)perylene	100,000 J	3000	2800 J

Benzo(b)fluoranthene	220,000 J	4700	3700 J
Benzo(k)fluoranthene	120,000 J	4200	3300 J
Chrysene	220,000 J	5400	4100 J
Dibenzo(a,h)anthracene	1000,000 J	1200 J	12,000 U
Fluoranthene	360,000 J	6800	5300 J
Indeno(1,2,3-cd)pyrene	120,000 J	3000	2600
Naphthalene	28000 J	2700	15,000
Pyrene	330,000 J	5200	3800 J
Phenanthrene	190,000 J	4700	4800 J

Notes:

- ^a Duplicate sample and sample dilution data were not used.
- ^b The value in bold exceeds the U.S. Environmental Protection Agency Region 9 Preliminary Remediation Goals for Residential Soil (November 2000).
- J = The value reported is an approximate concentration of the analyte
- U = Analyte was not present at or above the reporting limit; the value shown is an estimate of the reporting limit.

3.3 Sediment Samples

Background

During the previous site assessment sampling activities in 2001, 12 sediment cores were advanced in the stream bed of the Kinnickinnic River. A total of 30 sediment samples were collected and analyzed. The sediment sample data showed primarily elevated levels of metals, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in river sediments adjacent to the Solvay Coke site. Results of the sampling were included in the Integrated Site Assessment report (IA) for the Milwaukee Solvay Coke and Gas Company (Ref. 3). Sediment core MC-SD-D-010 was identified as the background sediment core relative to the Solvay Coke site. Sediment chemical concentrations in the nine of the cores adjacent to the site representing release samples were compared to the concentrations in background sample MC-SD-D-010. Core MC-SD-D-010 is located at the upstream tip of the site (southern-most property corner) and in the same reach of the stream channel as the nine cores representing release samples. Figure 3 in the IA report (Reference 3) shows the sediment sample/core locations.

ESI Sediment Sampling

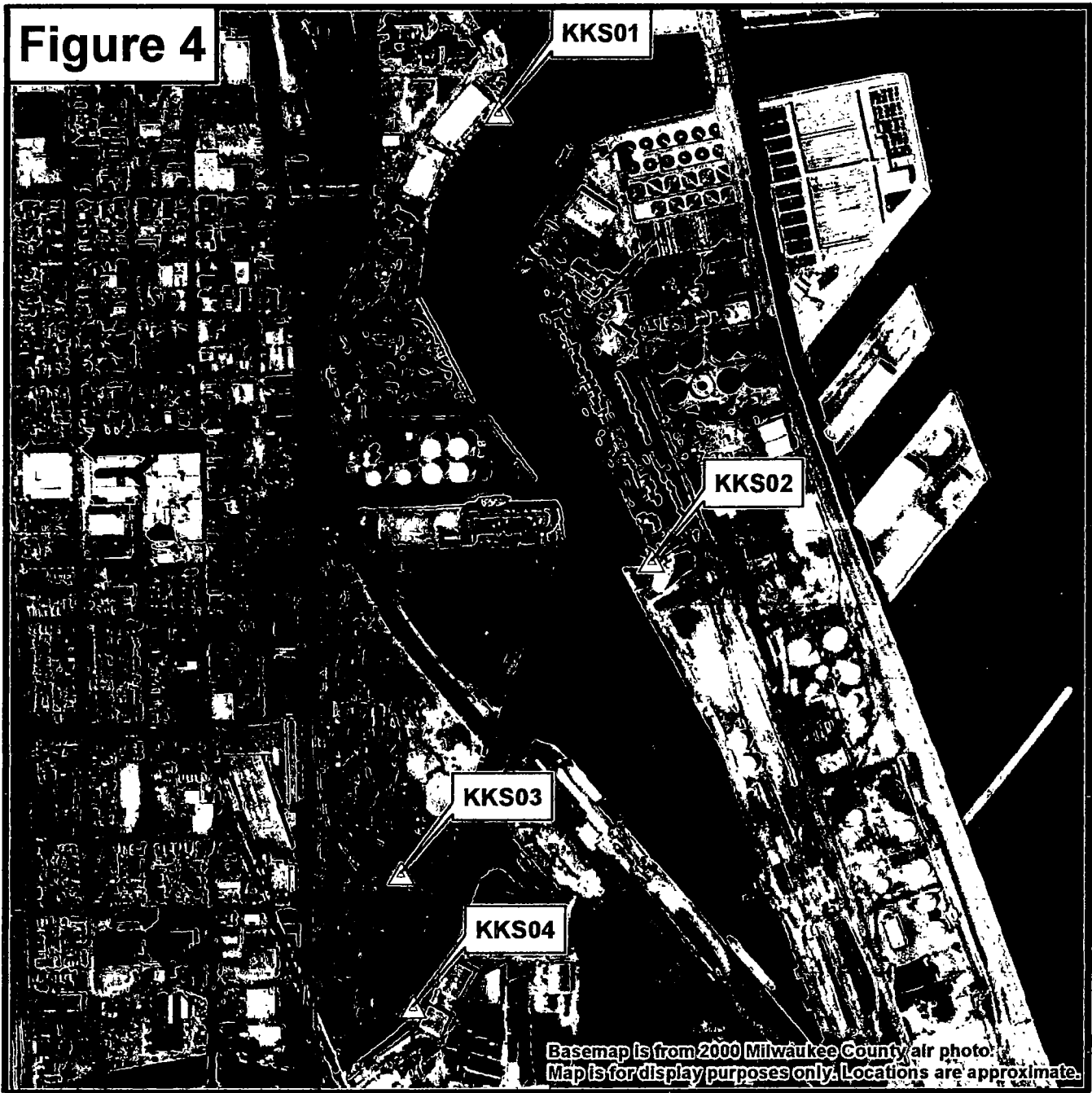
Additional sediment sampling was conducted on May 19, 2004. A Vibracore sampler was used to collect 4-inch sediment cores from the stream bed of the Kinnickinnic River. Four sediment cores were advanced. Samples for laboratory analysis were generally collected at two or three intervals from 0 to five feet below the water/sediment interface. Core 2004-SOL-KK-S03 was collected in the former car ferry slip. Two sediment cores (2004-SOL-KK-S01, and 2004-SOL-KK-S02) were collected downstream of the site along the west shoreline area at the location of the Milwaukee Metropolitan Sewerage District boat dock and on the east shoreline area at the location of the City of Milwaukee cargo boat dock. The fourth core (2004-SOL-KK-S04) was collected in the general vicinity of the previous background core MC-SD-D-010 that was sampled during the 2001 Removal Site Assessment. A different GPS coordinate system was used during each sediment sampling event (SSI vs. ESI) therefore, the exact location of the former background sample core location could not be replicated. The chemical concentrations of the three cores collected during the ESI adjacent and downstream of the site were compared to the concentrations determined in samples from core (2004-SOL-KK-S04) since the samples were collected from similar depth intervals. Sediment core 2004-SOL-KK-S04 was collected at the upstream tip of the site (southern-most property corner). Figure 4 shows the sediment sample/core locations. A total of thirteen sediment samples (including two field duplicates) were collected and analyzed. All sediment samples were analyzed for inorganics, VOCs, SVOCs, and pesticides/PCBs.

Table 6 summarizes the frequencies and ranges of selected inorganic and SVOC parameter concentrations that exceed screening levels in sediment samples. With the exception of arsenic and manganese, screening levels based on the Ontario Ministry of the Environment 1993 "Guidelines for Protection and Management of Aquatic Sediment Quality in Ontario" were exceeded for all other parameters listed in all 11 samples. Sediment concentrations of benzo(a)pyrene ranged from 1700 ug/kg to 6900 ug/kg. The ESI sample data again documents elevated levels of metals, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in river sediments adjacent to, and downstream of, the Solvay Coke site. Tabulated results for the ESI core samples and the background core samples are presented in Appendix B.

**TABLE 5
SEDIMENT CORE SUMMARY**

Sediment Core ID	Core Collection Date	Depth of Water Above Sediment (feet/inches)	Sediment Core Recovery (inches)	Depth of Sample Interval (feet)	GPS Position
S0L-KK-S01	19 May 04	10' 5"	67	1-2, 2-3, 4-5	43, 01. 352 N 87, 54. 339 W
S0L-KK-S02	19 May 04	15' 5"	115	1-2, 2-3, 4-5	43, 01, 015 N 87, 54. 065 W
S0L-KK-S03	19 May 04	14' 9"	58	2-3, 3-4, 4-5	43, 00, 699 N 87, 54. 409 W
S0L-KK-S04	19 May 04	21' 8"	48	0-2, 2-4	43, 00, 553 N 87, 54. 404 W

Milwaukee Solvay Coke & Gas Co. Sediment Sample Location Map



Legend



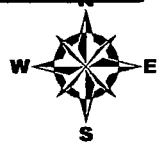
Sediment Sample Locations



Property Boundary



Map Prepared by Andrew Boettcher
Wisconsin Department of Natural Resources
2300 N Dr. Martin Luther King Jr. Drive
Milwaukee, WI 53212-3128



0 500 1,000 2,000 3,000 4,000



Feet

TABLE 6

**SUMMARY OF CONCENTRATION RANGES AND SCREENING LEVEL EXCEEDANCES
FOR SEDIMENT SAMPLES**

Parameter	Concentration Range ^a	Screening Level ^b	Exceedance Frequency ^c
Inorganics			
Arsenic	4.1 J- to 20.3 J- mg/kg	6 mg/kg	8 of 11 (eight)
Cadmium	2.9 J+ to 11.5 mg/kg	0.6 mg/kg	11 of 11 (one)
Chromium	81 to 433 mg/kg	26 mg/kg	11 of 11
Copper	59 to 147 mg/kg	16 mg/kg	11 of 11
Lead	123 to 338 mg/kg	31 mg/kg	11 of 11
Manganese	247 to 645 mg/kg	460 mg/kg	1 of 11
Mercury	0.24 to 3.7 mg/kg	0.2 mg/kg	11 of 11
Nickel	16.2 to 42.3 mg/kg	16 mg/kg	11 of 11
Zinc	179 to 931 mg/kg	120 mg/kg	11 of 11
Semivolatile Organic Compounds			
Anthracene	390 J to 5000 µg/kg	220 µg/kg	11 of 11 (four)
Benzo(a)anthracene	1400 to 7500 µg/kg	320 µg/kg	11 of 11 (two)
Benzo(a)pyrene	1700 to 6900 µg/kg	370 µg/kg	11 of 11 (two)
Benzo(g,h,i)perylene	840 to 5100 µg/kg	170 µg/kg	11 of 11 (two)
Benzo(k)fluoranthene	2900 to 14,000 µg/kg	240 µg/kg	11 of 11 (two)
Chrysene	2100 to 9500 µg/kg	340 µg/kg	11 of 11 (two)
Dibenzo(a,h)anthracene	340 J to 2100 µg/kg	60 µg/kg	11 of 11 (five)
Fluoranthene	3800 to 21,000 µg/kg	750 µg/kg	11 of 11 (three)
Fluorene	210 to 3,000 µg/kg	190 µg/kg	11 of 11 (five)
Indeno(1,2,3-cd)pyrene	840 to 4500 µg/kg	200 µg/kg	11 of 11 (two)
Phenanthrene	1800 to 12,000 µg/kg	560 µg/kg	11 of 11 (two)
Pyrene	2900 to 15,000 µg/kg	490 µg/kg	11 of 11 (three)

Notes:

^a Duplicate samples and sample dilutions were not used to determine concentration ranges.

^b Ontario Ministry of the Environment. 1993. "Guidelines for Protection and Management of Aquatic Sediment Quality in Ontario." Aug.

^c When the concentration of a given analyte in a sample is equal to or greater than the analyte screening level, the source documents define this as an exceedance of the screening level. Each number presented in parentheses is the number of estimated results ("J"-flagged values) that exceeded the screening level.

$\mu\text{g}/\text{kg}$ = Microgram per kilogram
J = Value reported is the approximate concentration of the analyte
 mg/kg = Milligram per kilogram
U = Analyte was not present at a concentration greater than or equal to the reporting limit; value shown is the reporting limit
UJ = Analyte was not present at a concentration greater than or equal to the reporting limit; value shown is an estimate of the reporting limit

Sediment samples had concentrations of these selected contaminants that document releases from the site to river sediments at levels three times or more above the background sediment core sample's concentrations, five times the CRQL, or ten times the background sample concentrations:

SOL-KK-S01, MMSD Dock:

2-3 foot sample: chromium, mercury

4-5 foot sample: chromium, mercury

SOL-KK-S02, City of Milw. Dock:

1-2 foot sample: chromium, mercury, acenaphthene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, bis(2-ethylhexyl)phthalate, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene

2-3 foot sample: chromium, mercury

SOL-KK-S03, Car Ferry Slip:

4-5 foot sample: chromium, lead, benzo(a)anthracene

TABLE 7

SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES
IN SEDIMENT CORE SOL – KK-01

Analyte	Sample Identification		
	KK-01 – 01-02	KK-01 – 02-03	KK-01 – 04-05
Inorganics	Concentrations in mg/kg^a		
Arsenic	4.1 J	13.3 J-	17.6 J-
Cadmium	3.6	7.2	5.9
Chromium	139	307	433
Copper	59	119	144
Lead	123	246	338
Mercury	0.59	1.2	3.7
Zinc	179	395	586
Semivolatiles	Concentrations in ug/kg^a		
Acenaphthylene	1700	960	830
Benzo(a)pyrene	3500^b	2200	1700
Benzo(g,h,i)perylene	2200	1300	840
Benzo(k)fluoranthene	6000	3800	2900
Indeno(1,2,3-cd)pyrene	2000	1200	840

Notes:

^a Duplicate sample and sample dilution data were not used.

^b The value in bold exceeds the reference sediment screening level for benzo (a) pyrene in the Ontario Ministry of the Environment. 1993. "Guidelines for Protection and Management of Aquatic Sediment Quality in Ontario." Aug.

J = The value reported is an approximate concentration of the analyte

U = Analyte was not present at or above the reporting limit; the value shown is an estimate of the reporting limit.

TABLE 8

**SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES
IN SEDIMENT CORE SOL – KK-02**

Analyte	Sample Identification		
	KK-02 – 01-02	KK-02 – 02-03	KK-02 – 04-05
Inorganics	Concentrations in mg/kg^a		
Arsenic	17.6 J	20.3 J-	10.1 J-
Cadmium	11.5	11.3	4.5
Chromium	349	354	217
Copper	147	147	71.3
Lead	318	327	240
Mercury	1.8	1.5	1.2
Nickel	42.3	42.3	17.4
Zinc	662	652	326
Semivolatiles	Concentrations in ug/kg^a		
Anthracene	2300	1200	1100
Benzo(a)anthracene	6400	3000	2500
Benzo(a)pyrene	6200^b	3200^b	2600
Benzo(g,h,i)perylene	5600	2300	1800
Benzo(k)fluoranthene	13,000	6200	5000
Chrysene	8500	4000	3200
Dibenzo(a,h)anthracene	2100	790	610 J
Fluoranthene	17,000	6800	6100
Indeno(1,2,3-cd)pyrene	4600	2000	1600

Pyrene	15,000	5800 J	4400
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Notes:

- ^a Duplicate sample and sample dilution data were not used.
- ^b The value in bold exceeds the reference sediment screening level for benzo (a) pyrene in the Ontario Ministry of the Environment, 1993. "Guidelines for Protection and Management of Aquatic Sediment Quality in Ontario." Aug.
- J = The value reported is an approximate concentration of the analyte
- U = Analyte was not present at or above the reporting limit; the value shown is an estimate of the reporting limit.

TABLE 9

SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES
IN SEDIMENT CORE SOL – KK-03

Analyte	Sample Identification		
	KK-03 – 02-03	KK-03 – 03-04	KK-03 – 04-05
Inorganics Concentrations in mg/kg ^a			
Arsenic	6.1 J-	4.1 J-	8.2 J-
Cadmium	4.1	2.9	9.3
Chromium	147	96.6	364
Copper	116	79.8	135
Lead	269	241	739
Nickel	33.9	25.7	40.4
Zinc	593	406	931
Semivolatiles Concentrations in ug/kg ^a			
Benzo(a)pyrene	2500 J	2000 J	4000^a

Benzo(g,h,i)perylene	1800 J	1700 J	2900
Benzo(k)fluoranthene	5000 J	4200 J	7900
Indeno(1,2,3-cd)pyrene	1600 J	1400 J	2600

Notes:

^a Duplicate sample and sample dilution data were not used.

^b The value in bold exceeds the reference sediment screening level for benzo (a) pyrene in the Ontario Ministry of the Environment. 1993. "Guidelines for Protection and Management of Aquatic Sediment Quality in Ontario." Aug.

J = The value reported is an approximate concentration of the analyte

U = Analyte was not present at or above the reporting limit; the value shown is an estimate of the reporting limit.

TABLE 10

**SUMMARY OF RESULTS FOR SELECTED METALS AND SVOC ANALYTES
IN SEDIMENT CORE SOL – KK-04**

Analyte	Sample Identification	
	KK-04 – 00-02	KK-04 – 02-04
Inorganics	Concentrations in mg/kg^a	
Arsenic	3.4 J-	4.7 J-
Cadmium	2.5 J+	3.2
Chromium	72.1	175
Copper	97.8	136
Lead	180	278
Nickel	24	33.2
Zinc	413	589

Semivolatiles	Concentrations in ug/kg ^a	
Acenaphthene	1900	110 J
Acenaphthylene	2900	250 J
Anthracene	5000	390 J
Benzo(a)anthracene	7500	1400
Benzo(a)pyrene	6000 ^a	1700
Benzo(g,h,i)perylene	3300	1200
Benzo(k)fluoranthene	8900	3500
Chrysene	8300	2100
Fluorene	3000	210 J
Indeno(1,2,3-cd)pyrene	2900	1100
Phenanthrene	12,000	1800
Pyrene	15,000	2900

Notes:

All sample concentrations are presented in micrograms per kilogram.

^a Duplicate sample and sample dilution data were not used.

^b The value in bold exceeds the reference sediment screening level for benzo (a) pyrene in the Ontario Ministry of the Environment. 1993. "Guidelines for Protection and Management of Aquatic Sediment Quality in Ontario." Aug.

J = The value reported is an approximate concentration of the analyte

U = Analyte was not present at or above the reporting limit; the value shown is an estimate of the reporting limit.

Many of the PAH compounds were found to be elevated in the sediment background core (SOL-KK-S04) samples. There is a noticeable tidal effect (seiche) on the river that could cause movement of contaminated sediment upstream. This effect, during the long period of site operations, may have also repeatedly caused releases in the form of coal tar/oil or other contaminated materials from site operations to move upstream. The seiche effect may have potentially increased the associated PAH concentrations, including benzo(a)pyrene in upstream sediments and the background core samples.

4.0 MIGRATION PATHWAYS

This section of the ESI report discusses the analytical results for samples collected from Areas A and B, and the Kinnickinnic River. Environmental media samples were collected of soil, sediment, and waste. The pathway discussions are based on the analytical data and discussion presented in the Site Assessment report. Generally, the data shows that there are potential completed pathways for soil exposure and surface water, with the surface water pathway currently having the greatest overall significance. Summary tables containing the sample laboratory data are available in Appendices B and C.

4.1 Soil Exposure Pathway

In general, most of the property is not paved. Access to the property is only partially restricted, primarily along the east and north property boundaries. The Removal Action activities removed the ASTs and associated wastes. During the ESI sampling activities, at least one soil waste pile (covered with plastic sheeting) was observed. A release to the soil exposure pathway was determined by comparing analytical data of the background sample (sample S33) to those considered to be attributable to or from a waste source. The semivolatile organic compound analysis of the soil samples identified concentrations of several PAHs (in addition to metals and VOCs) that exceed Federal PRGs for industrial and/or residential soil (Table 2). In seven of the nine soil samples, concentrations of benzo(a)pyrene were detected above PRG screening levels.

Elevated levels of contaminants in the soil were documented at depths above 2 feet in surface soil samples S13, S14, and S20. These surface soil samples showed elevated levels of metals and semi-volatile organic compounds (SVOCs) greater than three times background soil sample concentrations. Generally, the parameters exceeding background sample concentrations included arsenic, lead, and several PAH compounds.

Laboratory analysis of surface soil sample S20 (at former AST # 14) detected many PAH compounds with several (including benzo(a)pyrene) that exceed Federal PRGs for residential soil. All of the PAHs detected in sample S20 (including benzo(a)pyrene) had concentrations that exceed background sample concentrations. Laboratory analysis of surface soil samples S13 and S14 (at former AST # 13) for PAHs detected these compounds that exceeded Federal PRG concentrations for residential soil: benzo(a)anthracene, benzo(a)pyrene (S13), benzo(b)fluoranthene, dibenzo(a,h)anthracene (S13), and indeno(1,2,3-cd)pyrene. Most of the PAHs detected in samples S13 and S14 had concentrations that also exceed background sample concentrations.

Subsurface soil samples collected at the former tank pit and tank #13 had concentrations of contaminants above three times the background soil sample concentrations or five times the CRQL: Former Tank Pit (S08): naphthalene, acenaphthylene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene; Tank No. 13 (S09): phenanthrene, fluoranthene, pyrene, chrysene, and benzo(b)fluoranthene.

Waste Source Samples

Additional characterization of waste sources was conducted during the ESI. A total of 26 samples were collected from Area B (former coal storage yard). The semivolatile organic compound analysis

identified concentrations of PAHs (in addition to metals and VOCs) with many that exceed Federal PRGs for industrial and/or residential soil. In 25 of the 26 samples, concentrations of benzo(a)pyrene were detected above PRG screening levels. For comparison purposes, 15 of the 26 samples analyzed detected benzo(a)pyrene at levels greater than five times the Contract Required Quantitation Limit (CRQL) detected in the background soil sample.

Receptors

There are no known full time employees currently working on the Solvay Coke property. Occasionally, as observed during the ESI sampling, there may be contractors working on-site utilizing from one to several employees. There are no day-care facilities or schools within one-quarter mile of the site (Ref. 2). There are no resident individuals within 200 feet of suspected contamination (Ref. 2). The nearest resident is located approximately 600 feet west of the property (Ref. 2).

4.2 Ground Water Pathway

Investigation of the groundwater pathway was not part of the scope of the Expanded Site Inspection sampling activities. General discussions describing the geology and topography is provided for information purposes

Regional Geology

The Milwaukee area has generally low topographic relief ranging from flat, to gently undulating, to hilly. Soil deposits overlying bedrock include soils formed as a result of glaciation and by recent fluvial and estuary deposition. The glacial soils were deposited beneath a series of glaciers that advanced out of the Lake Michigan basin. The surficial geology of Milwaukee consists of glacial deposits of Quaternary age. These deposits typically consists of till; unstratified clay, silt, sand, gravel, and boulders with thickness of up to 200 feet in portions of the regions. Bedrock underlying the glacial deposits consists of undifferentiated Silurian and Ordovician age dolomites. Underlying these formations are the St. Peter Sandstone and undifferentiated sandstone. (Ref. 11)

Area Geology

The site generally is located in the area of the Menomonee Valley. The geology of the Menomonee Valley is grouped into four geologically and hydrogeologically distinct units:

The first unit is the shallowest unit and is comprised of fill material, which consists of reworked clay, silt, sand, and gravel with local inclusions of cinder, glass, wood, metal, rubble, brick, ash and household type trash. The thickness of the material ranges from 2 to 22 feet and generally this unit would have the same composition of materials. The second unit, which underlies the first unit, is a soft to stiff organic-rich silt, clayey, silt, and/or silty clay with local peat layers. The third unit consists of the unconsolidated deposits of loose to dense sand, silt, and silty fine sand. Throughout the unit, a complex interbedding of silty fine sand and gravel with discontinuous laminae sequence of silt and clay are present. The thickness of this unit ranges from 35 to 200 feet. The fourth unit consists of undifferentiated dolomite bedrock. Shale and sandstone have also been observed below the dolomite in selected borings in the Menomonee Valley study area. The thickness of this unit in depth below the surface ranges from 25 to 250 feet. The Milwaukee Metropolitan Sewerage District studied the geology of this area as part of its deep tunnel system. (Ref. 11)

Site Specific Topography and Geology

The surface topography of the vicinity is generally uniform and slightly elevated in some areas; ranging from 583.0 feet above the sea level to 597.7 feet above the sea level. The site elevation ranges from 584.8 feet above sea level to 593.8 feet above sea level. Coarse-grained media, such as fill, sand, gravel, can be found with thickness ranging from 15 to 20 feet. Underlying the coarse grained media is silty clay and other fine-grained medium. The thickness of this zone is approximately 20 feet deep.

(Ref. 11)

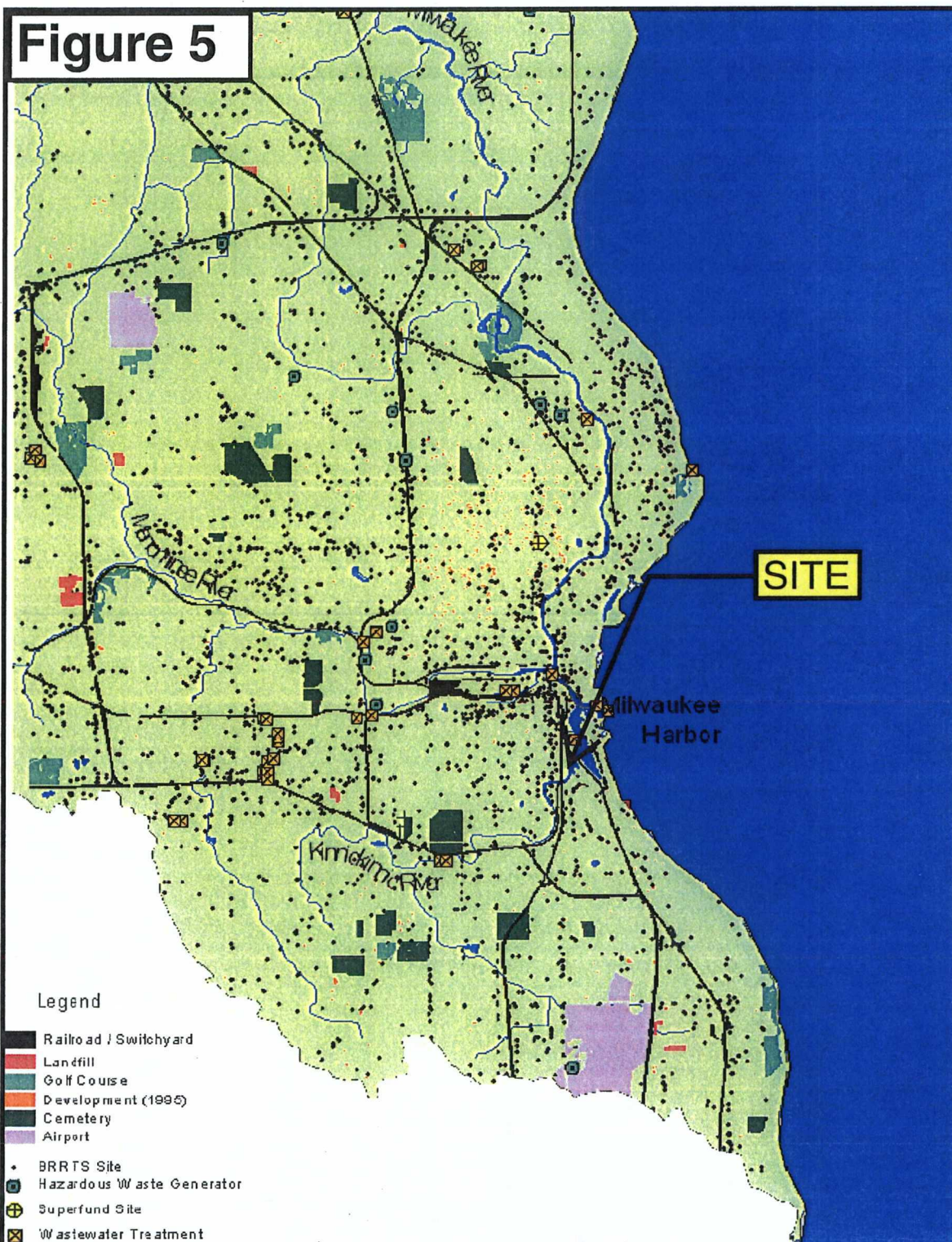
4.3 Surface Water Pathway

The sediment sample data collected during the previous site assessment sampling in 2001 documented elevated levels of metals, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in river sediments adjacent to the Milwaukee Solvay Coke and Gas Co. site. During the ESI, four sediment cores were advanced. Sediment cores were collected in the former car ferry slip, downstream of the site along the west shoreline area at the location of the Milwaukee Metropolitan Sewerage District boat dock, and on the east shoreline area at the location of the City of Milwaukee cargo boat dock, and a location near the upstream part of the site.

The Kinnickinnic River is considered a typical industrialized urban stream that has likely been impacted more from historic sources of PAHs than from currently existing sources (Ref. 13). Contaminants such as PAHs are generally considered ubiquitous in urban, industrial settings. Upstream of the site, a review of Sanborn maps determined that about eight major companies existed between Lincoln Avenue and Kinnickinnic Avenue during the 1930's, and increased to more than 20 in the 1950's (Ref. 13). Industries present during the 1930's and 1950's included: steel works, shoe manufacturing, tannery, wood working, brass foundry, iron works, coal wood and lumber yard, fuel company, ice making, and manufacturing of commercial refrigeration parts (Ref. 13). These industries probably contributed some degree of contaminant loading, including PAHs, to the river. Generally, these former operations are no longer present today. Stormwater discharges, both outfalls and non-point sources, together with sewer overflows and incidental spills, likely continue to contribute some amount of PAH loading to the river. Figure 5 shows the potential contaminant sources located within the drainage basins (Milwaukee, Kinnickinnic, and Menomonee rivers) in the source water area of the site.

It is widely known that former manufactured gas plants (MGPs) were major sources of organic compound contaminants, especially PAHs. Generally, more than 11 billion gallons of coal tar were produced at MGPs in the U.S. from 1816 to 1947 and the disposition of several billion gallons remains unknown and unaccounted for (Ref. 14). Many sites discharged free product coal tar oil, either directly or indirectly, to surface waters. Releases attributable to the Solvay Coke site were documented during the December 2001 site assessment sampling. Laboratory analysis of samples collected during the ESI again detected concentrations of metals and PAHs that exceed sediment screening levels, including most of the parameters listed in Table 6. Samples KK-01 and KK-02 had concentrations of chromium and mercury that exceed background sediment sample concentrations and document releases from the site to river sediments. Sample KK-02 had concentrations of PAHs that exceed background sample concentrations, also documenting releases to river sediments. The PAHs compounds include: acenaphthene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, bis(2-ethylhexyl)phthalate, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene.

Milwaukee Solvay Coke & Gas Co. Potential Contaminant Sources in Source Water Area



Base Map Source: Reference # 4

Possible direct discharges from the site to the Kinnickinnic River include: storm drains, probable coke quenching drains, and potential releases from spills by overland flow. Another likely release is contaminated groundwater from the site discharging to surface water. The probable point of discharge of releases from the site to the Kinnickinnic River is likely any point along the site, including storm water outfalls, seeps, and groundwater discharging to surface water. It should be noted that there is a noticeable tidal effect (seiche) on the river that could cause movement of contaminated sediment upstream. This effect, during the long period of site operations, may have also repeatedly caused releases in the form of coal tar/oil or other contaminated materials from site operations to move upstream. The seiche effect may have potentially increased the associated PAH concentrations, including benzo(a)pyrene in upstream sediments.

Drainage

The majority of the source water area for the Milwaukee Waterworks is drained by the Milwaukee, Kinnickinnic, and Menomonee Rivers, which join together in the Milwaukee Harbor before entering Lake Michigan. The Milwaukee River drains most of the source water area, originating in Fond du Lac and Sheboygan Counties. The Menomonee and Kinnickinnic Rivers drain the southwestern and southern portions of the source water areas, respectively (the Kinnickinnic River is located at the extreme southern portion of the drainage basin). The Milwaukee Harbor discharges in to Lake Michigan five miles southeast of one water supply intake and three miles east-southeast of the second water supply intake. See Figure 6 showing the drainage pattern of the Milwaukee Source Water Area. (Ref.4)

Water Quality Threat

The Source Water Assessment for Milwaukee Waterworks (Ref. 4) states: The Milwaukee Estuary is classified as an Area of Concern. Areas of Concern are defined by the U.S. and Canada as “geographical areas that fail to meet the general or specific objectives of the agreement where such failure has caused or is likely to cause impairment of beneficial use of the area’s ability to support aquatic life”. The Milwaukee Estuary Area of Concern includes the near shore waters of Lake Michigan, Milwaukee Harbor, and the lower portions of the Menomonee, Milwaukee, and Kinnickinnic Rivers. The area of concern extends approximately one half of a mile north of the intake to Sheridan Park. Major environmental problems identified in this area of concern include combined sewer overflows, contaminated sediments, storm water runoff, sewage treatment plant effluent, and industrial process discharges.

Drinking Water Intakes

The residents of the City of Milwaukee and interconnected nearby communities utilize a surface water supply source from Lake Michigan. There are six surface water intakes within 15 miles of the site. The Milwaukee Waterworks utilizes two surface water intakes. The City of Milwaukee Water Works system serves an approximate population of 175,000 individuals (Ref. 4). The other public water supplies utilizing Lake Michigan as a surface water source within 15 miles of the site include: North Shore, Cudahy, South Milwaukee, and Oak Creek (Ref. 2). The water utilities of North Shore, Cudahy, and South Milwaukee serve approximate populations of 35,000 (Ref. 5), 18,000 (Ref. 6), and 21,000 (Ref. 7), respectively. The total population potentially affected is 249,000 people.

Milwaukee Solvay Coke & Gas Co. Drainage Pattern of Milwaukee Source Water Area Map



Base Map Source: Reference # 4

Other Receptors

Lake Michigan and the tributaries that drain to the lake are considered: warm water aquatic life habitat; municipal, agricultural, and industrial water supply; and recreation waters.

Several State threatened or endangered species occur within 15 miles of the site: These include the Butler's garter snake (*thamnophis butleri*) listed as threatened in Wisconsin, Sticky False-asphodel (*tofieldia glutinosa*) State threatened, Bluestem goldenrod (*solidago caesia*) State endangered. Additional species within the 15-mile distance limit are listed as State Special Concern species (Ref. 9).

Shoreland wetland areas on Lake Michigan are located within the 15-mile target distance limit of the site. The closest wetlands to the site greater than two acres in size are located approximately 5 miles north of the site at the Downer Wildlife Preserve. Additional shoreland wetland areas greater than two acres exist about 5.5 miles south of the site near the Cudahy Waterworks, and at Warnimont Park, approximately 6 miles south of the site. The wetlands at Warnimont Park contain a calcareous fen (a rare community supporting calciphilic plants) that discharges to the lake (Ref. 9).

5.0 SUMMARY AND CONCLUSIONS

Historic uses at the Milwaukee Solvay Coke and Gas site and property included a coal storage facility, coking plant, coal gas production plant, furnace companies (iron and steel making), and two leather tanneries. ESI sampling activities were focused on the former coking and gas manufacturing plant operation. Sampling activities included further characterization of waste sources and releases to environmental media (soil and sediment). Contaminants at manufactured coal gas plants and coking operations are known to include polycyclic aromatic hydrocarbons (PAHs), phenols, volatile organic compounds (VOCs) such as benzene and toluene, and cyanide. Previous investigation and the more recent Geoprobe borings indicate that much of the site has some degree of fill or waste material overlying native soil.

Subsequent to the site assessment sampling, a removal action was conducted to address dilapidated buildings, asbestos containing materials, process wastes, and process system components. Former ASTs and associated wastes were removed causing some soil disturbance. Confirmation soil samples were not collected subsequent to the AST removals to document that all hazardous substances posing a risk were removed. A tank release of an estimated 73,500 gallons also occurred from Tank # 13 during the Removal Action. No remediation activity was conducted in response to this release.

Wastes and two types of environmental media were collected during the ESI for sampling and chemical analysis. Twenty-six waste source samples were collected from two of the previously designated Areas of Interest (AOIs) A and B. Two of the waste samples were collected from waste piles that remain on-site. Five soil samples were collected to determine if contaminated soil exists in the vicinity of the former tank pit and the vicinity of the former location of tank # 13 and tank # 14. Four additional soil samples were also collected to determine potential background soil conditions. Most of the samples were collected using a Geoprobe device. Eleven sediment samples were collected in a portion of Area D (river sediment adjacent to the site) and downstream of the site to further characterize the extent of sediment contamination. Sediment core samples were collected using a vessel mounted Vibracore device. The data shows both on-site and off-site releases of

hazardous substances and documents potential completed pathways for direct contact soil exposure, and surface water, with the surface water pathway currently having the greatest overall significance. The levels of contamination at certain areas of the site (both upland and in river sediment) continue to pose potential threats to human health and the environment.

Sediment Samples

The sediment sample data during both the site assessment and ESI sampling events show elevated levels of metals (samples KK-01, KK-02, and KK-03) and semi-volatile organic compounds (SVOCs) in river sediments adjacent to and downstream of the Solvay Coke site. Most notably, the SVOC analysis of sample KK-02 identified concentrations of PAHs including benzo(a)pyrene that exceed background sample concentrations, again documenting a release to river sediments and the surface water pathway. Many of the PAH compounds detected in sediment samples were at concentrations that also exceed aquatic water quality screening levels.

Soil Samples

Previous investigation determined that much of the site has some amount of fill or waste material overlying native soils. Although four samples were collected during the ESI to assess background soil conditions, sample S33 (a subsurface sample) was the only sample that appeared undisturbed by site operations, detecting few PAHs and at low concentrations. Generally, SVOC analysis of the soil samples identified concentrations of several PAHs (in addition to metals and VOCs) that exceed U.S. EPA Region 9 Preliminary Remediation Goals for Industrial and/or Residential soil. In seven of the nine total samples, concentrations of benzo(a)pyrene were detected above PRG screening levels demonstrating that soils continue to pose a potential human health and/or direct contact threat.

PAH concentrations in sample S08 significantly exceeded background concentrations for at least 14 compounds (including benzo(a)pyrene), thus documenting a release to subsoil in the vicinity of the former tank pit. Sample S09 exhibited levels of PAHs that significantly exceed background concentrations for at least five compounds, thus documenting a release to subsoil in the vicinity of former tank # 13. Surface soil samples S13 and S14 (also collected at former tank # 13) had fewer concentrations of PAHs that exceed Federal PRGs. Many of the PAHs detected in samples S13 and S14 had concentrations that also exceed background sample concentrations documenting a release to surface soil. Analysis of sample S13 detected benzo(a)pyrene at a concentration of 3600 ug/kg. In the vicinity of former tank # 14, laboratory analysis of surface soil sample S20 detected many PAH compounds with several (including benzo(a)pyrene) that exceed Federal PRGs for residential soil. All of the PAHs detected in sample S20 (including benzo(a)pyrene) had concentrations that exceed background sample concentrations. Soil sample data documents releases to surface and subsurface soil attributable to the wastes contained in the former tank pit, and former ASTs tank # 13 and tank # 14. The sampling documents that residual contamination remains following the completion of AST related waste removal action activities.

Waste Source Samples

Data from the December 2001 site assessment documented hazardous substances in the AST tank contents and also releases to site soils (predominantly VOCs and SVOCs). Twenty-two SVOCs were detected in all three solid waste samples collected from the ASTs. Four additional SVOCs were also detected in one or more samples.

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Waste Source Samples

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During the ESI field activities an additional 26 samples were collected from Area B (former coal storage yard). Samples were collected using a Geoprobe device, except for those collected from two waste piles. The borings again document that various types of fill materials overlie native soil. The SVOC analysis for samples collected in the former coal yard identified concentrations of PAHs (in addition to metals and VOCs) with many that exceed Federal PRGs for industrial and/or residential soil. In 25 of the 26 samples, concentrations of benzo(a)pyrene were detected above PRG screening levels. Fifteen of the 26 samples analyzed also detected benzo(a)pyrene at concentrations five times or more above the potential soil background Contract Required Quantitation Limit (CRQL) concentration. The sampling documents the distribution of waste source related PAHs (and other contaminants) across the entire Area of Interest Area B.

Author's Note:

The sampling performed at the former Milwaukee Solvay and Coke Company site was conducted under Federal Superfund Authority (CERCLA and SARA). SI and ESI sampling activities are a limited screening sampling intended to determine if releases have occurred from waste sources that are attributable to the site. SI and ESI sampling activities are not a substitute, in any form, for a Remedial Investigation (RI).

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* Note: A complete file of the references contained in this document is located at the Department of Natural Resources, Southeast Region Headquarters Office, 2300 N. Dr. Martin Luther King Jr. Drive, Milwaukee, Wisconsin.

Appendix A

Glossary of Terms

GLOSSARY

Actual contamination: A target exposed to hazardous substances based on analytical data or through direct observation.

Apportioned population: In the evaluation of drinking water target populations associated with a blended system, the portion of the population evaluated as being served by an individual well or intake within the system.

Aquifer: Rock or sediment that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs. Not all ground water is in an aquifer.

Background: The natural ambient concentration of a hazardous substance. Includes both naturally occurring concentrations and concentrations from human-made sources other than the site being evaluated.

Blended system: A drinking water supply system that can or does combine (e.g., via connecting valves) water from more than one well or surface water intake, or from a combination of wells and intakes.

Computer-Aided Data Review and Evaluation (CADRE): A PC based software program designed to aid the analytical data review for CLP RAS data according to the QC criteria defined in EPA's *Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses*.

CERCLA Information System (CERCLIS): EPA's computerized inventory and tracking system for potential hazardous waste sites.

CLP Analytical Results Database (CARD): A national database designed to store and integrate CLP results and QA/QC data. CARD consists of Superfund chemical analysis and analytical information on hazardous waste sites. Analytical data entered into CARD can be downloaded into electronic software applications, such as CADRE.

Coastal tidal waters: Surface water body type that includes embayments, harbors, sounds, estuaries, and back bays. Such water bodies are in the interval seaward from the mouths of rivers and landward from the 12-mile baseline marking the transition to the ocean water body type.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA): Legislation that established the Federal Superfund for response to uncontrolled releases of hazardous substances to the environment.

Contaminated soil: Soil onto which available evidence indicates that a hazardous substance was spilled, spread, disposed, or deposited.

Contract Laboratory Program (CLP): A nationwide network of commercial laboratories under contract to EPA that provides analytical data of known and documented quality for Superfund enforcement actions. The CLP consists of routine and non-routine standardized analytical procedures and associated quality control requirements managed under a broad quality assurance program, which includes sample projections, sample scheduling, chain-of-custody requirements, reporting and documentation requirements, audits, and data evaluations.

Data Quality Objectives (DQOs): The full set of qualitative and quantitative constraints needed to specify the level of uncertainty that a manager can accept when making a decision based on data. The DQO process is a planning tool that enables the site manager to specify the quality of the data (analytical methods and services to be used) required to support the objectives of the site investigation.

Data Use Categories (DUCs): A level of data quality defined by a specific combination of method, QA/QC, documentation, and review requirements.

Depth to aquifer: The vertical distance between the lowest known point of hazardous substances to the top of the aquifer being evaluated.

Distance to surface water: The shortest distance that overland runoff would follow from a source to surface water.

Drinking water population: The number of residents, workers, and students who drink water drawn from wells or surface water intakes located within target distance limits.

Drums: Portable containers designed to hold a standard 55-gallon volume of wastes.

Emergency response: An action taken to eliminate, control, or otherwise mitigate a threat posed to the public health or environment due to release or threatened release of a hazardous substance. Removals are relatively short-term actions to respond to situations requiring immediate action.

Factor: The basic element of the HRS requiring data collection and evaluation to assign a score.

Factor category: A set of related HRS factors. Each HRS pathway consists of three factor categories—likelihood of release or exposure, targets, and waste characteristics.

Field Analytical Support Project (FASP): Field sampling techniques designed to provide sample screening information during the field activities and provide real-time analytical data. Sample analysis is performed from a field base, mobile laboratory, or with portable instruments.

Federal Register (FR): Daily publication of the Government Printing Office; contains public notices, rules, and regulations issued by the Federal Government. Cited as “<volume> FR <page>.”

Fishery: An area of a surface water body from which food chain organisms are taken or could be taken for human consumption on a subsistence, recreational, or commercial basis. Food chain organisms include fish, shellfish, crustaceans, amphibians, and amphibious reptiles.

Geographical Exposure Modeling System (GEMS): Population database maintained by EPA’s Office of Toxic Substances that provides residential populations in specified distance categories around a point location.

Hazard Ranking System (HRS): Scoring system used by EPA to assess the relative threat associated with actual or potential releases of hazardous substances at sites. The HRS is the primary way of determining whether a site is to be included on the NPL.

Hazardous constituent: Hazardous substance.

Hazardous substance: Material defined as a hazardous substance, pollutant, or contaminant in CERCLA Sections 101(14) and 101(33).

Hazardous waste: Any material containing a hazardous substance, pollutant, or contaminant that is or was in a source.

Investigation-derived wastes (IDW): Wastes generated during the process of collecting samples during CERCLA investigations that must be handled according to all applicable or relevant and appropriate requirements. These wastes include soil, ground water, used personal protective equipment, decontamination fluids, and disposable sampling equipment.

Karst: A kind of terrain with characteristics of relief and drainage arising from a high degree of rock solubility. The majority of karst conditions occur in limestone areas, but karst may also occur in areas of dolomite, gypsum, or salt deposits. Features associated with karst terrain may include irregular topography, abrupt ridges, sinkholes, caverns, abundant springs, disappearing streams, and the lack of a well-developed surface drainage system of tributaries and streams.

Lake: A type of surface water body that includes:

- Natural and artificially-made lakes or ponds that lie along rivers or streams (but excluding the Great Lakes).
- Isolated but perennial lakes, ponds, and wetlands.
- Static water channels or oxbow lakes contiguous to streams or rivers.
- Streams or small rivers, without diking, that merge into surrounding perennially-inundated wetlands.
- Wetlands contiguous to water bodies defined as lakes are considered to be part of the lake.

Landfill: An engineered (by excavation or construction) or natural hole in the ground into which wastes have been disposed by backfilling or contemporaneous soil deposition with waste disposal.

Land treatment: Landfarming or other land treatment method of waste management in which liquid wastes or sludges are spread over land and tilled, or liquids are injected at shallow depths into soils.

National Contingency Plan (NCP): National Oil and Hazardous Substances Pollution Contingency Plan, commonly known as the National Contingency Plan. Regulation that establishes roles, responsibilities, and authorities for responding to hazardous substance releases. The NCP established the HRS as the principal mechanism for placing sites on the NPL.

National Priorities List (NPL): Under the Superfund program, the list of sites with releases and potential releases of hazardous substances, pollutants, and contaminants that appear to pose the greatest threat to public health, welfare, and the environment.

No Further Remedial Action Planned (NFRAP): Site disposition decision that no further response under the Federal Superfund program is necessary. Replaced by "Site Evaluation Accomplished" (SEA) recommendation.

Non-CLP Analytical Services: Analytical activities procured outside of the Contract Laboratory Program (CLP). Non-CLP data are data that are generated using non-CLP analytical services and are not produced under the CLP's quality assurance program. Non-CLP data can be generated by laboratories that participate in the CLP, by CLP Statement of Work analytical methods, and may even be presented to the user in CLP deliverable format. However, if the analytical services were not obtained through the CLP/Regional Sample Control Center (RSCC) route, they are considered to be non-CLP analytical services.

No suspected release: A professional judgment PA conclusion based on site and pathway conditions that a hazardous substance is not likely to have been released to the environment. (No suspected release is the PA terminology analogous to the HRS potential to release.)

Observed contamination: The evaluation of a release of a hazardous substance to the ground surface based on analytical data appropriate for the soil exposure pathway.

Observed release: The evaluation of a release of a hazardous substance to the environment based on analytical data of the migration pathway or direct observation of the release into the migration pathway media.

Ocean: A type of surface water body that includes:

- Ocean areas seaward from a baseline distance of 12 miles from shore.
- The Great Lakes, including wetlands contiguous to them.

PA-Score: EPA's computer program that automates scoring sites during the PA.

Pathway: The environmental medium through which a hazardous substance may threaten targets. The HRS evaluates the migration and threat potential through the ground water, surface water, air, and soil exposure pathways.

Pile: Any non-containerized accumulation above the ground surface of solid, non-flowing wastes; includes open dumps. Some types of piles are:

Chemical Waste Pile—consists primarily of discarded chemical products, by-products, radioactive wastes, or used or unused feedstocks

Scrap Metal or Junk Pile—consists primarily of scrap metal or discarded durable goods, such as appliances, automobiles, auto parts, or batteries, composed of materials that contain or have contained a hazardous substance

Tailings Pile—consists primarily of any combination of overburden from a mining operation and tailings from a mineral mining, beneficiation, or processing operation

Trash Pile—consists primarily of paper, garbage, or discarded non-durable goods that contain or have contained a hazardous substance

Potential contamination: A target located within the target distance limit that is subject to a potential release of hazardous substances from the site or for which no actual contamination has been established.

Preliminary Assessment (PA): Initial stage of site assessment under Superfund; designed to distinguish between sites that pose little or no threat to human health and the environment and sites that require further investigation.

PREscore: EPA's computer program that automates scoring sites according to the HRS.

Primary target: A target, based on professional judgment of site and pathway conditions and target characteristics known at the PA, that has a relatively high likelihood of exposure to a hazardous substance. (Primary target is the PA terminology analogous to an HRS target exposed to actual contamination.)

Probable Point of Entry (PPE): The point at which overland runoff from the site most likely enters surface water.

Quality Assurance/Quality Control (QA/QC): Planned, systematic procedures or methods to provide a high degree of confidence in the quality of work products or laboratory results.

Removal: An action taken to eliminate, control, or otherwise mitigate a threat posed to the public health or environment due to release or threatened release of a hazardous substance. Removals are relatively short-term actions to respond to situations requiring immediate action.

Resident: A person whose place of residence (full or part-time) is within the target distance limit.

Resident individual: Under the soil exposure pathway, a person living or attending school or day care on a property with observed contamination and within 200 feet of an area of observed contamination associated with the site.

Resident population: Under the soil exposure pathway, the number of residents and students on a property with observed contamination and within 200 feet of an area of observed contamination associated with the site.

Resource Conservation and Recovery Act of 1976 (RCRA): Legislation that established cradle-to-grave accountability for hazardous wastes, from point of generation to point of ultimate disposal.

Routine Analytical Services (RAS) Standardized CLP laboratory services that provide analyses of organic and inorganic compounds in water or solid samples.

Secondary target: A target, based on professional judgement of site and pathway conditions and target characteristics known at the PA, that has a relatively low likelihood of exposure to a hazardous substance. (Secondary target is the PA terminology analogous to an HRS target exposed to potential contamination.)

Sensitive environment: A terrestrial or aquatic resource, fragile natural setting, or other area with unique or highly-valued environmental or cultural features.

Site: The area consisting of the aggregation of sources, the areas between sources, and areas that may have been contaminated due to migration from sources; site boundaries are independent of property boundaries.

Site Evaluation Accomplished (SEA): Site disposition decision that no further response under the Federal Superfund program is necessary. A SEA recommendation denotes that EPA has completed its assessment at a site and has determined that no further steps to list the site on the NPL need to be taken unless information indicating that this decision was not appropriate make a recommendation for listing appropriate at a later time. The SEA recommendation replaced the "No Further Remedial Action Planned" (NFRAP) recommendation (see Henry Longest Memorandum, May 11, 1992).

Site Inspection (SI): The second stage of site assessment under Superfund. SIs are performed at sites that receive a further action recommendation after the PA, and build on PA information. SIs typically include sampling to identify hazardous substances, releases, and targets exposed to actual contamination and help characterize sites that pose the greatest threats to human health and the environment.

Source: An area where a hazardous substance may have been deposited, stored, disposed, or placed. Also, soil that may have become contaminated as a result of hazardous substance migration. In general, however, the volumes of air, ground water, surface water, and surface water sediments that may have become contaminated through migration are not considered sources.

Special Analytical Services (SAS): Nonstandardized laboratory services that provide analyses for organics, inorganics, dioxin, and other compounds in a variety of matrices. SAS analyses need to be scheduled on an as-needed basis.

Standard Operating Procedures (SOPs): Established Regional, State or contractor procedures approved by EPA to address non-site specific investigation activities and issues. These procedures cover topics such as sampling protocols, chain-of-custody requirements, and quality assurance sampling requirements.

Stream flow: The average rate of flow of a water body, expressed in cubic feet per second (cfs).

Stream or river: A type of surface water body that includes:

- Perennially-flowing waters from point of origin to the ocean or to coastal tidal waters, whichever comes first, and wetlands contiguous to these flowing waters.
- Aboveground portions of disappearing rivers. Artificially-made ditches, only insofar as they perennially flow into other surface water.
- Intermittently-flowing waters and contiguous intermittently-flowing ditches in areas where mean annual precipitation is less than 20 inches.

Student: A full- or part-time attendee of an educational institution or day care facility located within the target distance limit.

Superfund Accelerated Cleanup Model (SACM) A process for streamlining Superfund cleanups. The site assessment activities under SACM integrate elements of removal assessments, site assessments (PA/SI), remedial investigations (RI), and risk assessments; these are conducted concurrently where appropriate or advisable.

Superfund Amendments and Reauthorization Act of 1986 (SARA): Legislation which extended the Federal Superfund program and mandated revisions to the HRS.

Superfund Chemical Data Matrix (SCDM): EPA's database of hazardous substances and their chemical characteristics (such as toxicity, mobility, persistence) and media-specific benchmark concentrations.

Surface impoundment: A topographic depression, excavation, or diked area, primarily formed from earthen materials (lined or unlined) and designed to hold accumulated liquid wastes, wastes containing free liquids, or sludges that were not backfilled or otherwise covered during periods of deposition. A depression may be dry if deposited liquid has evaporated, volatilized, or leached or wet with exposed liquid. Structures that may be more specifically described as lagoon pond, aeration pit, settling pond, tailings pond, sludge pit, etc. Also a surface impoundment that has been covered with soil after the final deposition of waste materials (i.e., buried or backfilled).

Surface water: A naturally-occurring, perennial water body; also, some artificially made and intermittently flowing water bodies.

Suspected release: A professional judgement PA conclusion based on site and pathway conditions that a hazardous substance is likely to have been released to the environment. Suspected release is the PA terminology analogous to an HRS observed release.

Tanks and non-drum containers: Any stationary device designed to contain accumulated wastes and constructed primarily of fabricated materials (such as wood, concrete, steel, or plastic) that provide structural support; any portable or mobile device in which waste is stored or otherwise handled.

Target: A receptor that is within the target distance limit for a particular pathway. Targets include wells and surface water intakes supplying drinking water, populations, human food chain organisms, sensitive environments, wellhead protection areas, and resources.

Target Analyte List (TAL): The list of inorganic analytes that is specified in the CLP Statement of Work for inorganics analysis.

Target Compound List (TCL): The list of organic compounds that is specified in the CLP Statement of Work for organics analysis.

Target distance limit: The distance over which the HRS evaluates targets. Target distance limits vary by pathway: ground water and air pathways—a 4-mile radius around site sources; surface water pathway—15 miles downstream from the probable point of entry to surface water; soil exposure pathway—200 feet (for the resident population threat) and 1 mile (for the nearby population threat) from areas of observed contamination.

Terrestrial sensitive environment A terrestrial resource, fragile natural setting, or other area with unique or highly valued environmental or cultural features.

Water body type: Classification of a surface water body. Water body types include: streams and rivers; lakes; oceans (includes the Great Lakes); and coastal tidal waters. See the specific definition of each water body type for more detail.

Wetland: A type of sensitive environment characterized as an area that is sufficiently inundated or saturated by surface or ground water to support vegetation adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Worker: In the soil exposure pathway, a person who is employed on a full- or part-time basis and whose workplace is within 200 feet of observed contamination. In the migration pathways, a person whose place of employment is within the target distance limit.

Appendix B

Summary Tables of Sediment Analytical Results

Appendix C

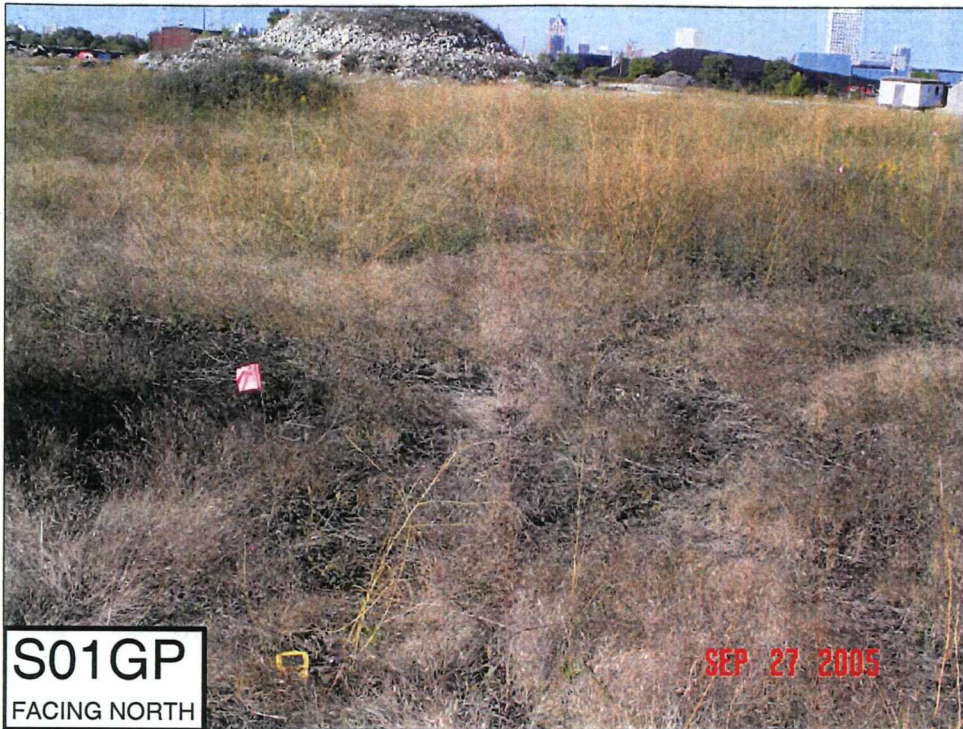
Summary Tables of Soil and Waste Analytical Results

Appendix D

Photo Documentation Log

The Following Photographs Are Included in Appendix D:

Photograph No.	Description
1	Perspective view of Geoprobe boring location SO1
2	Perspective view of Geoprobe boring location SO2
3	Perspective view of Geoprobe boring location SO3
4	Perspective view of Geoprobe boring location SO4
5	Perspective view of Geoprobe boring location SO5
6	Perspective view of Geoprobe boring location SO6
7	Perspective view of Geoprobe boring location SO7
8	Perspective view of Geoprobe boring location SO8
9	Perspective view of Geoprobe boring location SO9
10	Perspective view of Geoprobe boring location S10
11	Close-up view of waste pile sample location S11
12	Perspective view of waste pile sample location S11
13	Close-up view of coal pile sample location S12
14	Perspective view of coal pile sample location S12
15	Perspective view of surface soil sample location S13
16	Perspective view of surface soil sample location S14
17	Perspective view of Geoprobe boring location S15
18	Perspective view of Geoprobe boring location S16
19	Perspective view of Geoprobe boring location S17
20	Perspective view of Geoprobe boring location S18
21	Perspective view of Geoprobe boring location S19
22	Perspective view of surface soil sample location S20
23	Perspective view of Geoprobe boring location S21
24	Perspective view of Geoprobe boring location S22
25	Perspective view of Geoprobe boring location S23
26	Perspective view of Geoprobe boring location S25
27	Perspective view of Geoprobe boring location S26
28	Perspective view of Geoprobe boring location S27
29	Perspective view of Geoprobe boring location S28
30	Perspective view of surface soil sample location S32
31	Perspective view of Geoprobe boring location S33
32	Perspective view of Geoprobe boring location S34
33	Perspective view of surface soil sample location S35
34	Perspective view of Geoprobe boring location S36
35	Perspective view of surface soil sample location S37
36	Perspective view of Geoprobe boring location S38





S05GP
FACING NORTH

SEP 28 2005



S06GP
FACING NORTH

SEP 27 2005



S07GP
FACING SOUTH

SEP 27 2005



S08GP
FACING
NORTHWEST

SEP 28 2005



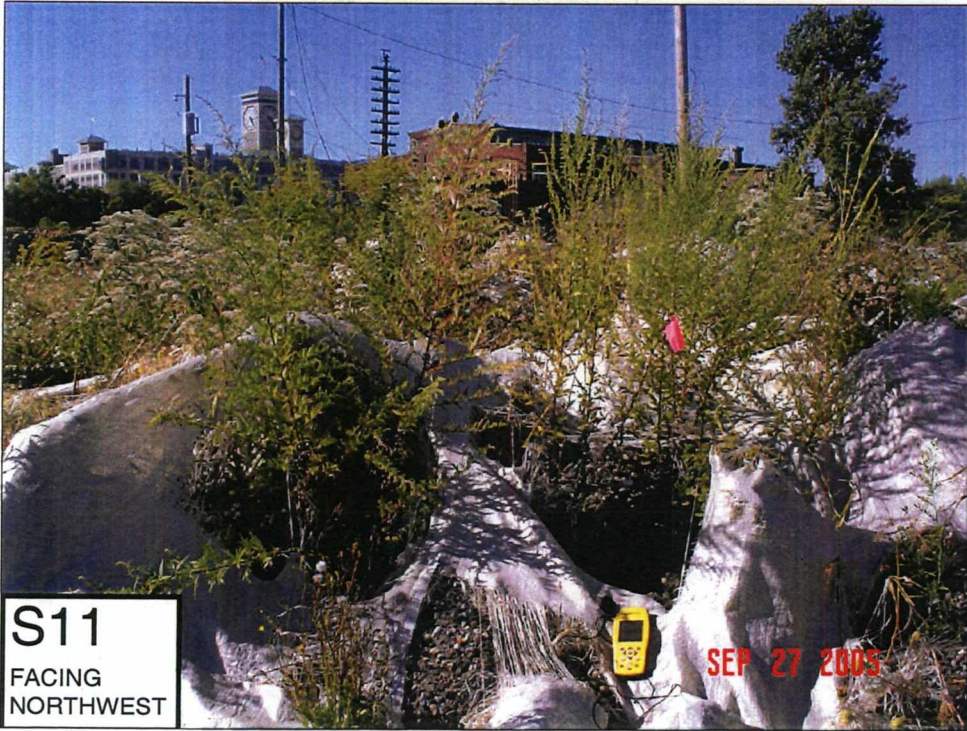
S09GP
FACING WEST

SEP 28 2005



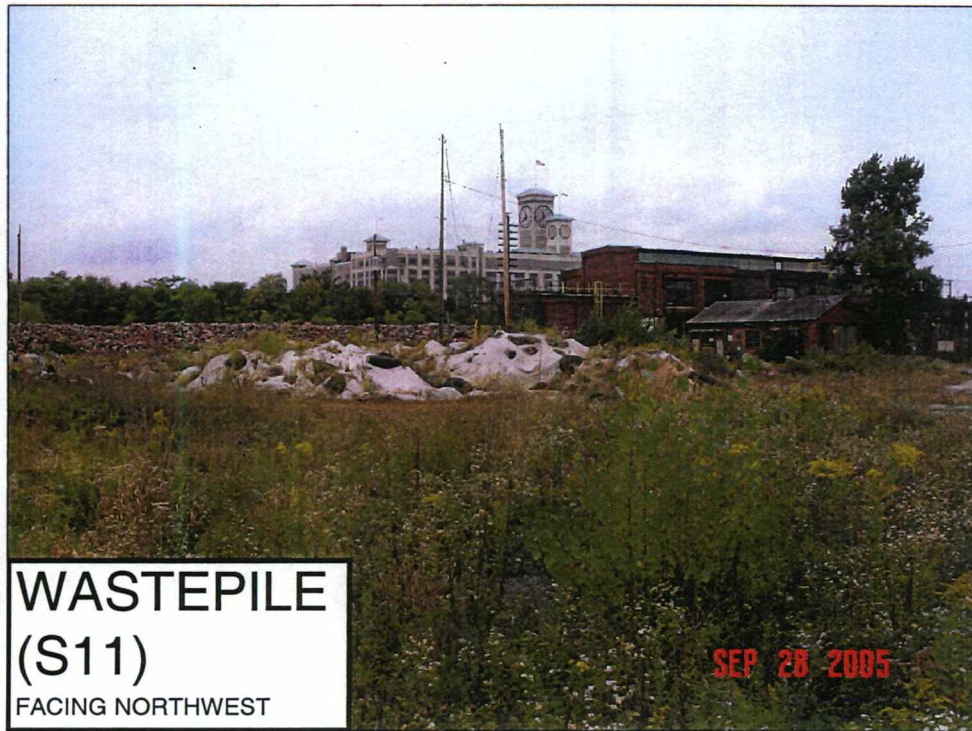
S10GP
FACING NORTH

SEP 28 2005



S11
FACING
NORTHWEST

SEP 27 2005



WASTEPILE
(S11)
FACING NORTHWEST

SEP 28 2005



S12
FACING WEST

SEP 27 2005



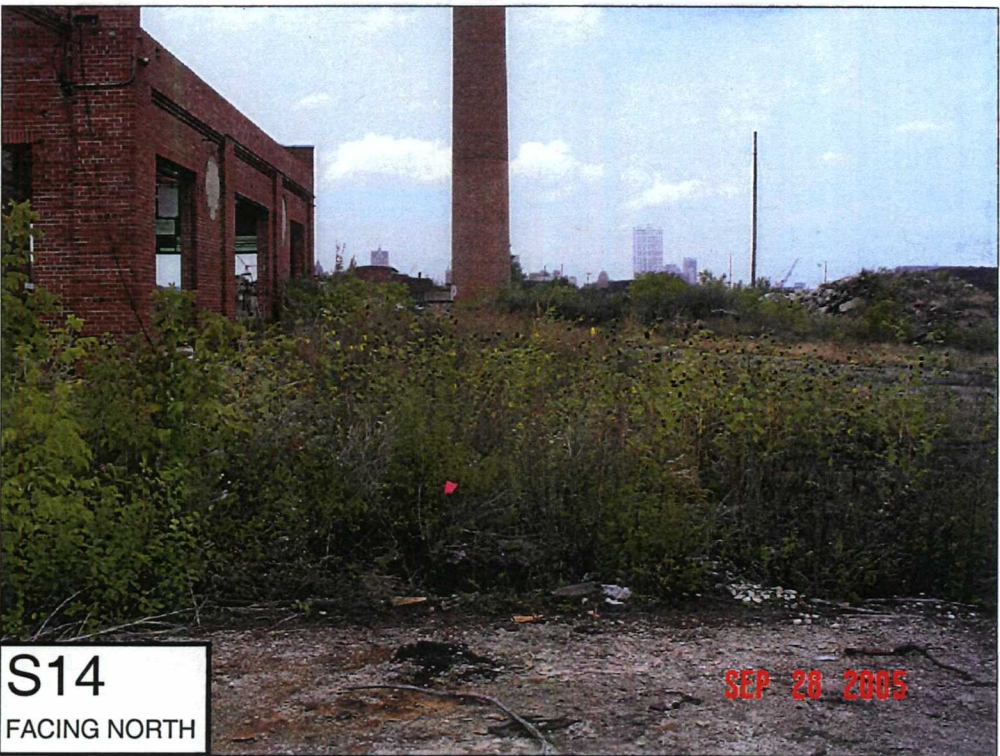
COALPILE
(S12)
FACING SOUTH

SEP 28 2005



S13
FACING WEST

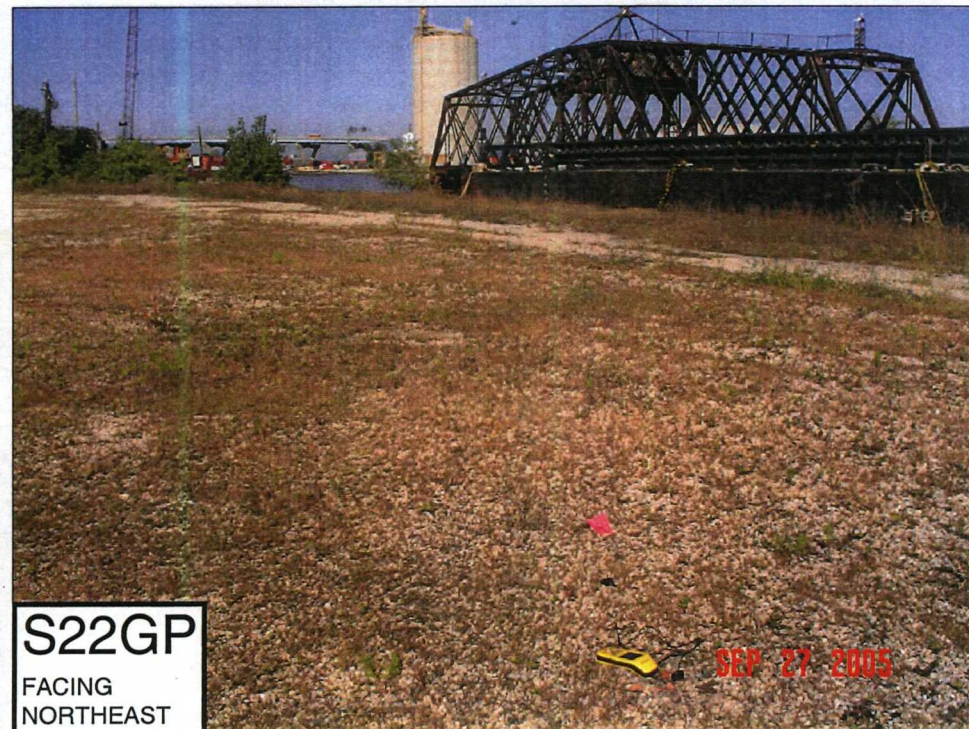
SEP 28 2005

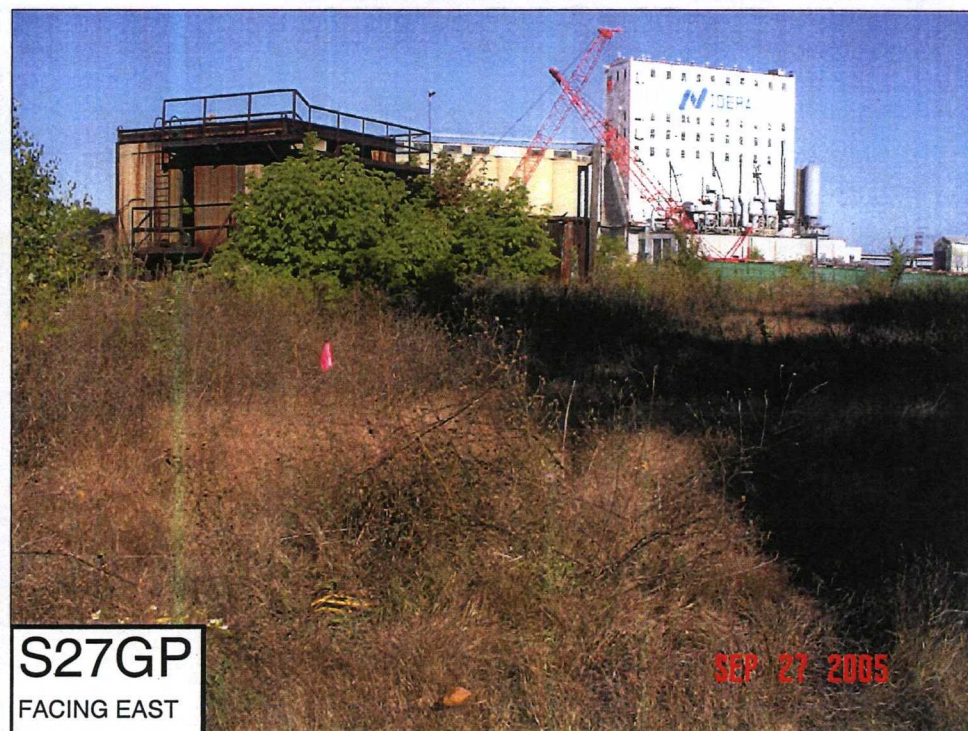
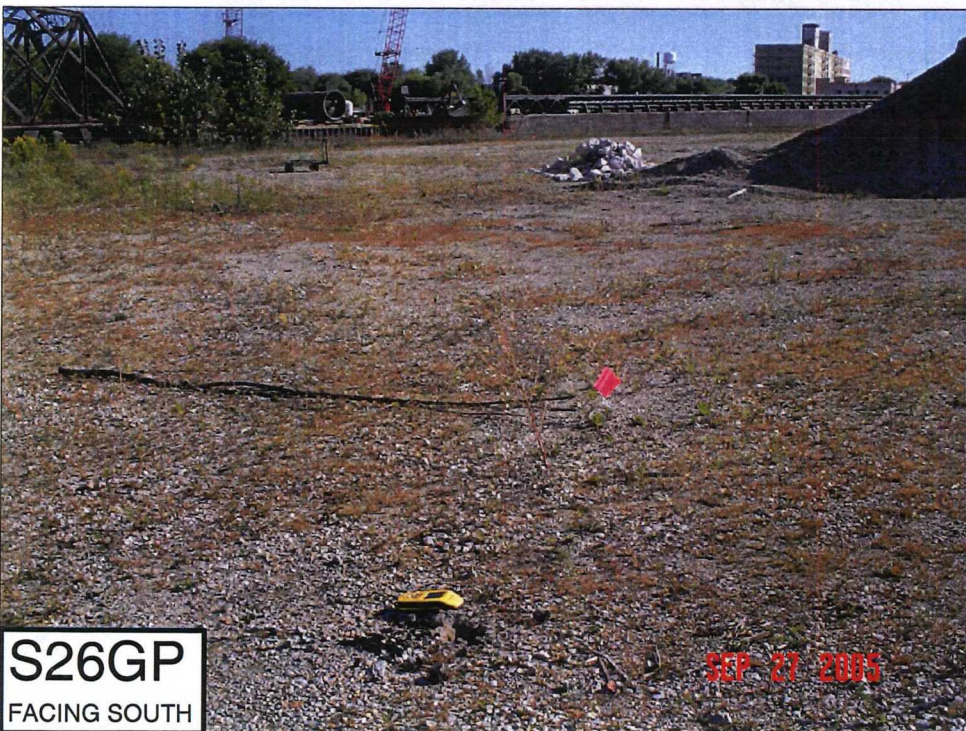


S14
FACING NORTH

SEP 28 2005









S28GP
FACING NORTH

SEP 27 2005



S32
FACING NORTH

SEP 27 2005



S33GP
FACING EAST

SEP 27 2005



S34GP
FACING NORTH

SEP 27 2005



S35
FACING
NORTHWEST

SEP 28 2005



S36GP
FACING
SOUTHWEST

SEP 28 2005



S37
FACING SOUTH

SEP 28 2005



S38GP
FACING NORTH

SEP 28 2005